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

Mar 2019

Project Reference Number

NIA_NGN_241

Project Registration

Project Title

Deep Excavation Load Analysis

Project Reference Number

NIA_NGN_241

Project Licensee(s)

Northern Gas Networks

Project Start

March 2019

Project Duration

1 year and 0 months

Nominated Project Contact(s)

Sam Higgins

Project Budget

£64,333.00

Summary

The objectives of this project are to:

1. Find, secure and assimilate knowledge of the current deep excavation process, practices and drivers.

2. Determine the extent to which the deep excavation design process can be automated.

3. Define or identify technologies that could alter the drivers and constraints upon deep excavations

4. Define a new more effective, lower cost and/or faster deep excavation work process, or demonstrate that this is not feasible.

Third Party Collaborators

Steer Energy

Nominated Contact Email Address(es)

innovation@northerngas.co.uk

Problem Being Solved

Currently, deep excavation analysis and construction is typically carried out by 3rd party consultants. This is due to the fact that NGN operatives are not certified to excavate at these depths without the necessary documentation and risk assessment. NGN are obligated to employ external contractors to complete excavation design work, as well as conduct a site visit before approval can be given for work to begin.

There are no alternative options for undertaking this work, resulting in monopolisation which leads to major unavoidable cost and

disruption.

A significant level of time, effort and investment is required to obtain load analysis for deep excavation activities. This creates a significant Opex investment for an external bought in service to use competent engineers to undertake experienced, knowledge and competent based analysis.

To enable a change in work practice and agree a methodology change, research and engagement with key stakeholders such as the HSE is required.

Method(s)

Currently, deep excavations on the gas network are typically carried out by 3rd party consultants. As GDN operatives are not certified to excavate at these depths without the necessary documentation and risk assessment, networks are obligated to employ external contractors to complete excavation design work, as well as conduct a site visit before approval can be given for work to begin.

There are no alternative options for undertaking this work, resulting in monopolisation which leads to major unavoidable cost and disruption.

There is therefore a need to explore and develop methods of speeding up and reducing the cost of designing, planning, and carrying out these types of excavations, whilst still meeting legal and safety requirements. In the first instance, it is believed that a form of 'analysis' tool that would be deployed by a specialist team could be used to fast track the design work.

The work that Steer Energy will carry out will deliver on the following objectives:

1. Find, secure and assimilate knowledge of the current deep excavation process, practices and drivers.

2. Determine the extent to which the deep excavation design process can be automated.

3. Define or identify technologies that could alter the drivers and constraints upon deep excavations

4. Define a new more effective, lower cost and/or faster deep excavation work process, or demonstrate that this is not feasible.

There are a range of options open to being explored during this work, and any outcome will need to balance the economic benefits of optimising the excavation design (as currently done) with the cost savings of standardising the approach across the whole range of excavations. In addition to this, thought will be needed on how best to capture the savings for Network Operator, rather than other parties. This may necessitate revision of contractor contract or incentives to align business drivers into deep excavation workflow.

This is an ambitious challenge, and one that involves a range of different stakeholders – from the Network Operators, to the HSE, to the consultants, and service contractors carrying out the work to the given design. At various points in the project, it will require input from these and others.

The work requires a multi-disciplined approach and success will depend on highly effective handling of the complex set of inputs and requirements for the design, planning, and execution of the excavation works. This project will be deemed a success if it offers either,

1. Approaches to reduce direct cost and schedule, or

2. Approaches to increase standardisation and increase operational safety and efficiency, or

Assurance that the proposed approaches do not offer significant improvements in cost, schedule, operational safety or efficiency.

Scope

This project is split into 4 elements:

- Understand

Steer will identify and work with structural engineering / geotechnical consultants in order to understand the excavation design inputs and how these change the outputs of the design. Steer will also need to meet with the Network Operators to understand the range of excavations that are going to be targeted through this project so that the priorities and drivers are thoroughly understood.

- ·Investigate

Steer will look at options for simplification and standardisation of the design outputs, bringing in a risk and reliability specialist to formally assess and challenge the thinking. Current assumptions are likely to be challenged and specific technologies that can cover a range of different excavation conditions may be proposed.

- Produce

The work from the previous two elements will allow Steer, with support, to produce a rough prototype of the 'design tool' which can then be used to demonstrate the extent to which the work can be standardised without compromising safety. This is likely to utilise Excel and / or PowerPoint, rather than the creation of a stand-alone programme.

