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## NIA Project Registration and PEA Document

### Date of Submission

Jun 2023

### Project Reference Number

NIA2\_NGET0041

## Project Registration

### Project Title

Wet Weather Data for OHL Noise Predictions

### Project Reference Number

NIA2\_NGET0041

### Project Licensee(s)

National Grid Electricity Transmission

### Project Start

July 2023

### Project Duration

1 year and 9 months

### Nominated Project Contact(s)

Wangwei Kong

### Project Budget

£269,079.00

## Summary

This project aims to examine the wet weather dataset used for prediction of Overhead Line (OHL) noise and assess if the dataset remains valid and reliable. Further, this research project looks to leverage the latest advances in weather forecasting technology to assess if future wet weather predictions can be made to understand the impact on OHL noise which ensures that the right asset investment decisions are made for future generations.

## Third Party Collaborators

Met office

## Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

## Problem Being Solved

Weather data is used to predict noise from Overhead Line (OHL) assets. These predictions inform Environmental Impact Assessments for major infrastructure projects, support consenting processes for new and updated OHLs and have a direct impact on the level of noise experienced by people living near OHLs. Given the scale of network reinforcements required for our Net Zero ambitions, we're keen to ensure our infrastructure decisions are adapted to an evolving climate and are right first time. The highest level of noise generated by an OHL can occur during rainfall and is referred to as 'wet noise'. Wet noise can be a source of annoyance to communities/ecosystems in proximity to our OHLs due to the presence of a tonal hum which is likely to occur at a rainfall rate of 1.0 mm/hour or more. During periods of heavy rainfall, OHL noise can be masked to a certain extent by noise associated with rainfall. Conversely, during periods of fog, mist and light drizzle, wet noise may occur and potentially cause annoyance in the neighbourhood. Currently, the dataset being used to predict wet weather is based on Annual Average Wet Hours above 0.2 mm/hour, developed using synoptic weather stations across the UK. Further assessment is required to understand if the dataset remains relevant, update it if needed and explore possibilities of bringing in prediction capability for wet weather to be forward-thinking in our

asset decisions. Further, we'd also like to understand if such a dataset relating to low intensity rain events can be leveraged for other climate adaptation efforts across our assets and networks.

## Method(s)

The proposed NIA project will carry out research to:

- Identify all the weather-related issues of OHL noise and project requirements, ensure whether the proposed methodology meets National Grid requirements and may involve exploring alternative methodologies.
- Update current set of wet weather data used by National Grid for the most recent decade (2011 to 2020) and most recent 30 years (1991 to 2020) and analyse to identify any differences.
- Provide the updated wet weather data in a format of value to National Grid.
- Research whether weather observation datasets, radar and relevant numerical weather prediction (NWP) data can be used to produce similar datasets and maps to those currently used by National Grid for determining the duration of low-level rainfall amounts and fog, mist and drizzle.
- Research the ability and value of current climate models in predicting low-level rainfall amounts, fog, mist and drizzle over the UK, and to determine whether such projections can be used by National Grid to predict changes in OHL noise and so aid future asset investment decisions.
- Research the potential impacts of low-level rainfall amounts, fog, mist and drizzle on other electricity assets. Does the updated set of weather data and results from the above research (3 and 4) provide insight on climate adaptation of other electricity assets, particularly for low-intensity rainfall events.

## Scope

The detail scope of work is set out below.

### Stage 1

Work Package 1: Discovery Phase (project inception, explore methodology, scope confirmation and workshops)

- Identifying all the weather-related issues of OHL noise (and other electricity assets) and project requirements to ensure alignment on scope and methodology of project, including project risk assessment.

Work Package 2: Update Wet Weather Data

- Determining whether the existing wet weather data provided by the Met Office a decade ago and used by National Grid to predict OHL remains valid.

Work Package 3: Gridding and Visualisation of Data

- Delivering the data extracted in Work Package 2 and corresponding visualisation in a flexible and sharable format for use within National Grid.

Work Package 4: Literature Reviews

- Exploring the use of weather observations and numerical weather prediction data for mapping historical low-level rainfall amounts and for fog, mist and drizzle.
- Climate predictions and impact on OHL noise
- Potential impacts of low-level rainfall amounts, fog, mist and drizzle on other electricity assets

### Stage 2

Work Package 5: If the literature review conducted in Work Package 4 identifies data sources and a solution of value, then this work will implement the solution. The exact scope of this work will depend on the outcome of Work Package 4 and will be scoped once the latter completed.

- Mapping historical low-level rainfall amounts and for fog, mist, and drizzle.
- Implementation - climate predictions and impact on OHL noise.

## Objective(s)

- Successfully identify all the weather-related issues of OHL noise and update wet weather data used by NGET.
- Identify the feasibility of using weather observation datasets, radar and relevant numerical weather prediction (NWP) data to produce similar datasets and maps to those currently used by National Grid for determining the duration of low-level rainfall amounts and fog, mist and drizzle.

