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

Nov 2014

Project Reference Number

NIA_SGN0066

Project Registration

Project Title

Real-Time Networks Feasibility Study

Project Reference Number

NIA_SGN0066

Project Licensee(s)

SGN

Project Start

November 2014

Project Duration

0 years and 5 months

Nominated Project Contact(s)

Alexander Webb, Project Manager

Project Budget

£234,533.00

Summary

The project, consisting of parallel feasibility studies, seeks to establish the requirements of implementing a Real-Time Network within SGN's networks and subsequently, following a successful NIC project, the rest of GB. As part of the NIA project, the feasibility studies will be assessed, both internally and independently with the preferred approach advising a NIC bid submission.

The studies will consist of assessment of areas of current business as usual practices as well as a view of required practices for both pre and post implementation.

Nominated Contact Email Address(es)

sgn.innovation@sgn.co.uk

Problem Being Solved

All network based strategic investments of the GDNs are underpinned by design based on steady state models produced using outdated calculations.

Historically, the distribution network has been designed to a minimum pressure of approximately 21 mbar (19 mbar for systems designed pre January 1996 & 20.75 mbar for systems designed post December 1995) at the extremity of the main under extreme peak demand values (SGN/NP/14). This Statutory Minimum Pressure is quoted in the SGN Safety Case. This allows for a projected pressure drop along services and customer's internal pipework to maintain pressure at a suitable level for all appliances. The SGN Safety Case refers to this pressure as the minimum that can occur under 1 in 20 Peak (pk) demand conditions at the extremities of systems. This peak demand is a calculation, first established in the 1980s which devises a worst case scenario for maximum gas usage.

At present, the association between pk6 demand and flow is not metered or recorded meaning all validation processes and subsequent strategic investments are based on assumptions based on location and weather forecasting. This calculation is produced by associating the nature of the customer with a demand profile, through the use of SIC codes (Standard Industrial Classification). The

formulae behind this system were established in the 1980's and have lost their validity with a number of social, technological and economic factors which have affected the gas customer in the previous 20 years. Notably the following:

- The use of modern combi boilers – this has had a two fold effect on pk demand usage with substantial immediate demand required to 'fire up' & reduced gas requirements in prolonged usage
- Home energy efficiencies – the increased energy efficiency of domestic dwellings has resulted in reduced general usage although this is only likely to create further disparity between pk6 and peak day demands
- Gas prices – Has influenced the nature of customers usage throughout various demand conditions
- Population increase in conjunction with an aging population have changed the manner in which gas is used seasonally
- Change in daily consumption patterns – the advent of the 24hour society with a proportion of consumers working at different times throughout the day, commuter towns and 24hr industrial users have an impact on demand diversification which has never specifically documented on a network basis but rather just standardised
- Micro & Mini CHP – An increased appetite for combined heat and power systems has seen no associated metering and as a result no planning assumptions on how these units may change peak and off-peak outputs

Historically, there has also been a disparity between the assumed diversification of loads within a distribution network and the actual customer usage. This propagates as over diversification of mains <8" and under diversification of >8" mains. Proof of this concept would allow for a reformulation of how the GDNs calculate their predicted loads throughout the year and allow for a more robust, reliable, distribution model.

Additionally, the methods for validation of LTS (Local Transmission System) differs greatly to the distribution approach with discrete calculations lacking cross reference for data integrity. The result of this is a failure to utilise complimentary data to enhance modelling accuracy.

Consumption data is currently available from Smart Meters throughout SGN's distribution zones however, the validity of the available information has never been assessed and its worth potential never quantified. It is expected that a clearer view on how to best utilise this currently available data will be advised through the NIA feasibility study.

Method(s)

All network based strategic investments are underpinned by steady state modelling produced using surveyed pressures & assumed demands based on scaled temperature conditions.

