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

Jan 2014

Project Reference Number

NIA_NGET0052

Project Registration

Project Title

Mathematics of Balancing Energy Networks Under Uncertainty

Project Reference Number

NIA_NGET0052

Project Licensee(s)

National Energy System Operator

Project Start

January 2012

Project Duration

3 years and 7 months

Nominated Project Contact(s)

Iain McIntosh

Project Budget

£49,000.00

Summary

This is a 3.5 year project which will include with elements of our understanding to be developed each year through early sight of potential models; however final models would become available at the end of the project.

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

Storage and demand shifting are regularly identified as a means of delivering the low carbon energy future of electricity by aligning availability of renewable resource (wind power) with demand. There are numerous potential storage technologies ranging from pumped storage, to batteries and thermal storage. Likewise, the concept of demand shifting is well understood, however the value to the industry and end consumer is not well understood.

Method(s)

The project would deliver mathematical models for uncertainty in energy networks and the management of this uncertainty through demand shifting and storage. The project will help identify the value of storage technologies and thus understand the nature of the role they may be able to play in the future operation of the networks.

Scope

This is a 3.5 year project which will include with elements of our understanding to be developed each year through early sight of potential models; however final models would become available at the end of the project.

Objective(s)

The objectives of this project include

- Develop an understanding of storage and demand shifting
- Identify key learning and outputs from the research within a PhD Thesis

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

A production of a PhD thesis will be considered a success and knowledge implemented through technical experts will be the success criteria

Project Partners and External Funding

Project Partners - Herriot Watt University

Potential for New Learning

The potential for learning on the commercial aspects of storage and demand is high.

Scale of Project

This project will involve a desktop study and investigation.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This project will deliver tools and techniques for potential use on the whole of the UK Transmission Network (national).

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

IFI=13k

NIA=36k

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)

The business benefit would be two fold. First it would help National Grid to better articulate the value of storage and demand shifting strategies to our customers and stakeholders and thus help shape both design of future services and a cost benefit of different products and technologies. . The models would include the ability to quantify the economic benefits of such new capabilities, to optimize their use, and to assess their impact on energy trading and markets. This should help us reduce operating costs, particularly in regards to operating margins and wind intermittency and assist in how we should target resources appropriately

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 final results will be applicable to operation of the whole networks with storage.

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

Research project, none at the end of this 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

As energy storage is becoming more prevalent on the system this learning will be relevant to all licensees.

The knowledge of the project will be disseminated on the ENA Smarter Portal as well as on www.nationalgrid.com/innovation. This project will also be disseminated through relevant national and international conferences and industry and academic forums.

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

☑ 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.

Given a review of all companies' IFI reports and a technology watch on the potential of storage in the network, the project engineer confirms that no duplication of innovation 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

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