

## NIA Project Registration and PEA Document

### Date of Submission

Oct 2024

### Project Reference Number

NIA2\_NGESO070

## Project Registration

### Project Title

Incorporating the impact of climate change in power system modelling

### Project Reference Number

NIA2\_NGESO070

### Project Licensee(s)

National Energy System Operator

### Project Start

August 2024

### Project Duration

1 year and 1 month

### Nominated Project Contact(s)

innovation@nationalgrideso.com

### Project Budget

£200,000.00

## Summary

The project aims to identify the best available meteorological data to model power systems at a range of time horizons, from two weeks ahead through to 2035. Having a firm understanding of the changing weather patterns and climate the UK will face in the coming years is a crucial part of being able to implement and manage a resilient energy network which delivers security and reliability of supply. Access to the right data sets will allow stakeholders to better plan the future energy requirements and better forecast energy supply and demand, reducing the risk to the network from climate change and resultant changes in weather patterns.

## Preceding Projects

NIA2\_NGESO055 - QWID FLEXER

NIA\_NGSO0023 - Mapping the Impacts and Visualization of Risks of extreme weather on system operation (MIVOR)

### Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

## Problem Being Solved

There is a growing sensitivity of supply and demand to meteorological conditions (both electricity and gas), occurring at a time of rapid global climate change. Current modelling methodologies have a reliance on historic conditions and do not account for how the credible range of weather will change in the future.

## Method(s)

This project will consist of four work packages which will scope out the range of current and future requirements, identify potential data and information sources, review any limitations or gaps in these data sources, and demonstrate the utility of these sources through example case studies. Recommendations for the use and implementation of the data sources will be given.

**Work Package 1** – A structured review with key stakeholders (to be agreed with the project sponsor) to identify the range of current and future requirements and applications the project seeks to address. These insights will be used to prioritise use cases for data to inform WP2. This will take the form of a series of workshops with key personnel. The output from this WP will inform WP2. Deliverable: Report detailing the findings of the stakeholder engagement

**Work Package 2** – A literature review to identify all potential data and information sources and bring together past and current industry applications and projects where possible. This would include discussions with leading scientists and sector experts in the Met Office, Met Office Academic Partners, and other organisations as appropriate. Deliverable: Report detailing relevant available datasets, including format, cost and licencing, and the relevance to the use cases.

**Work Package 3** – A review of findings and gap analysis. The Met Office will use tried and tested tools to assess the gap between what data are available and the needs of the priority use cases. The Met Office use a tool that has been adapted from those by Strategyzer for this purpose. The benefit of this tool is that it is designed to promote value to the use cases, and while it focuses on the data requirements, it can also be used to identify where there are gaps in functionality, support services, and technical and legal access requirements. The Met Office will use this output to identify approaches to alleviating these gaps. Deliverable: Report describing gaps between existing datasets and the needs of priority use cases

**Work Package 4** – Report detailing findings and recommendations from WP1-3 regarding priority use cases, relevant data sources and results of gap analysis, plus top-level recommendations for where further work could address the gaps and methodologies for using the data. Deliverable: Report summarising findings of WPs 1-3, and recommendations on how gaps may be filled including how and where to access the datasets required.

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

TRL Steps = 1 (1 TRL steps)

Cost = 1 (185k)

Suppliers = 1 (1 supplier)

Data Assumptions = 1

Total = 4 (Low)

## Scope

This project aims to provide ESO with improved accessibility to state-of-the-art weather data for modelling the power system (particularly security of supply) on time scales of present day to 2035. The project will analyse how weather and climate data is currently used in ESO and make recommendations as to how this can be improved by harnessing state-of-the-art data. The project will provide details of the benefit of the new datasets and how to implement the changes in ESO models. Additionally, the project will produce a best practice document, which will highlight how to access weather and climate data, how to post-process the data for modelling purposes and how to ensure the ESO updates their data at the right cadence.

## Objective(s)

The objectives for the project are as follows:

- To provide recommendations of the best datasets and information sources that can be used to improve existing ESO modelling work through the incorporation of weather data capturing the credible spread of future weather from the present day to 2035.
- Analysis as to the limitations of existing datasets and any gaps in terms of missing information or tools.
- Case studies illustrating how the recommended datasets can improve ESO modelling.

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

NGESO does not have a direct connection to consumers, and therefore is unable to differentiate the impact on consumers and those in vulnerable situations. Benefits to all consumers are detailed below.

## Success Criteria

The project can be deemed successful if:

- Suitable datasets can be found which capture the credible variability of potential weather experienced by GB from the present day to 2035, incorporating climate change.

