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 2025

### Project Reference Number

NIA_SHET_0054

## Project Registration

### Project Title

Overhead Line Wind Speed Monitoring

### Project Reference Number

NIA_SHET_0054

### Project Licensee(s)

Scottish and Southern Electricity Networks Transmission

### Project Start

March 2025

### Project Duration

1 year and 6 months

### Nominated Project Contact(s)

Brant Wilson – Innovation Portfolio Manager

### Project Budget

£150,745.00

### Summary

Wind speed data is essential for calculating Dynamic Line Ratings (DLR), and its accuracy impacts its effectiveness. Accurate wind speed data across long sections of our overhead lines (OHLs) is currently minimal. There are few Met Office weather stations close to our OHL locations, so windspeed data is interpolated. This project will trial the use of Distributed Acoustic Sensing (DAS) technology to measure wind speed along the length of an OHL.

### Nominated Contact Email Address(es)

transmissioninnovation@sse.com

### Problem Being Solved

Accurate wind speed data across long sections of our overhead lines (OHLs) is currently minimal as there are very few weather stations close to these locations. As a result, windspeed data is often interpolated. The accuracy of windspeed data has implications on our understanding of the effect of wind speed on our assets and also impacts planning and expectations on other weather-related projects (such as DLR). There is a need to capture more accurate weather variable data to allow for better asset, operational and monitoring planning.

### Method(s)

The method is based on an enhanced Distributed Acoustic Sensing (DAS) technology, where the optical fibre is investigated by transmitted optical signals from Prisma's proprietary optical architecture. The system measures acoustic signals caused by vibrations of the towers and the lines. Each event along the line is acoustically coupled to the optical ground wire (OPGW) and propagates down the OPGW. Electrical phenomena have unique characteristic frequencies. This is done without installing any sensors on the line or towers. A panel is installed at the substation and is connected via a dark wire (unused existing fibre).

Data Quality Statement (DQS):

The project will be delivered under the NIA framework in line with OFGEM, ENA and SSEN Transmission 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. Deliverables will be shared with other network licensees through the closedown reports on the Smarter Networks Portal.

Measurement Quality Statement (MQS):

The methodology used in this project will be subject to 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 ENA's Energy Networks Innovation Process (ENIP) document, the cumulative risk score is scored as 4 = LOW from the sum of the risk thresholds below:

TRL Steps – 2 TRL Steps – Low (Score 1)
Cost – <£0.5m – Low (Score 1)
Number of suppliers – 1 – Low (Score 1)
Data – Defined assumptions and principles – Low (Score 1)

## Scope

PrismaPower, the proposed DAS solution, has been tested and evaluated in various environments across Israel, the USA, and Europe. The primary testing environment in Europe has been the Mediterranean region. Average wind speeds in Mediterranean coastal areas range from 4 m/s to 7 m/s, while inland areas typically experience average wind speeds of 2 m/s to 5 m/s. In contrast, we understand that average wind speeds in northern Scotland range from 7 m/s to 10 m/s in coastal areas and 4 m/s to 7 m/s in inland regions. Wind gusts of up to 30m/s or significantly higher are common during moderate and strong storms.

Additionally, baseline ambient temperatures in Scotland tend to be lower. PrismaPower has not yet been trialled in this specific environment. Therefore, a trial in Scotland is essential to ensure the technology's suitability and reliability under these distinct environmental conditions.

Upon completion of the trial period, Prisma will supply a report analysing the captured windspeed data. This will allow for a comparison between the new windspeed data, and the data captured by the Met Office weather station, which is most closely situated to the OHL.

## Objective(s)

The objective of the project is to assess the suitability of DAS technology to accurately measure wind speeds on OHLs and to cross validate the findings with existing wind speed data sources.

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

An assessment of distributional impacts (technical, financial, and wellbeing related) for this project has been carried out 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 a neutral impact, meaning that it does not have any effect on customers in vulnerable situations. This is because it is a Transmission project.

## Success Criteria

The project will be deemed as successful if all items in the scope, objectives and learnings are met which can be used to determine if DAS technology can be used to provide accurate wind speed data for OHLs.

## Project Partners and External Funding

The project will be undertaken using NIA funding by Scottish Hydro Electric Transmission supported by the contractor - Prisma Photonics.

## Potential for New Learning

This approach to capturing wind speed data is new to the GB network. This project will allow for an assessment to be carried out to compare this approach to the more traditional approach of using weather stations. As this type of monitoring approach has not been tested to date on a network with similar conditions to SSEN-T's there will be learning in terms of its performance in the Scottish

Highlands. Here there are more frequent and intense wind gusts, complex airflows influenced by mountainous terrain, and higher humidity levels, which could affect the vibration sensing technology differently compared to the relatively stable wind conditions in Israel/US where it has been trialled to date.

## Scale of Project

This project is designed to get maximum learning for minimal cost. This scale of project expects to provide sufficient learning to understand the effectiveness of the trialled technology. Any smaller scale project would limit the ability to fully develop the learnings.

## Technology Readiness at Start

TRL5 Pilot Scale

## Technology Readiness at End

TRL7 Inactive Commissioning

## Geographical Area

The project will be undertaken in the Scottish Hydro Electric Transmission licence area in Scotland.

