SIF Project Registration

Date of Submission

Mar 2022

Project Reference Number

10020514

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Project Title

NIMBUS - Network Innovation and Meteorology to Build for Sustainability

Project Reference Number

10020514

Project Licensee(s)

Scottish and Southern Electricity Networks Transmission

Project Start

March 2022

Project Duration

2 Months

Nominated Project Contact(s)

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Project Budget

£148,435.00

Project Summary

NIMBUS will revolutionise the way detailed meteorological data and models are used in the design and decision-making of electricity assets, through innovative uses of the data and predictive modelling techniques.

The project meets the scope:

- By investigating how novel uses of data and digital platforms can significantly improve network planning, modelling, and forecasting capabilities. NIMBUS will investigate novel ways to use and interpret meteorological data to improve decision-making by focusing on a use-case driven approach and real-world application testing by SSEN.
- By creating enterprise and business processes to facilitate the flow of data within and between organisations. NIMBUS will create processes, using the Open Energy framework, for accessing and understanding meteorological data, thereby demonstrating the increased value of data when it is connected in a federated, decentralised, many-to-many digital system.

The experience of Partners is summarised below and detailed in AppendixQ3-2:

SSEN Transmission (SSEN-T) is best placed to lead this project because its network extends over some of the UK's most challenging terrain and faces extremes of weather and altitude in the UK. SSEN-T is focused on developing real world solutions to support cost-efficient asset intervention planning and decision making.

SSEN Distribution (SSEN-D) faces similar weather and climate related challenges to SSEN-T but has different types of assets to manage, so brings a different network perspective to this project.

Icebreaker One, winner of the 'Modernising Energy Data Access' competition, is leading the work developing Open Energy, a service that makes it easy to search, access and securely share energy data.

The users of this innovation will initially be energy networks, but the aim is to create solutions that also support other asset industries,

such as transport and telecoms. These users have similar needs to the energy networks as they are also managing assets on networks that are exposed to the environment.

Third Party Collaborators

Icebreaker One

Met office

Nominated Contact Email Address(es)

transmissioninnovation@sse.com

Problem Being Solved

The problem that NIMBUS is trying to solve is that the limitations of current weather and climate (meteorological) data mean that it is impossible to predict, with any great degree of accuracy, the impact that weather events and climate change will have on the individual assets that make up our electricity networks across their lifetime.

SSEN's electricity network assets run across the UK's most challenging terrain and are subject to the extremes of the UK weather. With a life cycle of 40-60 years, assets built today will need to remain resilient during a period when climate change is predicted to extend both the duration and intensity of the weather extremes experienced today.

The design and predictive modelling techniques, used in building today's electricity networks, utilise only basic locational data in an attempt to generically model the effects and impacts of weather and climate on assets at a regional or circuit level only. When weather data is used, it is only accessible weather forecasts at best based on a 2km grid at a height of 10m with smoothed out orography and topology.

NIMBUS will take the most recent developments in detailed locational meteorological data and associated predictive technologies and integrate this data with other asset and environmental data. After the Beta phase, the data will be accessible via the Open Energy Search and Access Control and in a format that is ready to use in visualisation tools (such as ARCGIS).

The ability to predict the impact of weather and climate more accurately on our assets will lead to improved asset management decision making across the lifecycle of the assets. The opportunities that could be realised as a result of this project are reduced network faults, extended asset life spans and improved safety, leading to reduced disruption and costs, all to the benefit of the consumer. The outputs could also extend to other linear asset networks such as transport and telecommunications and provide similar benefits in those sectors.

Project Approaches And Desired Outcomes

The Big Idea

NIMBUS addresses the aims of the competition by:

- delivering the next generation of user driven digital products, services and processes spanning transmission, distribution and other organisations; and
- improving data availability, quality, interoperability, access, and insights to third parties to improve the efficiency, security and resilience of network.

The big idea is that meteorological data (such as rainfall, wind speeds, temperature etc) will be made available, at an asset-specific level of detail, and usable by the energy networks to improve the ability to model and predict the impacts of weather and climate change across the whole life of a network asset. The approach can be expanded to other utilities and any sector that manages assets exposed to weather and climate. Making this data available to the energy industry and wider supply chain will use open data standards being developed for the energy industry.

In the Discovery Phase, NIMBUS will develop business-driven use cases for the application of detailed meteorological data. This phase will also quantify the consumer benefits that could be achieved from these use cases. The Alpha and Beta phases will focus on:

- Testing access to required data sets (with granularity of 50-100m grid or below, and at heights above 10m) and testing the methodologies required to map those data sets.
- Development of the logic and analytics needed to translate meteorological data into outputs that can be used in risk modelling and visualisation tools (including the EA technology CBRM platform and ESRI's ArcGIS).
- Testing the outputs in SSEN use-cases and modelling the impact.
- Creating a deployable solution for the widest range of end-users.

This innovation is at TRL 3, a strong concept but it needs validation. The solutions to exploit this idea already exist but the gap is the data. This project will investigate if we can access and use the right data at the right level of granularity and the benefits of doing so. The aim is to reach TRL8/9 (BAU) by the end of Beta phase.

We do not anticipate the need to share or make available any IP as part of this project that is not already in the public domain. Any IP used or created will be included in the NIMBUS Data and IP Register and managed under the terms of the Collaboration Agreement. Also, any Icebreaker One outputs from prior work will already have been published under an open license.

