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 2021

Project Reference Number

NIA_CAD0071

Project Registration

Project Title

Intelligent Governor Surveying and Monitoring

Project Reference Number

NIA_CAD0071

Project Licensee(s)

Cadent

Project Start

March 2021

Project Duration

1 year and 0 months

Nominated Project Contact(s)

Project Budget

£41,850.00

Summary

Cadent have set up a Gas Governor Improvement Plan to review the condition of their <7bar Governor asset group. In the first instance there is a need to confirm the location and condition of the buildings (conditions covering multiple attributes). Typically, data on the condition of these assets would be captured by a field operative who would need to travel to each asset and manually capture key attributes. This would need to be completed regularly to ensure asset data and condition monitoring is up to date.

A holistic view of Governor asset data is required, including location, asset health and asset risk data to make better asset management decisions. Some key problem areas that need to be identified across the governor asset group within the West Midlands are:

· Issues with the location data of Governor assets and proactive identification of assets compared to historical records
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.
· Physical location information related to the assets (e.g. Compound, footway, verge etc.)
· Kiosk details and general state of repair
· Vandalism of assets e.g. Graffiti
· Correct vents on kiosks and state of repair of the vents
· Labelling present and correct on compounds or kiosks
· Impact protection of assets where required in safety critical locations
· Identification of changes to the environment to enable proactive site husbandry e.g. vegetation encroachment on assets
· Encroachment of buildings on to our assets
· Identification of standing water and possible water ingress points

Nominated Contact Email Address(es)

Innovation@cadentgas.com

Problem Being Solved

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Method(s)

To Research and provide a Proof of Concept (PoC) for an Artificial Intelligence model that can capture asset data attributes for the Governor asset class. It will provide an understating of the viability of utilising Cadent Asset Data, Ordnance Survey Roads Data and combining this with 360-degree HD image capture and intelligent asset attribute analysis.

An initial group of 175 Governors will be surveyed with the 360 cameras in the area around Stafford. In parallel, an Artificial Intelligence (AI) model will be created for the collection and analysis of further gas governor management data utilising data captured from the 175 Governors to 'train' the model. This model will then be tested against a further group of Governor assets. The model could be developed further should additional data be required in certain areas. Longer term, this model could be applied during national annual capture of specific areas to provide dynamic change intelligence with the cost of a dedicated manual capture process.

Scope

The Proof of Concept will be limited to the following scope:

- Initial identification of key Governor asset data attributes
- HD image capture and asset attribute analysis of the **175** gas governors in the Staffordshire area, as per shape file provided by Ordnance Survey.
- Access to supporting 360-degree HD imagery through Gaist HighwayView for reference as required by Cadent asset management team.
- Data provided in shape file or csv format for integration/use in OS or Cadent tools. It can also be viewed and used in Gaist's AssetStream tool if required.

· Gaist will create the training dataset needed to develop a deep learning model to automatically detect the dynamic aspects of the data collection (visibility of signs, presence of graffiti, overgrown vegetation, etc.). Gaist will train a model on the data and analyse the accuracy of this AI model.

· The produced computer model needs to be able to analyse imagery of a gas governors and assess various attributes of it automatically. We will also understand its limitations and accuracy of the model to predict unseen data.

· The key output of the project will be an understanding of the viability of an AI model that utilises regular image capture to provide Cadent with an understanding of key Governor asset data attributes and changes to these over time

The project will include the following stages:

· Project set up and asset attribute identification – 2 Weeks

· Survey and initial assessment – 4-6 Weeks

· Creating and testing of AI model – 3-4 Weeks

· Reporting on AI model – 2 Weeks

· Project closure and learnings – 2 Weeks

It is anticipated the following Governor Asset Data attributes will be included in the scope

Objective(s)

The key objectives of this project are:

· To survey and provide 360 HD Imagery of 175 Governors in the Stafford area

· To produce an AI model based of the HD imagery captured and asset attribute analysis

· To test the AI model's ability to provide a holistic view of Governor asset data, combining location, asset health and asset risk data

· To provide a simple system and dashboard to access data and imagery

· Data curation and enrichment; providing data in a format that is useful to Cadent and can be integrated with current asset data to improve completeness and add value

· Ensure data can be easily extracted from systems and autonomously identify and detect changes to various asset data attributes

· Provide an understanding if an AI model can be used as an innovative way of working, lower costs improve efficiency and provide valuable services

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

To deliver a Proof of Concept for an Artificial Intelligence model which can be used to identify selected attributes related to Cadent's Governor asset base. The success criteria will include:

· Successful HD imagery capture of 175 selected Governors

· Intelligent asset attribute identification on the 175 Governors with imagery

· A test Artificial Intelligence model developed and trained using captured imagery combined with OS and Cadent asset data

· The ability to test the model on a further set of governors with automatic capture of asset attributes

· A report detailing the success rate of the AI model and the feasibility for using across our Governor asset base in the West Midlands and the other Cadent networks.

