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NIA Project Registration and PEA Document

Date of Submission

Feb 2022

Project Reference Number

NIA2_NGET0005

Project Registration

Project Title

Environmental Risk and Assurance (ERA)

Project Reference Number

NIA2_NGET0005

Project Licensee(s)

National Grid Electricity Transmission

Project Start

January 2023

Project Duration

1 year and 3 months

Nominated Project Contact(s)

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Project Budget

£455,314.00

Summary

Electricity assets such as towers and the equipment in substations have been designed to withstand a variety of environmental conditions. The increasing number and ferocity of extreme weather events exposes assets to a greater risk. For example, uncontrolled surface water flooding events are expected to rise along with the cost of damages.

To ensure the network continues to provide an uninterrupted electricity supply to its millions of customers, the ever-growing complexity of environmental risks needs to be constantly monitored.

Given the expected increase in extreme weather events, the current practice is likely going to be under increased pressure which will limit the ability to recognize escalating environmental risks.

Third Party Collaborators

University of Liverpool

Previsico ltd

Energy Innovation Centre

Frazer-Nash Consultancy

Nominated Contact Email Address(es)

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Problem Being Solved

Electricity assets such as towers and the equipment in substations have been designed to withstand a variety of environmental conditions. The increasing number and ferocity of extreme weather events exposes assets to a greater risk. For example, uncontrolled surface water flooding events are expected to rise along with the cost of damages (\geq £1.5m per site).

To ensure the network continues to provide an uninterrupted electricity supply to its millions of customers, the ever-growing complexity of environmental risks needs to be constantly monitored.

At present, all risk notifications, are manually reviewed by a few specialists. Weather notifications are received in the form of heatmaps and require experienced human interpretation based on knowledge of the geographical area. Once reviewed, the severity of the notification is graded and categorised to allow for the appropriate action and mitigation response to be initiated before any environmental threats impact the network. This process is already time consuming and resource intensive.

Given the expected increase in extreme weather events, the current practice is likely going to be under increased pressure which will limit the ability to recognize escalating environmental risks

Method(s)

The project will develop a bespoke, proof of concept model that harnesses available data sources to generate a quantitative risk rating that corresponds to the likelihood of an asset being damaged by an upcoming weather event. Outputs – including those from networks of strategically placed sensors – will be fed into the bespoke model to provide a robust multi-hazard warning platform to support improved hazard resilience for NGET assets.

The tool will also generate automated alerts to real-time risks – allowing NGET to prepare and respond in a coordinated way – and provide details of the asset coordinates, asset risk and mitigation actions alongside a heatmap for asset risks across a region.

Data Quality Statement (DQS):

The project will be delivered under the NIA framework in line with OFGEM, ENA and NGGT / NGET internal policy. Data produced as part of this project will be subject to quality assurance to ensure that the information produced with each deliverable is accurate to the best of our knowledge and sources of information are appropriately documented. All deliverables and project outputs will be stored on our internal SharePoint platform ensuring access control, backup and version management. Relevant project documentation and reports will also be made available on the ENA Smarter Networks Portal and dissemination material will be shared with the relevant stakeholders.

Measurement Quality Statement (MQS):

The methodology used in this project will be subject to our supplier's own quality assurance regime. Quality assurance processes and the source of data, measurement processes and equipment as well as data processing will be clearly documented and verifiable. The measurements, designs and economic assessments will also be clearly documented in the relevant deliverables and final project report and will be made available for review.

In line with the ENA's ENIP document, the risk rating has scored Low.

TRL steps score = 2

Cost score = 1

Suppliers score = 2

Data assumption score = 1

Scope

The project will be split into 8 sprints:

1. Risk model and software requirements capture including sensor hardware requirements.
2. User interface requirements capture.

a. Data gathering and processing. Interim flood forecasting system setup and sensor hardware and interim software preparation.

3. Risk model development and platform setup.
 - a. Sensor hardware installation. Incorporation of erosion data into risk model.
4. Risk model development and platform development.
 - a. Incorporation of new erosion data into risk model. Completion of any outstanding sensor installations.
5. Risk model validation.
 - a. Platform and user interface development. Incorporation of new erosion data into risk model.
6. Platform and user interface development.
 - a. Incorporation of new erosion data into risk model (refinement).
7. Platform and user interface development.
 - a. Incorporation of new erosion data into risk model (refinement).
8. Proof-of-concept tool delivery and supporting documentation.

Objective(s)

This project aims to deliver a methodology for quantifying asset risk, based on location, asset type and weather data. A modelling tool to implement this methodology specifically for NGET assets will be built.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

Technical and wellbeing impact:

Based on the recommendations and findings in this research, energy networks may adopt the environmental risk and assurance tool. It will support networks in the defence against uncontrolled flooding which will benefit vulnerable consumers. The consumer impact of any of the methods or solutions developed in this project are not dependent on any of the following factors: Dwelling and location (potentially including tenure) Readiness for digital technology Personal and social factors (for example, households with disabilities and medical conditions, or which speak English as a foreign language).

Success Criteria

The project will be successful if it achieves the objectives set out in this document. In particular, the following outputs will be important when assessing the success of the project:

1. Automatically alert users to operational sites that require review.
2. Provide co-ordinates of sites.
3. Categorise information based on criticality of risks.
4. Provide a heatmap of risks.
5. Integrate with existing systems, where possible.
6. Have different user levels dependent on the level of employee responsibility and overall detail required, e.g., operational, managerial, etc.
7. Retain historic information and build recommendations by incorporating this historic data.
8. Provide an automated 'worry list' that is updated as new data is received.