A Real-Time Network uses live metering of key performance factors (ie. flow, pressure, temperature, CV etc.) using new and innovative sensoring technologies in order to give a representation of actual network performance from minute to minute. The result is an accurate method for network modelling and the potential to rewrite all design assumptions.

This project aims to identify the key requirements and potential benefits of implementing a Real Time Network within GB gas networks and will form part of SGN's NIA programme 2014/15. This will inform a Network Innovation Competition (NIC) bid to take place in 2015. The NIC bid will seek Ofgem funding to demonstrate a real-time, 'smart' network within SGN's area of operation. This demonstration will seek to redefine 1:20 demand forecasting, and network management, two key factors impacting on all strategic investments and management of SGN's networks.

Following a procurement event, two high standard submissions were received with different approaches to producing a feasibility study for the development of a Real-Time Network within SGN's area of operation. Due to both options having unique merits that SGN were keen to utilise and following Ofgem's guidelines on competition within innovation, it was deemed the prudent option is to run both feasibility studies in parallel.

This project is a feasibility study that sees SGN collaborating with both Enzen and DNV-GL to run two feasibility studies, independent of each other. The outputs from both studies will be assessed against each other from both an internal SGN perspective as well as independently. This approach is intended to drive out the best possible project when approaching the NIC bid which will ultimately reflect best value for the UK gas customer.

Scope

The project, consisting of parallel feasibility studies, seeks to establish the requirements of implementing a Real-Time Network within SGN's networks and subsequently, following a successful NIC project, the rest of GB. As part of the NIA project, the feasibility studies will be assessed, both internally and independently with the preferred approach advising a NIC bid submission.

The studies will consist of assessment of areas of current business as usual practices as well as a view of required practices for both pre and post implementation.

Objective(s)

This project seeks to achieve the following outcomes:

- A clear review of current legislation and documentation
- A completed review of previous projects in relevant areas
- Analysis of potential trial sites across SGN's supply zones
- Identification of potential tech providers
- Review of IT infrastructure and outline requirements for NIC
- Stakeholder engagement plan
- Production of a cost benefit analysis

Following completion of the above stages a review process will be completed both internally by the project steering group and by an independent assessor.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The success of this project will be reviewed against the following criteria:

- Two feasibility studies into Real-Time Networks consisting of:
- Identification of relevant legislation to be considered in NIC bid process
- A view of relevant past projects to feed into a Real-Time Network
- Recommendation of sites to trial a Real-Time Networks within SGN's licensed supply areas
- Guide of recommended tech partners to provide sensor and metering solutions
- Outline of IT infrastructure requirements
- Stakeholder Engagement Plan
- CBA
- Analysis concluding the preferred method to take forward to an NIC bid submission in 2015

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project has been designed as a feasibility study with the involved project partners advising the scale of a potential follow on NIC bid. However, the objective will be to use key networks in order to reduce the area the field trial needs to cover and therefore represent substantial value for money for GB gas consumer.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This is a research project however, the following NIC bid is due to be trialled across SGN's licensed area and will incorporate extreme climatic scenarios therefore both SGN's Scotland and South of England zones are likely trial sites.

Revenue Allowed for the RIIO Settlement

None.

Indicative Total NIA Project Expenditure

The total project expenditure will be £234,533, 90% of which is allowable NIA expenditure (£211,080).

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 is a research project therefore there are no direct savings achieved through the duration of works. However, the following NIC bid has the potential to deliver substantial benefits to the GB gas consumer through reductions strategic investments including; mains reinforcement, regulator replacements, open cut mains replacement etc.

Please provide a calculation of the expected benefits the Solution

This is a research project.

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

There are no costs associated with sharing the conclusion and recommendations of this study with the other Network Licensees. As this project is a very low technology readiness level, it is not possible to estimate the costs of deployment at this stage.

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

This is a research 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

A final report will be completed by SGN at the conclusion of the project. This will include findings from both feasibility studies at disseminated to the other GDNs at their request.

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.

n/a

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