- These recommended datasets can be easily incorporated into existing ESO modelling pipelines to improve modelling capabilities.
- There is clear guidance as to the benefits and limitations of the recommended datasets, and understanding from ESO stakeholders as to the potential implementation.

**Project Partners and External Funding**

Met Office, no external funding contribution.

**Potential for New Learning**

The parties expect to learn about the existence of datasets and information sources which can reliably capture the credible spread of weather driven by climate change from the present through to 2035 and can be used to improve modelling of the GB power system. The limitations of these data sources and any gaps in terms of missing information will be made clear. The learning will be disseminated through a best practice guide on how to use the data sources. Example case studies and demonstration exercises will be developed in order to illustrate the benefit of implementing these datasets into existing modelling pipelines. A wider showcase and workshop event will take place towards the end of the project, to disseminate findings to teams at the ESO and wider industry stakeholders and allow for feedback to be included in final project deliverables.

**Scale of Project**

This project will span 12 months with Met Office delivering the work, including stakeholder engagement.

**Technology Readiness at Start**

TRL1 Basic Principles

**Technology Readiness at End**

TRL3 Proof of Concept

**Geographical Area**

The scope of the project will be to make recommendations on models that cover the whole GB system, but suggested datasets may cover a wider area.

**Revenue Allowed for the RIIO Settlement**

None

**Indicative Total NIA Project Expenditure**

£200,000

## Project Eligibility Assessment Part 1

There are slightly differing requirements for RII0-1 and RII0-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RII0-2 / RII0-1).

### 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 RII0-2 projects only)

Please answer **at least one** of the following:

#### How the Project has the potential to facilitate the energy system transition:

The energy system is going through rapid and extensive change, with supply and demand increasingly weather-driven. This project will facilitate NGESOs role though the energy system transition by:

Customer

The project has potential to align wider industry with a single source of truth, in terms of recommended dataset to use in modelling the power system. This benefits stakeholders by increasing confidence in data sources used in their modelling work and allowing easier comparison between pieces of analysis undertaken by different industry participants.

System Security

The identification of improved datasets capturing the effects of climate change has the potential to improve electricity and gas security of supply modelling across a range of timescales, from weeks ahead through to 2035. This improved modelling can potentially lead to a more secure system, as there may be increased accuracy in identifying the frequency, magnitude, and types of risks to the system, leading to improved mitigation actions.

#### 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 (RII0-1 projects only)

N/A

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

N/A as this is a Research project

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

he scope of the project will deliver recommendations for ESO models that cover the whole GB system, and so will not need to be replicated across GB. However, the objective is that the best practice recommendations will be applicable to the wider industry, especially those that are giving input on the project.

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

The scope of the project will deliver recommendations for ESO models that cover the whole GB system; therefore, no geographical rollout is required. Any decision to implement the recommendations from this project across the wider industry can be taken independently with their own cost benefit calculation.

### 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

Learnings generated from this project will benefit the ESO and wider stakeholders through the identification of datasets containing the credible spread of weather in the present and future driven by climate change. These datasets, and recommendations as to their best use and any limitations, can be used in a range of modelling applications within the ESO and used by industry participants in their models.

### 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.

The recommendations will be made in direct relation to the way ESO (and wider industry as applicable) uses weather data in modelling, and so there is no equivalent prior project. There are no other innovation projects working on this problem.

### 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

The Project will utilise expertise in climate science and weather data working with an expert external party.

We will seek to understand and apply the latest cutting-edge climate projections and datasets.

This is the first project of its type at the ESO and could have impact on a wide range of modelling that we produce. Additionally, this knowledge could be harnessed by other stakeholders.

## Relevant Foreground IPR

The following Foreground IPR will be generated from the project:

- The project will deliver reports outlining suggested datasets to use as inputs for various modelling applications in the ESO.

Reports produced during the project will be shared on the Smarter Networks Portal.

## 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 ESO 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.nationalgrideso.com/future-energy/innovation>

Via our managed mailbox [innovation@nationalgrideso.com](mailto:innovation@nationalgrideso.com)

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

This is a research based project where there are risks that the objectives cannot be met.

The Project will utilise specialised expertise beyond that available internally within the NESO.

## 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 a number of innovation risks associated with this project that have been identified:

- For near term models (owned within the team), which currently use weather data to provide forecasts, the climate signal in the data may be too small to impact results.
- For longer term models (owned by other teams), it is less likely the signal will be too small to be significant, but these may not be designed so that a climate signal can be factored in.
- The data recommended in the gap analysis may be under licence and not attainable to the ESO for some reason.
- The data may not be at the required temporal or spatial granularity to feed into existing ESO models, requiring further work for implementation.

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

☒ Yes