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 2014

Project Reference Number

NIA_NGET0095

Project Registration

Project Title

Visualization of Renewable Energy Models

Project Reference Number

NIA_NGET0095

Project Licensee(s)

National Energy System Operator

Project Start

October 2013

Project Duration

4 years and 1 month

Nominated Project Contact(s)

Ronan Jamieson

Project Budget

£120,000.00

Summary

This project will work closely with the other research National Grid is conducting aimed at developing new renewable models:

- NIA_NGET0016- UK-wide wind power:Extremes&Variability
- NIA_NGET0028 - Impact of extreme events on power production at the scale of a single wind-farm
- NIA_NGET0039 - A Combined Approach to Wind Profile Prediction
- NIA_NGET0085 - UK Regional Wind: Extreme behaviour and predictability, and
- NIA_NGET0139 - PV Monitoring Phase 1.

This will enable the outputs of this project to utilise the most up to date information on the renewables models.

The project scope includes the following:

- Literature review: build knowledge of policy drivers; economic weighting of carbon emissions; implications of increasing variability and electricity system management.
- Implementation of a variety of interrogation methods including operator natural viewpoint navigation and other input devices
- Development of a range of basic prototypes based on datasets for initial assessment.
- Detailed visualisation development and testing. This stage is anticipated to concentrate on two or three prototypes using

complementary display technologies.

- Consideration should be given to incorporation of these visualisation systems more formally into real-time operation.
- Parallel testing with current NG operative practice to determine efficacy of the visualisation approach. Compare the current process with the new process at the non-operational stage.
- On-going visualisation refinement and testing should reflect the full interactions between NG operatives and real-time decisionmaking.
- Utilising the training facilities to test the effectiveness of the new process in making real time decisions.

Preceding Projects

NIA_NGET0016 - UK-wide wind power: Extreme and Variability

NIA_NGET0028 - Impact of extreme events on power production at the scale of a single wind-farm

NIA_NGET0039 - A Combined Approach to Wind Profile Prediction

NIA_NGET0085 - UK Regional Wind: Extreme behaviour and predictability

NIA_NGET0139 - PV Monitoring: Phase 1

Third Party Collaborators

University of Reading

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

The move towards decarbonisation is changing the energy mix in the UK dramatically as the increased penetration of renewables take effect. Wind and Solar energy in particular is expected to play a large role in providing energy to the country. As an energy source it faces certain challenges that need to be addressed to ensure its positive contribution, a particular challenges is the accurate prediction of its energy output, especially under particular weather conditions.

This is a complex process both in terms of understanding the complex behaviours and interactions of the inputs in the renewable energy models and presenting the output information in an effective manner that enable operational staff to make the correct decisions. As uncertainty is a large factor of this, a particular visualisation challenge that needs addressing is how to effectively display this variability without losing the underlying information.

Method(s)

Research and Development

This project will deliver a series of Work Packages (WP) with the overall aim of developing new and innovative visualisation techniques and improve existing techniques that will be utilised by both the energy forecasting team and the control room within National Grid. The visualisations for the energy forecasting team will help them better understand the inputs to their renewable models. For the Control Room understanding the outputs of the various renewable models in terms of energy will assist them in making more effective decisions in real time, which could ease the facilitation to a low carbon economy.

Scope

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Objective(s)

The objective of the project is to develop visualization approaches that will enable complex data to be readily translated in useful knowledge about renewable generation impacts on system operation in a visually intuitive way.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success of the project is based on the delivery of a final report which demonstrates the recommended visualisation implementation(s) so that it can be operated by National Grid personnel.

Project Partners and External Funding

The University of Reading

No external funding

Potential for New Learning

The University of Reading has extensive experience in both its Computer Science and Meteorology Departments, from which the academic supervision will come. Also as part of the state of the art, visualisation techniques that are utilised by other industries will be investigated to see what areas can be adapted for use. This means that we are giving the project the best chance to develop new available learning.

Scale of Project

This project is being done as a desktop study.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The project will be carried out at the University of Reading.

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

The total NIA project expenditure will be £120,000

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:

n/a

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)

National Grid on average (2006-2011) spends £120m a year on reserve in the Balancing Market to cover uncertainties in demand and generator performance. The increased penetration of renewable on the system effects both of these uncertainties therefore there is a direct business benefit to National Grid and the consumer if greater certainty (e.g. improved renewable energy forecast – inputs, more effective visualisations of the forecast - output) can be created.

Please provide a calculation of the expected benefits the Solution

Not required for a research Project.

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

The output of the project will be relevant to the operation of the whole of the GB electricity system.

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

The final output of the project is to identify measures to implement the project within National Grid, this will enable the associated costs of roll out to be defined.

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

n/a

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

The project will meet environmental and reliability challenges as identified as part of the National Grid's innovation strategy.

☑ Has the Potential to Develop Learning That Can be Applied by all Relevant Network Licensees

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.

Following a review of the ENA portal and, to the best of our knowledge more widely, this work has not been done before.

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

n/a

Relevant Foreground IPR

n/a

Data Access Details

n/a

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

n/a

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

n/a

This project has been approved by a senior member of staff

☑ Yes