Project Partners and External Funding

This project will be wholly NIA funded

Cadent Gas Ltd - £34.1k Extenral NIA funding which is made up of the following:

- Development and Data Capture Cost: £31k
- Contingency: £3.1k

Ordnance Survey – Nil contribution to external funding

Potential for New Learning

The solution will provide an innovative, and interactive solution which is new to the industry. It could be capable of automatically proving asset information (initially limited to Governors) and monitoring of these asset attributes for changes over time without manual intervention or review of the data. This could significantly improve efficiency of asset surveying and improve the ability to proactively manage our assets.

Scale of Project

The scale of this project will be limited to the West Midlands network for the purposes of the Proof of Concept and development. Learnings will be shared across all networks in Cadent and if a solution proves to be beneficial it is anticipated that this could be implemented across the Operate and Maintain function in the West Midlands but also across Cadent.

This project provides the smallest scale investment to prove the feasibility of the Artificial Intelligence solution, whilst including enough scope to scale up the solution if it is proved successful.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This project will be limited to the Stafford area of Cadent's West Midlands network.

Revenue Allowed for the RIIO Settlement

No revenue allowing for in the RIIO settlement

Indicative Total NIA Project Expenditure

£34,100

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)

It is anticipated that costs of physical surveys of assets on site will be avoided if this project is a success, however the primary benefit of this project is proactive identification of changes to various asset attributes but providing the model with regularly updated OS imagery which can be captured across the UK.

The reduction of physical surveys will also lead to reduction in travel time, reduced risk of RTCs and a small reduction in carbon emissions.

Please provide a calculation of the expected benefits the Solution

It is estimated that the current cost to survey a Governor is £181.38 and takes approximately 2 hours.

The artificial intelligence model will have an estimated cost of £50 per year per Governor, and would require no additional time from Cadent, however it will be updated continually as imagery is captured by OS/Gaist.

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

The method if proven could be scaled up to the circa 10,000 Governor assets across all Cadent's networks.

It is expected that each GDN will have a similar number of Governor assets relative to their size.

There is also a possibility that this solution could be deployed to various other asset types if successful.

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

Implementation costs specific to this technique will be minimal as the proposed deployment model would be a contract service offered by Ordnance Survey. It will however be dependent on the similarity of assets between networks. It is likely a similar imagery capture, and intelligent analysis exercise would be required for significant changes to asset types. It is envisioned that this project will provide a further understanding of this and the possible costs involved.

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 the UK Gas Distribution Networks have a large asset base which requires regular surveys and audits, and maintenance to maintain site conditions. Particular issues of encroachment, vegetation growth and vandalism impact all GDNs, and so a solution which could provide automated detection of these and various other attributes for the monitoring of assets over time could be used by all Network Licenses as well as across many other utilities.

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 the key area for Cadent of maintaining a safe and resilient network, specifically by optimizing assets and practices in our Operate and Maintain process. This project has a backbone of data that runs through it and provides a proactive solution to monitor and maintain assets with the use of Artificial Intelligence and data.

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.

This solution is a new and unique technique to a known and yet unsolved problem. All learnings from the project will be available to share across Cadent's networks and the other Gas Distribution Networks.

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

We are not aware of any other network that is utilizing regular image capture of its roadside assets and combining this with an Artificial Intelligence model to analyse and monitor assets.

The technology was not previously available to trial and there was therefore an assumption that every site needed physical attendance for surveys to be conducted.

Relevant Foreground IPR

Foreground IP created, acquires or otherwise developed during the Project shall be owned by Cadent. Cadent will offer a limited license to the collaboration partner(s) to use the resulting foreground IP for conducting its own internal research and development. GDNs will have an automatic right to request a license to the Relevant foreground IP.

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

This project is looking to developed and test an unproven Artificial Intelligence model that can anaylse a large number of asset attributes without operator intervention. The solution will need to work with various data streams including the captured HD imagery, OS Maps data and Cadent asset data.

The technology is yet unproven and Cadent will still need to perform regular surveying and maintenance of its Governors as BAU until the technology is proven. Although the potential for cost saving has been demonstrated there is still a high degree of risk associated with the project and, as such, Cadent Gas is unable to fund the project as part of its business as usual activities.

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

The solution will not provide a BAU solution without first requiring a Proof of Concept and there is a large risk with the unproven technology surrounding the AI model and its suitability for Cadent's requirements.

The technical solution relies heavily on the ability to train the Artificial Engine on a data set of approximately 1000 HD images. It is unknown if this will provide enough data points for all the attributes that Cadent is looking to identify on our Governor assets and therefore if the AI model can provide a reliable monitoring solution.

This project has been approved by a senior member of staff

☑ Yes