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

Aug 2014

Project Reference Number

NIA_NGGT0057

Project Registration

Project Title

Building Information Modelling (BIM) investigation into enhanced techniques

Project Reference Number

NIA_NGGT0057

Project Licensee(s)

National Gas Transmission PLC

Project Start

August 2014

Project Duration

0 years and 9 months

Nominated Project Contact(s)

Paul Lee

Project Budget

£490,000.00

Summary

Initial investigation highlighted potential savings of 4-11% in the Front End Engineering Design phase alone This proposal will move National Grid closer to realising the circa 20% (Her Majesty's Government estimate) whole life cost and carbon saving associated with BIM; in particular through the design and construction project phases (4D, 5D and 6D BIM phases). Internal and external collaboration will continue to be at the heart of the trial with the sharing of intelligent 3D models and lessons learnt across National Grid and the wider gas industry.

At the heart of the proposal is the development of:

- A BIM Execution Strategy to make BIM business as usual;
- Policies, procedures & guidance notes e.g. model creation and key stage handover processes;
- Design & constructability assessment methodology;

Supplier (Principal Contractor & subcontractor) collaboration strategies and integration with current business practices.

Preceding Projects

NIA_NGGT0024 - BIM (Building Information Modelling)

Third Party Collaborators

Premtech Ltd

Costain

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

With increasing pressure to deliver complex projects to time and budget, whilst reducing carbon footprint, National Grid is considering the application of Building Information Modelling (BIM) as part of the solution.

It is unclear whether BIM techniques or tools will add value to National Grid's ways of working and/or sustain current levels of performance/reliability without significant expenditure or disruption to business as usual.

Method(s)

The project deliverables include development of:

BIM Bank

It is anticipated that computer aided design savings of between 25% and 83% can be achieved through the reuse of component and assembly models. This project seeks to expand the "Lego box" concept into a web based "BIM Bank" using Sharepoint; a first of a kind for the utility industry. A BIM Bank would also promote greater optioneering during the early project stages.

To enable the deployment of BIM across the gas Project Model, the library of transmission asset components and assemblies is to be developed using intelligent 3D modelling techniques. The proposal is to develop the most typical components and assemblies across the range of compressor equipment packages, gas pressure / rating tiers, pipeline diameters and civil components, to reflect the most likely future workload. Post implementation, the BIM bank will organically grow as more projects contribute to the core repository.

3D Modelling and Analysis

The project seeks to investigate cost savings associated with interoperability evaluation enabling complex technical analytics such as thermal, flood, vibration, noise, fluid flow & transients, capacity and lighting assessments.

Minimum Off-take Connections

To improve customer satisfaction and reduce repeat development costs, a prototype BIM model of a minimum off-take connection (MOC) will be produced. The output will include a parametric model, which amends the components and assembly sizes and ratings based on defined process conditions. Standard report templates will be produced e.g. datasheets, material take offs, basis of design templates and others to facilitate a consistent lifecycle approach. This approach can be flexibly applied to future non-standard projects e.g. unconventional gas connections using bio-methane.

Life Cycle and Carbon Costing

The components and assemblies created will be shared with the Sustainability Safety & Resilience (SSR) team to record the carbon footprint of each model using Sima Pro. This will support earlier construction/asset lifecycle choices/decisions as well as generally enhancing knowledge. The direct integration of the Sima Pro relational database and the 3D models will be tested throughout the project and extended to cover plant. This will contribute to National Grid's carbon reduction targets in 2020 and 2050 carbon reduction targets.

Interactive policy and procedure training

Value is more than just cost saving; value can be driven from using the intelligent 3D models to benefit wider areas of the business. The generated models from the trial will be offered to the Learning and Development team to support:

- Future training and development activities;
- Up-skilling trainees on existing & future sites;
- Reducing future project development costs

To advance virtual reality training and move away from text or 2D based procedures to vocational, realistic training, the project will transfer the engineering 3D model to a graphical solution (games engine, e.g. Unity) using an interactive headset and equipment (e.g. Oculus Rift). This will enable remote training, with avatars, and the demonstration will utilise the recompression equipment from PMC

(Pipeline Maintenance Centre) and deliver a Non Routine Operation in a visual format. This is a completely novel approach; communicating technical procedures in a virtual reality environment.

Site Surveying – Laser Scanning (Mobile and Aerial)

Mobile point clouds for surveying traffic management routes and aerial point clouds generated from standard photography will be demonstrated as part of phase 2

Stakeholder Engagement

National Grid will seek to make presentations to inform industry on the outcome of the project. The presentations for NGGT will be to bodies such as PIG and IGEM. Previous National Grid presentations on this topic have attracted audiences in excess of 200 persons.

Scope

Initial investigation highlighted potential savings of 4-11% in the Front End Engineering Design phase alone This proposal will move National Grid closer to realising the circa 20% (Her Majesty's Government estimate) whole life cost and carbon saving associated with BIM; in particular through the design and construction project phases (4D, 5D and 6D BIM phases). Internal and external collaboration will continue to be at the heart of the trial with the sharing of intelligent 3D models and lessons learnt across National Grid and the wider gas industry.

At the heart of the proposal is the development of:

· A BIM Execution Strategy to make BIM business as usual;

· Policies, procedures & guidance notes e.g. model creation and key stage handover processes;

· Design & constructability assessment methodology;

Supplier (Principal Contractor & subcontractor) collaboration strategies and integration with current business practices.

Objective(s)

To understand BIM techniques & tools and how they can add value to the way National Grid operates.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

To further understand the potential cost savings across Gas project models in design and construction. The learning from this project will enable National Grid to make an informed decision on the deployment of BIM techniques & tools.

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project is desk based, but will require field data from site LiDAR scans that will enable As Installed intelligent 3D modelling. The 3D project models will be trialed in a virtual environment and tested on National Grid IS infrastructure to ensure compatibility and operability with in-house systems.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL7 Inactive Commissioning

Geographical Area

Coordination meetings – Ashby and National Grid House in Warwick

BIM modelling – Premtech offices, Ashby, LE65 1NF

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£490,000

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)

Anticipated savings of £28M over the RIIO period based on total forecasted development & construction expenditure for compression and pipelines.

Please provide a calculation of the expected benefits the Solution

Base Cost:

Circa £30m on FEED studies during the RIIO period

Circa £500m on CAPEX over the RIIO period

Method Cost:

Saving 10% on FEED studies - £3m

Saving 5% on CAPEX - £25m

Total Savings - £28m

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

The outputs from this project can be rolled out across the energy sector. Two gas distribution network operators attended knowledge sharing presentations and have already indicated a desire to discuss the use of the BIM Bank, noting competition law requirements. We will continue to engage in discussions with other Distribution Network Operators and other infrastructure managers.

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

This is dependent on the technological maturity and capital expenditure of each Transmission or Distribution Network Operator. The corporate BIM Execution Strategy will define the level of costs an organisation will incur e.g. defining the Level Of Detail along each stage of use, number of Users, level of access etc. The project will further define the level of investment required to achieve BIM Business Readiness. Initial estimates of capex of circa £1M are required to both invest in software, bespoke scripting e.g. developing workflows, training & communications and the creation of a "generic & detailed" 3D library.

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

The outputs from this project and National Grid's Journey will be communicated through external presentations to interested parties. In addition, the output of the 3D engineering models converted into 3D gaming type simulations operated in a virtual environment will be demonstrated.

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

This project fits within the Strategic theme.

☑ 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