- Analyse the ability and value of current climate models in predicting low-level rainfall amounts, fog, mist and drizzle over the UK.
- Identify the potential impacts of low-level rainfall amounts, fog, mist and drizzle on other electricity assets.

## Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

An assessment of distributional impacts (technical, financial and wellbeing related) for this project has been conducted using a bespoke assessment tool, which assesses the project as having a positive, negative or neutral effect on consumers in vulnerable situations. To help inform the assessment, this tool considers the categories of consumers identified in the Priority Services Register.

This project has been assessed as having an overall positive impact on consumers in vulnerable situations. The assessment has identified that this project will look to help NGET to invest on better conductors which reduces both cost and noises for consumers

## Success Criteria

- Successfully update wet weather data used by NGET.
- Understand the ability and value of current climate models in predicting low-level rainfall amounts, fog, mist and drizzle over the UK.
- Understand the potential impacts of low-level rainfall amounts, fog, mist and drizzle on other electricity assets.
- Make clear proposals regarding the availability, and possible development, of maps and data sets to support low-level rainfall.

## Project Partners and External Funding

SSE Transmission is not an official project partner and they are not funding this project. They are working with the Met Office to understand the reasons for unexplained line noise on some OHL which have been subject to complaints. The learning from this work will inform this project. SSE Transmission are a potential beneficiary of this project and would like to be kept informed.

## Potential for New Learning

- The use and benefit of new science and data to update the current rainfall data used by NGET and the energy sector
- The ability and value of current climate models in predicting low-level rainfall amounts, fog, mist and drizzle over the UK. And how these might be used to create improved rainfall maps for use in line noise.
- Understand the potential impacts of low-level rainfall amounts, fog, mist and drizzle on other electricity assets.
- The outputs created from the project will be shared with interested parties in the energy sector.
- SSE Transmission running tests and lab experiments regarding low-level rainfall. The Met Office is also involved in this work and a working group has been set up to share outputs from both projects between the parties.

## Scale of Project

All work is strategically linked and designed to deliver the defined objectives. Therefore, the scale of the project is as specified, since there would be inadequate potential for new learning with a less ambitious and smaller project.

## Technology Readiness at Start

TRL2 Invention and Research

## Technology Readiness at End

TRL3 Proof of Concept

## Geographical Area

The geographical area is the UK.

## Revenue Allowed for the RIIO Settlement

N/A

## Indicative Total NIA Project Expenditure

£242,171.1

## 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:

The learnings from the project will directly impact the design and implementation of OHL to reduce the impact of noise. The predictions from this project will inform Environmental Impact Assessments for major infrastructure projects, support consenting processes for new and updated OHLs and have a direct impact on the level of noise experienced by people living near OHLs. Given the scale of network reinforcements required for our Net Zero ambitions, we're ensuring our infrastructure decisions are adapted to an evolving climate and are right first time.

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

Understanding the impact of rain on the OHL noise is important in reducing the negative impact of noise from OHL on consumers.

### 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)

N/A

#### Please provide a calculation of the expected benefits the Solution

The innovation method has a benefit of approx. £558,000 over 40 years. This needs to be considered along with several unknowns that cannot be predicted at this stage such as outage costs to deal with noise issues, scheme specific conditions such as access, urban/rural, length of route, environmental etc. that may make a particular conductor more expensive or cheaper than average costs used in this CBA.

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

The developed methodology is of generic nature and would be applicable to all electricity network Licensees across GB, this would be inclusive of transmission and distribution owners.

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

If the project is successful, the method/tool can be further developed to roll out across GB. The estimated cost will be reviewed at the completion of the project.

### 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 learning will be used in the planning and designing of new OHL and upgrading of existing lines, to reduce the line noise and the impact on consumers.

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

N/A

#### 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.

Current maps and data are outdated and in need of updating. Other interested parties are included in the project through the OHL Noise working group to make sure that related projects don't duplicate work.

#### 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 uses new science and data in updating the existing data used for OHL Noise. This is the first project in understanding of low-rainfall impact on OHL Noise.

#### Relevant Foreground IPR

- Maps and associated data sets updating current maps and data being used.
- Reports regarding the learning regarding low-rainfall.

- The background IPR will not be required to use the foreground IPR.

## 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](mailto: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

This project aims to update the set of wet weather data used by NG for the most recent decade and most resent 30 years. It will also identify whether weather observation datasets, radar and relevant numerical weather prediction data can be used to produce similar datasets and maps to those currently used by NG. This is not a business-as-usual activity as there is considerable risk associated with the development and implementation.

## 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

There are technical risks associated with any innovation project as the proposed solution may not work. Replacing the existing data with updated science and data has a low risk, the additional work relating to low-rainfall is unknown and as such posses a number of technical risks, related to the validation and verification of any results, and identifying viable sources of relevant data and science.

Therefore, considering the risks associated with the success of the project, NGET believes NIA funding is the best route for the project.

## This project has been approved by a senior member of staff

Yes