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 2020

Project Reference Number

NIA_NGT0049

Project Registration

Project Title

Forward Resilience Measures (Stage 1)

Project Reference Number

NIA_NGT0049

Project Licensee(s)

National Grid Electricity Transmission

Project Start

June 2020

Project Duration

0 years and 11 months

Nominated Project Contact(s)

Ben Kuchta

Project Budget

£426,291.25

Summary

The resilience requirements of electricity networks will need to evolve with a changing energy landscape as society adapts how it uses energy to meet the 2050 net zero decarbonisation target and national infrastructure sectors become increasingly interdependent.

This project aims to develop a resilience assessment framework that combines qualitative and quantitative resilience assessments and output forward looking resilience measures,: applicable to electricity network owners to help plan for future resilience requirements.

This project is the first stage of work focused on the future resilience of the electricity transmission network.

Nominated Contact Email Address(es)

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Problem Being Solved

The resilience requirements of electricity networks will need to evolve with a changing energy landscape as society adapts how it uses energy to meet the 2050 net zero decarbonisation target and national infrastructure sectors become increasingly interdependent.

The following future trends will demand a resilient and robust energy network:

- Changes to the generation mix, increased volume of renewable generation and decentralised generation.
- The decarbonisation of heat and transport will introduce further complexity to the electricity system by increasing dependencies on electricity across many infrastructure sectors.
- New energy vectors such as a hydrogen will present new interactions and challenges.
- Increased dependence across society and all infrastructure sectors upon information communication technology and infrastructure.
- Increasing trend towards the integration of infrastructure and therefore further cross-sector interdependencies
- Changing frequency and likelihood of extreme weather conditions driven by climate change.

This project aims to develop a resilience assessment framework composed of both qualitative and quantitative resilience assessment models that will output forward looking resilience measures applicable to National Grid Electricity Transmission and others within the electricity sector to help plan for future resilience requirements and effectively ensure the UK has a resilient and robust electricity transmission network.

Method(s)

There are currently a number of industry and cross sector resilience publications, including frameworks that have not yet been utilised among the electricity networks.

This project aims to compile and assess such reports that will enable us to develop a resilience assessment framework composed of both qualitative and quantitative resilience assessment models. The methodology will identify common, sector specific, forward looking resilience measures which will enable the electricity networks to confidently plan for future resilience requirements and move towards a future integrated transmission system in line with various industry recommendations.

Scope

Work Package 1 (WP1) – Project input development

This phase of the project will develop the high level functional design of the project and the inputs to the resilience framework, the resilience assessment model including the system definition.

Work Package 2 (WP2) - Resilience assessment model development and application

This work package aims to develop and deliver a resilience assessment model that can qualitatively and/or quantitively assess the future resilience of the transmission network against defined resilience measures and can determine the appropriateness of selected solutions to achieve the required resilience.

Work Package 3 (WP3)– Resilience framework application

This work package will apply the resilience framework to output forward looking resilience measures in defined resilience categories for electricity transmission network owners. Each resilience sector will have clear criteria to be met, with multiple stages and ranks.

Work Package 4 (WP4) – Stakeholder engagement

This work package will focus on the dissemination and promotion of the tools developed in the project at agreed periods between the project partners. Stakeholder engagement will be helpful to ratify the inputs of the resilience assessment model and to socialize the outputs.

Objective(s)

To develop a resilience assessment framework composed of both qualitative and quantitative resilience assessment models that will output forward looking resilience measures applicable to National Grid Electricity Transmission and others within the electricity sector to help plan for future resilience requirements and effectively ensure the UK has a resilient and robust electricity transmission network.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

If successful, the project will deliver:

- A standalone prototype tool (based on the resilience assessment framework composed of both qualitative and quantitative resilience assessment models) for carrying out forward looking resilience assessments. This prototype tool will encapsulate the resilience framework and output forward looking resilience measures.
- Develop an innovative holistic technique for assessing the impact of the defined system threats against future scenarios using bespoke resilience and risk measures.
- Produce a detailed description of how the methodology within the resilience framework (composed of both qualitative and quantitative resilience assessment models) is applied to National Grid transmission network, including extensive simulation results and presentations.
- A detailed final report to be published and publicly shared on the resilience assessment tool (based on the resilience assessment framework composed of both qualitative and quantitative resilience assessment models), its application on network resilience analysis and its generic applicability and transferability to other networks and threats/scenarios.

Project Partners and External Funding

N/A

Potential for New Learning

This project has the potential to provide new learning in:

- Developing an innovative holistic technique for assessing the impact of the defined system threats against future scenarios using bespoke resilience and risk measures
- Developing an ability to quantify the reliability and resilience enhancement of different investments/operational solutions.
- Integrating resilience in the decision-making and planning process, complementing risk-based asset management practices as well as traditional reliability-driven and deterministic criteria.
- Provide a principle understanding that will allow networks to further develop, enhance and enable a collective move towards whole-system resilience.

Scale of Project

This project is a desktop study and will endeavour to engage with a number of stakeholders around the UK.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The United Kingdom

Revenue Allowed for the RIIO Settlement

No revenue in the RIIO settlement is allocated to this project.

Indicative Total NIA Project Expenditure

£426,291.25

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 risks addressed in the resilience framework are all associated with potentially very high impact events compromising security of supply. This project deals with the initial stage of understanding the risks and current level of resilience as it is primarily a desktop study (TRL 2 – 4). Because of this, it is not yet possible to quantify the potential estimate of the saving if the problem is solved.

Please provide a calculation of the expected benefits the Solution

This is a research project.

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

The method can be applied to network licensees.

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

The rollout costs cannot be quantified at this stage as the methodology and resilience framework have not been developed yet.

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

The outputs of this project would be directly applicable to other electricity network licensees, and the framework developed will be a best practice example that can be adapted. It's anticipated that this methodology also has the potential to be utilised across gas transmission & distribution 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 corporate responsibility 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.

Whilst there are projects under the topic of resilience that have been completed or are in progress, such as the recommendations from the ERP resilience report including nia_enwl010 and enwl021 that we are building upon. No other projects have been identified that are similar to the extent of having duplication to this project on the Smarter Network Portal.

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 will be innovative in the field of resilience because: • It will be assessing the future resilience of the network with validation against the present network. The work in this project will consider a range of future scenarios and will determine how the resilience requirement varies between them. • This project will develop, for the first time in the UK, a holistic resilience assessment that combines and develops qualitative and quantitative approaches with the aim to capture the advantages of both for electricity transmission network resilience planning. • Develop an innovative holistic technique for assessing the impact of the defined system threats against future scenarios using bespoke resilience and risk measures. • Provide a principle understand of how resilience can be considered as a planning criterion of transmission network, utilising multiple measures, shaping the roadmap towards resilience driven decision making and planning within and across sectors. • The ability to quantify the reliability and resilience enhancement of different solutions.

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

There are significant risks associated with undertaking such research and using it for the basis to enable cashable benefits. Without the NIA funding, this work would not be carried out.

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 project can only be funded through the NIA as there are significant risks which warrant further investigation and development of this research area, prior to its use within the business. The main risks are that there is no proven business case related to the application of a resilience methodology within electricity transmission. While a value case has been defined for this project, it wholly depends on the delivery of the described outcomes to enhance our understanding and improve our technical knowledge. Regardless the outcome of such endeavours, this information will be invaluable to asset managers.

This project has been approved by a senior member of staff

☑ Yes