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NIA Project Registration and PEA Document

Date of Submission

Aug 2015

Project Reference Number

NIA_NGET0167

Project Registration

Project Title

South East Smart Grids

Project Reference Number

NIA_NGET0167

Project Licensee(s)

National Grid Electricity System Operator

Project Start

August 2015

Project Duration

1 year and 0 months

Nominated Project Contact(s)

Jingling Sun

Project Budget

£415,000.00

Summary

1. Technical solution located within the TSO control room for providing coordination, optimisation and visualisation of the transmission and distribution network for a base location (3 GSP's) and adjacent transmission networks. The solution will be used as an offline tool for the NIA project but will be functional for future interoperability with existing operation systems and data streams.
2. Obtain detailed models from applicable DNO (UKPN) and TSO data historian for implementation within the technical solution. The TSO data historian interface will be an offline manual feed to avoid impacting operational systems.
3. Interactive visualisation interface located within the TSO control room for demonstrating the impact of transmission and distribution resource under use case scenarios.
4. Perform and analyse results of trials to develop recommendations for progression of concept to large scale real-time demonstration.

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

The South East of England is anticipating significant changes in the way electricity is both generated and consumed. The transmission system is expecting to have to accommodate an increasing number of interconnectors and wind farms. The distribution system will see an increasing volume of embedded generation (solar PV in particular), along with changes to the type of demand such as an increase in electric vehicles, storage and demand side response (DSR). In order to prevent thermal overloading and to manage voltage stability, it is likely that significant network reinforcements will be required with both high costs and long lead times.

When interconnectors transfer large amounts of power to or from the UK, the network in the South East will become heavily loaded. If the thermal loading gets too high the network can suffer a voltage collapse which can ultimately lead to a blackout. Additionally the

large variation in the amount of loading on the lines causes high voltage issues during times of low demand.

The nature of the changes from the demand side and within the distribution networks are likely to create higher voltages at both transmission and distribution levels particularly during low demand periods. This would require active management such as paying to constrain local generators to control the voltage. In the longer term, installation of reactive compensation equipment would be needed to prevent future incidents.

In power systems with long distances between connection points, voltage collapse following a system disturbance may occur. If not mitigated this could lead to a system collapse. The mitigation of such an event traditionally requires the building and installation of new transmission lines, use of series compensation, and/or installation of large volumes of reactive power compensation.

Without new economic and efficient solutions to address the aforementioned issues, costly network reinforcements with long lead times will be required. These may delay or limit the creation of new connections for GB consumers, thus limiting the opportunity to utilise distributed resources such as DSR, storage and solar PV.

Method(s)

The purpose of this NIA project is to allow the studies required to determine the range of issues, innovative mitigating measures which need to be developed are carried out in a timely manner as per Work Stream 7's timeline. This will also allow feeding the results into other Smart Grid Forum workstreams (i.e. WS6).

Develop and perform trials to demonstrate use case scenarios based on historical data and known technical issues to study effectiveness of coordinated T&D approaches using DER against traditional methods.

Scope

1. Technical solution located within the TSO control room for providing coordination, optimisation and visualisation of the transmission and distribution network for a base location (3 GSP's) and adjacent transmission networks. The solution will be used as an offline tool for the NIA project but will be functional for future interoperability with existing operation systems and data streams.
2. Obtain detailed models from applicable DNO (UKPN) and TSO data historian for implementation within the technical solution. The TSO data historian interface will be an offline manual feed to avoid impacting operational systems.
3. Interactive visualisation interface located within the TSO control room for demonstrating the impact of transmission and distribution resource under use case scenarios.
4. Perform and analyse results of trials to develop recommendations for progression of concept to large scale real-time demonstration.

Objective(s)

1. Develop methods and tools for assessing impact of distributed resource on the transmission network.
2. Enable visualisation and assessment of the distribution network within transmission optimisation.
3. Test methods for effective use of distributed resource for transmission purposes (direct control or DSO co-ordinated).

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

1. Results and learning obtained from modelled trials of use of DER to manage transmission system constraints.
2. Recommendations developed to progress from desktop study to large scale implementation and real-time trials.

Project Partners and External Funding

n/a

Potential for New Learning

1. Understanding the capability of DSR resources to help with managing transmission constraints
2. Developing the tools to enable further coordination between transmission and distribution

investments

Scale of Project

Desktop study environment

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

South East network modelling and static data from both transmission and distribution networks – including available DER's.

Revenue Allowed for the RII Settlement

£0

Indicative Total NIA Project Expenditure

£415,000

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)

This project will provide greater use of the DNO resources. Should we decide to take this forward under a NIC project, the benefits will be a lot greater but we envisage the NIA work on its own provide savings around £500k per annum in reduction of constraint.

Please provide a calculation of the expected benefits the Solution

Achieving the savings are mainly to do with reduction in constraint cost.

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

This will help in modelling the Distribution Networks in our power system analysis tool.

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

This requires:

1. Demonstration via a NIC project -> £11m
2. Only use the modelling benefits -> one man year -> £100k

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

All relevant Network Licensees are participating in the project and will be involved at all stages of the project.

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

To be able to plan effectively in delivering a network that is able to deal with the changing energy futures, that include the electrification of heat and transport, the carbon reduction targets set by government whilst and at the same time remaining safe, reliable and cost effective.

- 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.

We have checked previous works/existing works across the GB industry. We can confirm that the scope of the work is novel.

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