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

Jul 2017

Project Reference Number

NIA_UKPN0025

Project Registration

Project Title

Overhead Line Assessments Using Panoramic Images

Project Reference Number

NIA_UKPN0025

Project Licensee(s)

UK Power Networks

Project Start

July 2017

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Chino Atako

Project Budget

£165,550.00

Summary

This project will apply to all (~700,000) wood pole overhead line (OHL) supports and spans in EPN and SPN and will provide an indication of:

- How many of the overhead line supports are visible via Street View;
- The quality of the images (e.g. poles obscured by vegetation, how recent the records are etc.); and
- Deliver a methodology for routine inspections, using Google Street View images and 360 degree images captured by a third party, as part of business-as-usual activities following the completion of the project.

Nominated Contact Email Address(es)

innovation@ukpowernetworks.co.uk

Problem Being Solved

UK Power Networks currently has approximately 700,000 wood pole supports for overhead lines on its network. These pole supports and their associated spans are inspected periodically to observe their condition and to identify any safety risks. These inspections are mainly carried out by foot patrol and in certain circumstances by helicopter. In an effort to innovate and utilise existing technologies, UK Power Networks is looking to carry out a proof of concept to use Google Street View images to carry out safety inspections on overhead line assets, as an alternative to foot patrols and helicopter patrols. This will be supported by use of a third party to capture sample 360-degree (panoramic) images where Google Street View is unavailable. Successful completion of the project and implementation as “business-as-usual” will yield the following benefits:

- Provide UK Power Networks with the ability to assess overhead line assets remotely (desktop assessments);
- Reduce unit costs of overhead line safety inspections and overall overhead line inspections costs;

• Improve completion rates (achievements) for planned safety inspections each year;
• Give UK Power Networks the flexibility to assess OHL/poles or spans between inspection cycles at minimal costs. It will also ensure that UK PowerNetworks has up-to-date OHL assessment records whenever Google Street View images are updated;
• Reduce UK Power Networks' carbon footprint by reducing the amount of travel required for inspections;
• Improve accuracy of asset records e.g. grid references for Lidar patrol inputs; and
• Set the foundation for continuous improvement i.e. improved operational efficiencies, reduced costs etc.

Method(s)

This project will be carried out in conjunction with OniGroup (a Google for work partner) and Captura (a surveying and inspections company). The approach will be to determine whether Google Street View images exist for at least 40% of UK Power Networks' 700,000 pole positions (grid reference, or longitude and latitude), determine the image quality on a sample set of poles and, if satisfied with the volume and quality of Street View images available, build an interface for desktop inspections. To cater for locations where Street View images do not exist, UK Power Networks will utilise Captura to trial a methodology to capture 360-degree images via on-site surveys using Captura's backpack solution.

The project will be completed in two parts; additional details for both parts of the project are given below.

Part 1 – Use readily available Google Street View panoramic images to carry out desktop assessments of OHLs

Stage One: Identify if Street View images are available for UK Power Networks poles
OniGroup will implement a process of running static Google Street View images to identify if images are available for each of UK Power Networks 700,000 poles. All successful "hits" will be returned to UK Power Networks. The project would need to be able to obtain Google Street View images for at least 40% of the poles that were returned as successful "hits" to be able to proceed with the second stage.

In addition, OniGroup will carry out a sample assessment on 300 available Google Street View images (for UK Power Networks poles) selected at random. This assessment will enable assessment of the quality of the Street View images and prove the concept of using Street View images for desktop assessments.

During this assessment OniGroup will:

- Run the 300 Google Street View Images through the Vision API;
- Return the images with Pole ID and Street View year; and
- Provide the additional data in a spreadsheet format with the following:

- Clear image;
- Obscured by vegetation; and
- No pole visible.

Stage Two: Build an interface for inspections

If the criteria are met from the first stage i.e. the project can obtain Street View images for at least 40% of the UK Power Networks pole population and that the images are of sufficient quality, the project will proceed with stage two, which will be to build an interface for inspections. The interface will allow users to carry out desktop assessment of poles including the following functionality:

• Ability to select a pole/overhead line circuit from a dropdown list and by search functionality;
• Clicking on the pole/circuit in the dropdown list will take the user to a Street View or 360 degree image of the pole (so that user can pan around the pole to inspect it); and
• A pop-up box on the screen to allow the user to record the condition assessments.

