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

Jan 2018

Project Reference Number

NIA_WWU_045

Project Registration

Project Title

Eye In The Sky

Project Reference Number

NIA_WWU_045

Project Licensee(s)

Wales & West Utilities

Project Start

January 2018

Project Duration

3 years and 1 month

Nominated Project Contact(s)

Morgan James – Wales & West Utilities, Rona Mitchell - UK Power Networks, Gavin Howarth – Northern Powergrid, Andy Middleton – Northern Gas Networks, Martin Lyster - Scottish and Southern Electricity Networks, Nicolle Fieldsend-Roxborough – National Grid Transmission, Graham Harvey – National Grid Transmission, Steven Carson - Cadent

Project Budget

£1,854,504.00

Summary

This project aims to establish that BVLOS operations are possible now in most airspace with existing technologies. With the cooperation of Department of Transport (DfT) through the Transport Systems Catapult (TSC) and the Civil Aviation Authority (CAA), a regularised operating framework will be established, specifically for BVLOS linear infrastructure surveys like pipelines or overhead lines. This framework will be designed to embrace future technologies as they are developed but it is anticipated to allow 'business as usual' BVLOS inspection by project completion.

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Nominated Contact Email Address(es)

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Problem Being Solved

The use of drones to inspect critical network infrastructure is becoming recognised as a viable alternative to traditional inspection methods. Drones could deliver a reduction in cost, while increasing flexibility and safety. Some of these benefits are already being investigated by UK energy networks including Wales & West Utilities who recently completed an NIA feasibility study for small unmanned aerial systems (NIA_WWU_037). However, existing drone inspections must be conducted within Visual Line Of Sight (VLOS), which in the UK means 400 feet vertically and 500 metres horizontally and maintaining a safe distance from people, buildings and vehicles. The current regulatory framework set out by the Civil Aviation Authority (CAA), offers no standardised provisions for Beyond Visual Line of Sight (BVLOS) operations of drones.

Limitations of VLOS mean that the full potential of drone operations is difficult to realise and BLVOS operations could greatly increase the operating range and hence cost effectiveness and utility of drone surveys.

The primary challenge remaining is to develop acceptable means of demonstrating safe BVLOS operations that can be approved by the CAA.

Method(s)

This project aims to establish that BVLOS operations are possible now in most airspace with existing technologies. With the cooperation of Department of Transport (DfT) through the Transport Systems Catapult (TSC) and the CAA, a regularised operating framework will be established, specifically for BVLOS linear infrastructure surveys like pipelines or overhead lines. This framework will be designed to embrace future technologies as they are developed but it is anticipated to allow 'business as usual' BVLOS inspection by project completion.

The main work streams of the project will be:
1. Concept of Operations (CONOPS) development. Categories of drone operation will be developed in order to address specific inspection requirements. To accommodate the variance in CONOPS and to build and demonstrate the safety cases across the greatest number of inspection tasks this project will develop 4 categories of drone CONOPS.
2. Development of safety cases. For the 4 CONOPS categories identified, the appropriate safety case will be developed and submitted to the CAA for approval. For example, it is anticipated that hovering drones operating close to electricity towers and overhead lines (OHL) will exploit the presence of this obstacle in one CONOPS as providing 'shelter' since passing manned aircraft must legally keep well clear of these obstacles. However, regular planned vertical photography flights over gas pipeline routes are likely to exploit different safety arguments with more emphasis on de-confliction methodologies with other airspace users.
3. Flight trials. Each CONOPS with the safety cases applied will be demonstrated initially in segregated airspace and finally in non-segregated airspace. The demonstration drones will be selected, modified and systems integrated to suit the CONOPS and safety cases that have been developed. The flight trials will provide flight and inspection data.
4. Data analysis. Flight data will be used to confirm that the CONOPS and safety cases are fit for purpose while inspection data analysis will inform the networks of drone BVLOS capabilities and the business benefits case.

Scope

This research and development project has three distinct phases, each broken down into stages with the following deliverables.
Phase 1 (Stages 1-3) – Stakeholder Engagements & Trial Inspection in Segregated Airspace (TISA)
Phase 2 (Stages 4-7) – Trial Inspection in Non-segregated Airspace (TINA)
Phase 3 (Stage 8) – Enabling regular use of drone BVLOS Inspection
In each phase, effort is split into major tasks such as development of CONOPS and safety cases, selection, modification and integration of drone systems and support equipment, alongside regulatory development work and the planning and conduct of BVLOS flight trials around the UK. It is estimated that 100 flights will be undertaken over 50-100 hours of flying time, covering 1,000-2,000 km of linear track and datasets will be disseminated to partners for parallel exploitation along with end of stage reports.