Project Partners and External Funding

Not applicable

Potential for New Learning

Learning from this project will include a greater understanding of the risk that adverse weather events may have on critical infrastructure operated and maintained by NGET, for instance the influence of surface water flooding, and river and slope erosion.

This learning will be disseminated through the reporting via the ENA portal.

Scale of Project

The project will look at the entire electricity transmission network across England and Wales. This is necessary due to the sweeping

impact of various environmental threats. In addition to this, 50 sites have been identified as suitable for the project in terms of being able to provide meaningful insight and validation.

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The project will be mostly desktop based. The installation of 50 physical sensors will be carried out at suitable NGET sites.

Revenue Allowed for the RIIO Settlement

Not Applicable

Indicative Total NIA Project Expenditure

£409,783

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:

In order to facilitate the energy system transition, networks must comprehensively monitor, manage and mitigate the increasing complexity, frequency and scale of environmental impacts caused by climate change.

For example, the average damage caused to a substation as a result of uncontrolled flooding could be in the region of £1.5m per site.

This project aims to develop a tool that provides greater levels of protection, assurance, and insight to minimise the impact of climate change, specifically flooding and erosion.

How the Project has potential to benefit consumer in vulnerable situations:

Not applicable

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)

Not applicable

Please provide a calculation of the expected benefits the Solution

Baseline:

- The process currently requires the manual review and intervention of any environmental threat. The frequency and scale of these threats are increasing. Therefore, the current process now carries an elevated risk. When reviewing the potential impact of uncontrolled flooding, it has been determined that this specific threat combined with the risk has a very high likelihood of causing £6,000,000.00 of damages. It is expected this value could increase in the next price control and this project will help reduce the impact.

Method:

- It's proposed that the development of the tool would mitigate the financial impact of £6,000,000.00.
 - The tool would be able to assimilate information from multiple, complex data sets faster.
 - The process would be digital and autonomous.

Benefits:

- Reduction in damage to assets.
- Reduction in labour hours to restore.
- Reduction in costs to the network.
- Reduction in time taken to restore assets.
- Increase in network resilience.

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

The Method is replicable across electricity distribution and transmission networks in the UK.

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

Similar project costs can be expected should a licensee wish to roll out the Method across their network. A licensee could expect costs in well in excess of £30,000 per year in licences and rental costs. This will scale depending on the number of physical sensors and data sets required.

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

Learning from this project will include a greater understanding of the risk that adverse weather events may have on critical infrastructure operated and maintained by NGET, for instance the influence of surface water flooding, and river and slope erosion.

Other electricity networks can benefit from this learning and the application of it to improve mitigation processes.

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

Not applicable

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.

When searching for prior art, no project was found on the ENA website that matched the scope and objectives of this project.

This project combines multiple data sources, coupled with physical sensors and the expertise of three suppliers to create a novel solution that can mitigate the impact of uncontrolled flooding and erosion. Such a solution has not yet been investigated or employed in the UK at an electricity transmission asset level.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

Not applicable

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

NGET assets are complex and interconnected with each one carrying exclusive condition and risk data.

Environmental threats are equally as complicated and there are many sophisticated data sets that represent this.

These environmental threats have a unique impact on each asset. There is no capable, market ready solution that can quantify the threat to an NGET asset.

By developing an applied tool, it will have the ability to autonomously determine the appropriate course of action so that the necessary mitigation can be deployed swiftly.

Relevant Foreground IPR

Foreground IPR will be created in the form of support documentation for the tool and the tool itself for the purposes outlined in 2.6. Success Criteria.

The suppliers will contribute to the background IPR in terms of knowledge, knowhow, software and data relating to:

- Applying behavioural science to evaluate interventions.
- Integrations of data from a large number of sources.
- Secure cloud storage and handling of sensitive data.
- Early warning system development.
- Comprehensive understanding of storm related hazards.
- Experience in rainfall erosion and flood forecasting.
- Use of hazard data to calculate and assess environmental risk and asset vulnerability.
- Experience in communicating and visualising environmental risk and asset vulnerability.
- National data platform used for visualising geospatial data.
- Real-time flood forecasting technology to process rainfall and hydrodynamic modelling for hyperlocal forecasting.
- Rainfall, erosion, and flood simulation data.

NGET will contribute background IPR in the form of knowledge, knowhow and data relevant to its operation across the electricity transmission network in England and Wales.

Data Access Details

Data for this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the new Strategic Innovation Fund (SIF) can be found or requested in a number of ways:

- A request for information via the Smarter Networks Portal at <https://smarter.energynetworks.org>, to contact select a project and click 'Contact Lead Network'. National Grid already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.
- Via our Innovation website at <https://www.nationalgrid.com/uk/electricity-transmission/innovation>
- Via our managed mailbox box.NG.ETInnovation@nationalgrid.com

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

The project aims to combine and utilise complex data sets related to assets, environment, and weather. It is ambitious and novel and so there is no guarantee of a successful outcome. Such work would not be funded as part of business as usual.

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 outcome of the project is not guaranteed, and the business case is such that it wouldn't be funded through Business as Usual.

Operational risks:

There is very limited knowledge as to the best operational location for the physical sensors across NGET. Siting a sensor in the wrong location could prevent the transmission of useable data.

Technical risks:

Combining multiple data sets to avoid false positives. Data needs to be validated and refined.

Progressing using NIA funding ensures the outcomes of the project are shared with other network licensees, allowing them to adopt similar practices.

This project has been approved by a senior member of staff

Yes