Innovation Justification

Learnings from other projects which considered the integration of weather and asset-based data will inform NIMBUS. However, most research to date has focussed on the short-term actions and operational response side of asset failure and have stopped at understanding historical trends for better operational fault response.

NIMBUS will model into the future and incorporate new meteorological variables that can optimise asset management and create a more resilient and reliable network. National Grid ESO's MIVOR project did look at future impacts, but on a regional level.

The ability to provide meteorological data, at a granularity that can be utilised at an asset level is what makes NIMBUS unique. Figure1 (Appendix Q5) shows that climate data is currently available at a regional level. This means that we apply the same weather and climate data to large sections of our electricity networks. Figure2 shows that by improving the granularity of the forecasts, it will be possible to differentiate closer to an asset level, meaning we will be able to model the impacts of weather and climate-driven deterioration at the asset, rather than regionally, allowing us to target only those assets that require intervention.

NIMBUS is also innovative because the outputs will be accessible through the technical and governance architecture of Open Energy, allowing data to be shared within a secure trusted framework (Figure3). Data identified in WP2 will be shared via Access Control in future project phases and provide the infrastructure for partner organisations and the broader networks to securely and safely share data to prolong the life of their assets and deliver the UK digitalisation and net zero strategies.

NIMBUS has the potential to demonstrate the value of connecting data across other linear asset industries like, transport and telecommunications. The delivery of highly granular meteorological data through GIS applications and Open Data sources to multiple industries and users is another example where this project can be considered truly innovative. The level of uncertainty about the outcomes of the project (for example, the cost benefit analysis of providing data to such a granular level) and the associated risk for SSEN-T is not commensurate with the rates of return associated with the T2 Price Control and our investors, as we are a low return

low risk company. Because of the scale and the detail of the project, we have no existing allowances or uncertainty mechanisms that could be used therefore external funding is required.

Project Plans And Milestones

Project Plan And Milestones

What is your project plan? What are your milestones?The Discovery phase project is split into five work packages (WP) and three milestones, detailed in Appendix Q7-1 and Appendix Q7-3.

WP1. Project Management

The consortium will meet at the start to finalise scoping (Milestone 1) and then weekly to update on progress, risks, and new results that require iteration of outputs.

WP2. Critical use cases

WP2 will identify critical uses cases through workshops and interviews with SSEN stakeholders. A template will be used to collect details including use case description, current solution, and data used. The use of meteorological data will be explored, the data parameters required, and the potential benefits identified. Success will be a series of critical use case templates used to assess data requirements and benefits (Milestone 2).

WP3. Identification of data requirements

WP3 will investigate the data requirements. Interviews and workshops with Met Office, SSEN and other stakeholders, will be used to understand the data required and its availability, and to evaluate the methodologies, tools, and skill sets required to produce the data. Success will be a report on existing capabilities, data gap analysis, required development, innovation, and additional partners.

WP4. Understanding data interoperability and policy

WP4 will produce recommendations for networks (tailored specifically to SSEN's context) on data interoperability. It will understand the provision of, and barriers to, asset-specific meteorological and related data. It will focus on data sharing and interoperability, specifically reducing friction in decision-making and the data policies necessary for future phases to lead to business as usual. The work package will be a combination of desk-based research, open consultations and interviews with key stakeholders.

WP5. Value assessment

WP5 will provide a cost-based analysis (CBA) that assesses the longer-term investment in the development of operational solutions. SSEN-T will lead this work package and deliver the CBA (Milestone 3), but all Partners will be required to input.

Risks and Mitigations

The key risks with mitigations are:

1.The availability of SSEN-T, SSEN-D and Met Office stakeholders for interviews. All participants will be confirmed, and interviews scheduled prior to project start.

2.The use cases identified don't address the market needs. There will be a strategy for identifying use cases, agreed by partners and before project start, and regular check points and validation built into project design.

No major constraints have been identified for the Discovery phase.

Route To Market

SSEN already uses basic locational data and generic climate factors in optimising the design and location of new transmission assets. The increased granularity and accuracy of the data outputs of the project will be provided in formats that can easily be incorporated into the existing CBRM and ArcGIS tools used today.

The risk models used by SSEN to model and predict asset performance and deterioration, do so on an asset-by-asset basis. Therefore, the capability to exploit both asset condition data and climate-based deterioration predictions, on an asset-by-asset basis, is already built into our models -- we just do not currently have the specific meteorological data available to use. NIMBUS will provide this data, allowing the granularity of the models to be significantly improved, becoming a key enabler of more detailed risk-based intervention planning across the asset life cycle.

Other regulated network companies use similar predictive risk modelling techniques as SSEN. So, ensuring that the outputs of NIMBUS can be used in industry standard design tools will also be a key enabler for those organisations to incorporate the benefits and learning of project NIMBUS into their own 'business as usual' activities.

NIMBUS will serve as the blueprint for the wider energy market. By testing what works and what does not, iterating quickly and focusing on narrow use cases to deliver value, we will increase repeatability for new use cases. In order to encourage uptake across the networks, we will run a process of open engagement, that will include:

- regular webinars to share the project learnings and invite feedback;
- a collaborative approach (transparent publishing, open consultation, etc); and
- openly licensing outputs to encourage repeatability and uptake.

In future phases, we will also consider providing training to help other networks, other linear asset owners (eg transport and telecommunications) and key players within the industry adapt the outputs of NIMBUS to their own contexts.

Costs

Total Project Costs

148435

SIF Funding

148435

This project has been approved by a senior member of staff

☑ Yes