Objective(s)

To investigate and demonstrate the ability to fly BVLOS in uncontrolled airspace over participants networks with regulatory approval

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The project will develop an acceptable means of demonstrating safe BVLOS operations that can be approved by the CAA.
The project will:
1. Develop learning from BVLOS test flights in a segregated air space
2. Develop an operational planning software tool to allow networks to quickly asses which safety cases are appropriate for flights in their network
3. If approved by the CAA, develop learning from trial BVLOS in uncontrolled airspace

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

This project is a research and development project that will develop a regularised operating framework specifically for BVLOS linear infrastructure surveys. The project is more than a desktop exercise and will involve hundreds of flight trials on real network assets to prove safety cases developed for the CONOPS that relate to network inspection tasks. At the end of the project it is hoped that the BVLOS capability will cover a significant proportion of the energy networks assets.

Technology Readiness at Start

TRL6 Large Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

The first set of flight trials are planned to take place in temporary segregated airspace established over suitable network routes for these trials. The second set is planned to take place in airspace without the need for specific segregation, as a ‘prototype’ for full commercial BVLOS inspection work.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total Project cost is £1,854,504; with external costs: £1,390,878 and Internal costs: £463,626

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)

• A reduction in cost and environmental impact (particularly carbon footprint and noise pollution) compared to manned helicopter flights
• An increase in safety, reducing the inherent risk of manned helicopters flights and climbing towers for DNO's.

Please provide a calculation of the expected benefits the Solution

Base Cost
The cost associated with surveying high pressure pipelines is circa £8 per KM.
Assuming a GDN or GTO had 2,000 KM of pipeline to inspect the cost of delivery would be as follows:
2,000 km x 26 (number of surveys undertaken in a year) = 52,000 km
52,000km x £8 = £416,000
Method Cost
It is estimated that an unmanned aerial survey would cost in the region of £2 per KM. The actual cost and associated benefits will be reviewed and developed throughout the project.
Beyond Visual Line Of Sight Survey for a GDN/GTO
2,000 km x 26 (number of surveys a year) = 52,000 km
5,2000km x £2 = £104,000
GDN/GTO base cost is £416,00
GDN/GTO method cost is £104,000
Saving
£416,000 – £104,000 = £312,000
BVLOS Survey for a DNO
Unmanned Ariel Systems (UAS) solutions will be much cheaper and easier to deploy than the current method of using a manned helicopter, an advantage potentially more significant after storms or other ad hoc inspection tasks. In addition, the following benefits have been considered: Further costs savings are also anticipated in other areas:
• Assuming a reduction of in the number of overhead supports in "no fly zones"
• Increased efficiency of inspections (reduced number of and lower cost of in some case).
• Optimising the investment pipeline as a result of the enhanced inspection data and intervention strategies
The total financial benefit of this project is estimated to be £100k per licensee per year, a total potential benefit of £1.4m across all 14 DNO's

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

One of the project outputs will be a planning tool to identify where and over what distance, on the network licensees' networks, BVLOS drone surveys are viable.

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

The project will deliver knowledge on how to fulfil the safety cases to permit the flying of drones BVLOS, with CONOPS, planning tools, a business case savings tool and guidance material to enable BVLOS drone surveys in the UK. Network licensees will then be able to cost the roll out of the Method for their Networks.

As a result of this project, it is possible that the market will react to changes in the CAA UAS flight regulations by providing BVLOS drone flying services which result in equal or better output to that which is currently achieved through helicopter flight. As such, the roll-out of these services would not be particularly impactful on the network operators but would result in reduced costs.

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 Network Licensees will be able to use the learning generated, with DNOs benefitting from improvements to the safety and efficiency of inspection of overhead lines for:
• Vegetation growth and vegetation cropping
• OHL, insulator and other OHL component integrity and condition
• Power line sag
• Relative temperature at conductor connection points
• Pole lean and pole rot
• Storm damage
For GDNs & GTO's improvements to the safety and efficiency of inspection of pipeline corridors for:
• Land use and encroachment
• Marker post integrity
• Vegetation encroachment
• Vehicle recognition
• Ground Movement
• River Bank Erosion

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