- Review

In this element, Steer will look at how the outcomes from the 'produce' element can be fitted to the regulatory and legal landscape, including industry standards. The element will also include a short 'gap analysis' to inform work in Stage 2.

Reason for extending the project

The problem being explored requires a cross cutting approach, both to capturing the internal and external expert opinions surrounding the subject. The complexity involved in capturing the former was underestimated. The expert views are reliant on operational colleagues, who have competing network essential responsibilities. This led to multiple sessions, leading to the slippage of project activities.

The expert opinions have now been captured, with the project moving into the optioneering stage. The project timeline has been re-evaluated, taking into consideration operational colleagues' commitments.

To continue with the project, the project timeline requires extending. There will be no impact to the project cost.

Objective(s)

The objectives of this project are to:

1. Find, secure and assimilate knowledge of the current deep excavation process, practices and drivers.

2. Determine the extent to which the deep excavation design process can be automated.

3. Define or identify technologies that could alter the drivers and constraints upon deep excavations

4. Define a new more effective, lower cost and/or faster deep excavation work process, or demonstrate that this is not feasible.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project will be deemed a success if it offers a definitive outcome relating to either,

1.Approaches to reduce direct cost and schedule, or

2.Approaches to increase standardisation and increase operational safety and efficiency, or

3.Assurance that the proposed approaches do not offer significant improvements in cost, schedule, operational safety or efficiency.

Project Partners and External Funding

Steer Energy

Potential for New Learning

The project is by its very nature highly innovative and open until towards its completion – this provides the clear basis of a specific technology development plan in future phases of work.

Scale of Project

The scale and deliverables of this project is as follows:

- Report on the work carried out: for review by engineering and commercial leaders to allow this project to be validated as sufficiently mature for further work
- New workflow diagram for deep excavation process (expected to include automated design) for review by engineering and commercial leaders to allow the feasibility of the proposed way ahead to be considered
- Statement of objectives for stage 2: as basis for early decision on whether to seek a proposal for this work

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

NGN area

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

External costs – £47,500

Internal costs – £16,833

Total project costs- £64,333

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 design, planning, and site execution of deep excavations currently incur the cost of bespoke engineering consultancy on every occasion. The consultancy (in design, execution and inspection) is usually on the critical path for each job and therefore disrupts work planning and extends the disruption of site works experienced by the public. This project has the potential to reduce the cost of works - reducing the cost base passed on to customers – and to shorten the inconvenience of sites works experienced by the local public/customers.

Please provide a calculation of the expected benefits the Solution

Not applicable to this project (TRL2-3)

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

Not applicable to this project (TRL2-3)

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

n/a

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

☐ 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

Deep excavations are an essential step in many network repair and modification activities for all network licensees. The project will develop methods of speeding up and reducing the cost and risk of deep excavations, or robustly demonstrate that this cannot be achieved. The methods will either be directly applicable to other networks or readily adaptable to them.

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 safety and environment is the key area of the innovation strategy that is being targeted. Predominantly to look to improve operational efficiency via exploitation of computer based technology without detrimental impact on safety.

☑ 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 conducted research and are confident an equivalent solution is not available on the market or in currently owned software solutions.
No similar projects are being carried out by other Network Licensees.

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

Other methods and approaches have been used to drive efficiency in the management of excavations on site, however this project may lead to the development of design/selection software to assist in deep excavation shoring on the basis of algorithms and practices devised. This innovation in digital technology is challenging, however we believe it now offers the best opportunity to find additional efficiencies that up to now remains unproven.

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

We recognize the need to build upon and improve our current operational practices. However, this project study is low level TRL and the outcomes are very uncertain. Clarity is needed to evaluate future potential hence the reason we are investing in this project through the NIA mechanism. This project is highly innovative and involves higher technical and safety risk than would be acceptable through our business as usual funding. It represents a novel use of software technology not previously used in the industry or globally.

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

Within NGN we currently undertake excavation with technical input as a mandated requirement upon certain site conditions. This technique has not changed in a number of years and whist proving effective, there are areas where improvement may be possible from a commercial, operational, and wider safety management functionality requiring to potentially enable change from current practice.

This project has been approved by a senior member of staff

☑ Yes