national gas transmission

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

Dec 2013

Project Reference Number

NIA_NGGT0017

Project Registration

Project Title

Heat in the Soil Form - Assessment of heat in soil caused by buried infrastructure

Project Reference Number

NIA_NGGT0017

Project Licensee(s)

National Gas Transmission PLC

Project Start

September 2013

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Michael Jordin, Ketan Mistry,
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Project Budget

£170,000.00

Summary

It is necessary to investigate the following areas:

1) The potential short and long term effects that buried infrastructure would have on the cultivation of the agricultural land in which it is placed.

2) The effects on inter-species competition in both arable and grassland habitats (e.g. will an increase in temperature favour weed species?).

3) The effects on soil micro-organisms, invertebrates and small mammals which are linked to soil fertility (i.e. will increase temperatures effect invertebrate numbers, both beneficial and pest species).

4) The potential long and short term effects on water tables, ground water, surface water bodies and artificial drainage systems.

5) The verification of effects that the infrastructure may have on different soil and rock types that may be encountered (i.e. clays, sandy loams, peats, sandstones limestones, chalks, granites etc.).

6) The possible mitigation measures that could be adopted to reduce or ameliorate the effects of the infrastructure operating at temperatures of up to 100oC on the ground in which it is located. Options to be considered could include coatings, surrounding the infrastructure with heat absorbing material, burying deeper etc.

7) Other potential effects, not identified above, that buried infrastructure may have on the environment in which it is placed.

Third Party Collaborators

Macaulay Scientific Consulting Ltd

Nominated Contact Email Address(es)

Box.GT.Innovation@nationalgrid.com

Problem Being Solved

The ecological and environmental risks attached to the introduction of heat into soils, such as the effects of buried pipelines and high voltage electricity cables incrementally inducing temperatures from 4 degC up to 100degC on the ground in which it is placed, is not currently understood. The heat induced from the buried assets will have an impact on the soil microbiology, crop yields and soil water distribution.

Method(s)

An initial desk study review of existing data sets and interpretation of information is required followed by a gap analysis to identify areas of research to be undertaken. Proposals for further areas to be researched based on knowledge gained within this phase will be developed.

Once the knowledge gaps have been identified focused research will be undertaken in those areas where insufficient knowledge exists. Guidance on best practice for developing future infrastructure projects, to reduce the cost/environmental impacts of National Grid whilst executing its required infrastructure developments will be obtained.

Scope

It is necessary to investigate the following areas:

1) The potential short and long term effects that buried infrastructure would have on the cultivation of the agricultural land in which it is placed.

2) The effects on inter-species competition in both arable and grassland habitats (e.g. will an increase in temperature favour weed species?).

3) The effects on soil micro-organisms, invertebrates and small mammals which are linked to soil fertility (i.e. will increase temperatures effect invertebrate numbers, both beneficial and pest species).

4) The potential long and short term effects on water tables, ground water, surface water bodies and artificial drainage systems.

5) The verification of effects that the infrastructure may have on different soil and rock types that may be encountered (i.e. clays, sandy loams, peats, sandstones limestones, chalks, granites etc.).

6) The possible mitigation measures that could be adopted to reduce or ameliorate the effects of the infrastructure operating at temperatures of up to 100oC on the ground in which it is located. Options to be considered could include coatings, surrounding the infrastructure with heat absorbing material, burying deeper etc.

7) Other potential effects, not identified above, that buried infrastructure may have on the environment in which it is placed.

Objective(s)

The aim of this research project is to understand the ecological and environmental risks attached to the introduction of heat into soils from buried assets.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

This project will provide detailed information to allow National Grid to be in a position to influence the design of elements of the transmission infrastructure which create the heat, to minimise environmental and financial risks (such as crop loss and cost avoidance related to Compulsory Purchase Order (CPO)).

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

At this research stage the work is desk based and theoretical. No site work is required however simulations will be carried out in areas where there is insufficient information available.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The project is a desk based study which will be conducted by Macaulay Scientific Consulting Ltd located in Aberdeen. The learning will be of use across the National Gas and Electricity Transmission Systems.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£170,000

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)

Approximately £300k for each compulsory purchase order (CPO) avoided. By understanding the ecological and environmental risks attached to the introduction of heat into soils, National Grid will be in a position to influence the design of those elements of the transportation infrastructure which create the heat to minimise environmental, reputational and cost (in the shape of crop loss compensation to land owners etc.) risk. The cost of legal preparation and execution of a CPO is in excess of £300k per CPO.

Please provide a calculation of the expected benefits the Solution

N/A Research Project

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

Knowledge gained can be directly applied to all infrastructures on the National Transmission System.

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

This work is at the early stage of research and development. The information will be shared with both relevant internal and external parties, based on the results additional work or changes to policies will be instigated. Costs are estimated in the region of £10k based on review of the reports by staff members in various teams including Capital Delivery, Electricity Transmission Asset Management, Gas Transmission Asset Management, Land and Development and the Carbon Capture and Storage team.

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 knowledge gained during this research project on the ecological and environmental effects to the introduction of heat into soils will be applicable across all business functions that use buried assets capable of transferring heat to the surrounding environment. This issue is relevant to both gas and electricity transmission networks but most relevant to gas transmission due to the amount of buried infrastructure and the temperature variations experienced, however the learning will be shared with all relevant parties.

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 addresses challenges associated with the Environmental 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