## Revenue Allowed for the RIIO Settlement

No allowance has been made for this type of development within the RIIO-T2 settlement. No savings are expected during project implementation; future savings may be possible depending on the outcomes of the project.

## Indicative Total NIA Project Expenditure

The total expenditure expected from the project is £150,745. 90% of which £135,670.50 is allowable NIA expenditure.

# 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:

As we transition to net zero, there is drive to simultaneously ensure that we are doing everything that we can to maximise the existing Transmission network. As part of this, there is a focus on grid enhancing technologies. If successful, the outputs of this project will provide windspeed data with positive implications for many of our grid enhancing technology projects such as Dynamic Line Rating, REVISE and Ice Mapping. Wind speed is a key component in DLR calculations and being able to increase the effectiveness of DLR via improved windspeed data could lead to an increase in grid capacity on our OHLs. This helps to support the energy system transition by increasing efficiency and reducing constraint of renewable energy.

## 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)

N/A

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

The CBA model is based on the following assumptions:

• Weather sensors have lifetime of 10 years; however, we also built the model from 45 years of assets to be aligned with other transmission assets.

• The single benefit case is estimated on the whole line from Dounreay to Beauly.

• For granularity, we would need a weather sensor per tower to achieve the same results as Prisma, however this might not be practical in terms of DLR sensors.

• The estimated benefit is £3.1 million without risk adjustment for the lifetime of 10 years. With a general risk factor of 30%, it results in potential benefit of £2.2 million in 2018 price.

• The estimated benefit is £9 million without risk adjustment for the period of 45 years. With a general risk factor of 30%, the riskadjusted benefit is £6.3 million in 2018 price.

There are several benefits associated with this innovation project, both qualitative and quantitative, that are listed below:

• DAS can cover the whole line (weather stations on our network are currently relatively sparse, and our data history shows patchy reliability as a result).

• DAS does not require anything to be attached to the OHL, instead it is installed at the substation – easy maintenance and installation.

• Provides wind measurements specific to the line for DLR (even Met Office data is limited) – more effective DLR impact – increased grid capacity.

• Provide alerts for extreme weather conditions.

• More data improves our understanding of behaviours and patterns. This will be useful for DLR projects and REVISE and CREDO, which would benefit from improved wind data.

• It supports the transition to net zero, and the increased effectiveness of DLR would lead to increased grid capacity.

• This would negate the need to install weather stations or sensors in remote areas of Scotland.

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

All GB Transmission owners can utilise the same technology to gather enhanced wind speed data for their network area.

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

Costs are dependent on each TO and cannot be confirmed as part of this NIA 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

If successful, the learning outputs of this project will provide windspeed data with positive implications for many of our grid enhancing technology projects such as Dynamic Line Rating, REVISE and Ice Mapping. Wind speed is a key component in DLR calculations and being able to increase the effectiveness of DLR via improved windspeed data could lead to an increase in grid capacity on our OHLs.

## 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.

A review of the ENA Smarter Networks portal has concluded that there is no duplication with existing or past completed projects.

## 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 is innovative in that it is trialling monitoring equipment that has not been trialled and validated in the environmental conditions of SSEN-T's network. This is new to the GB network; it has been rolled out in Israel and is currently being trialled in the US. A trial in the Scottish Highlands will provide an understanding of how the equipment works in this location. The alternative or traditional approach to capturing windspeed data is to install weather stations. This requires operations staff installing and maintaining the weather stations in remote locations with safety and cost implications. The monitoring equipment that will be trialled during this project is installed at the substation on a panel and makes use of an otherwise unused fibre. Unlike other monitoring or sensor equipment, this approach does not require anything to be installed on the OHL itself making it safer and less complex to install and maintain.

## Relevant Foreground IPR

No new IPR is expected to be created during the project. Any background IPR will remain property of the creator.

## Data Access Details

For information on how to request data gathered in the course of this project, see Strategic Innovation Fund (SIF) and Network Innovation Allowance (NIA) Data Sharing Procedure at https://www.ssen-transmission.co.uk/about-us/innovation/.

Additionally, data from this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the Strategic Innovation Fund (SIF) can be found or requested in the ways listed below:

• Via the Smarter Networks Portal at: https://smarter.energynetworks.org. To contact select a project and click ‘Contact Lead Network’. SSEN Transmission 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: Innovation - SSEN Transmission (ssen-transmission.co.uk)

• Via our managed mailbox: transmissioninnovation@sse.com

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

The Network Licensee (SSEN-T) is not funding the project as part of its business-as-usual activities because the project involves an innovative technology. This innovative approach carries inherent risks and uncertainties, necessitating a Research, Development, or Demonstration phase to validate its feasibility and effectiveness. The project aims to address existing challenges in a more effective manner, leveraging cutting-edge technology and novel systems that require thorough testing before they can be integrated into standard operations.

## 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

This project can only be undertaken with the support of NIA due to the overall cost, risks and timescales required. There is also commercial risk that the project may not deliver the expected outcomes. NIA is the best mechanism to fund development projects such as this.

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

☑ Yes