Part 2 - Utilise the services of a third party (Captura) to provide 360 panoramic images of OHL poles/spans (where there is no Google coverage) at lower costs than traditional methods

Captura's technology is a 360-degree camera system that can be fitted to a backpack unit, which allows the operator to walk and capture 360-degree images and GPS location of their position. This part of the project will include an initial field trial feasibility study, comprising of a selection of walk-bys of OHL assets collecting 360 photo images and then processing into Street View web-Player datasets. The aim of this part of the project is to capture wood poles on different overhead line construction types . Captura would take

a sample circuit of approximately 300 poles that have a mixture of main lines, spur lines and LV network. On completion of the Project Captura will provide a Project report on the field trial results together with recommendations for image capture improvements and any Street View Player enhancements. Key steps:

• On-site surveys:
- Approximately 300 poles (sample selection of OHL sections at different locations, different voltage; and
- Test inspection methodology and capture panoramic images.
• Customise existing online portal;
• Upload inspection images to customised online portal and or provide file outputs for use in UK Power Networks systems (Geospatial tool, NETMAP or other);
• Desktop assessments; and
• Validation of cost of methodology.

Scope

This project will apply to all (~700,000) wood pole overhead line (OHL) supports and spans in EPN and SPN and will provide an indication of:

- How many of the overhead line supports are visible via Street View;
- The quality of the images (e.g. poles obscured by vegetation, how recent the records are etc.); and
- Deliver a methodology for routine inspections, using Google Street View images and 360 degree images captured by a third party, as part of business-as-usual activities following the completion of the project.

Objective(s)

The objectives of the project are to:

- Verify that the there is sufficient “coverage” of UK Power Networks’ operational areas by Google Street View to be able to carry out OHL assessments remotely;
- Verify that the images from Google Street View images are of sufficient quality to carry out condition assessments remotely;
- Develop a replicable methodology to assess overhead lines using Google Street View images;
- To demonstrate that this approach is a cost-effective approach when compared to other traditional methods for overhead line assessments (foot patrols, helicopter patrols etc.); and
- To demonstrate that 360 degree images can be captured on site in a cost effective way.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

n/a

Success Criteria

The following will be considered when assessing whether the project has been successful:

- Greater than 40% coverage of UK Power Networks’ Overhead line assets using Google Street View (Note: this is entirely dependent on Google street view images being available for UK Power Network’s pole positions);
- Of the pole supports and spans identifiable through Google Street View, greater than 50% of images have been taken within the last six years;
- Good image quality of 360 degree images captured on site by a third party; and
- Development of a map interface tool to enable user(s) to carry out OHL assessments from a desktop

Project Partners and External Funding

n/a

Potential for New Learning

n/a

Scale of Project

The project includes costs for carrying out the review of the 700,000 poles/spans in UK Power Networks' operating areas as well as trial of onsite data capture for a sample size of 300 overhead line pole supports. The overall project cost is £165,550.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

Wood pole overhead line poles/spans will be reviewed in all of the areas within EPN and SPN.

Revenue Allowed for the RIIO Settlement

No revenue has been allowed for this trial in the RIIO-ED1 settlement.

Indicative Total NIA Project Expenditure

Total project cost is £165,550

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)

Successful implementation of the proposed methodology will reduce inspections costs in RIIO-ED1 and will enable us to have lower inspections costs for overhead lines in RIIO-ED2.

Gross annual savings following full-scale deployment across EPN and SPN will be £164k per year (£596k for the remainder of RIIO-ED1, after the project completion, taking into account a discount rate of 3.5% and initial development costs of £166k.)

Please provide a calculation of the expected benefits the Solution

A CBA has been used to confirm expected return from this project if successful, this can be summarised as:

- Base Cost: £525k per year (£2.1m for the remainder of RIIO-ED1 taking into account a discount rate of 3.5%);
- Method Cost: £166k development costs (first year only) + £361k per year method costs (£1.6m for the remainder of RIIO-ED1 taking into account a discount rate of 3.5%);
- Carbon Saving Benefits: £19k per year (£78k for the remainder of RIIO-ED1 taking into account a discount rate of 3.5%); and
- NPV: Base Cost - (Method Cost - Benefits): £596k for the remainder of RIIO-ED1 taking into account a discount rate of 3.5%).

The assumptions behind the CBA calculations, are:

- The hourly rates for inspectors will remain the same throughout ED1;
- 15 desktop inspections can be completed per hour using the desktop solution that will be developed as part of the project;
- 40% of all of UK Power Networks' pole locations will be accessible via Google Street View; and
- There will be a reduction in mileage due to more desktop assessments carried out and a direct reduction in carbon emissions up to £19,229 kgCO2e.

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

The approach, using Google Street View images to assess overhead lines, is applicable to other DNOs due to the large coverage of Google Street View images along UK roads (96%) and significant number of DNO wood pole overhead line assets along roadsides.

DNOs will only need to complete a feasibility assessment to determine the specific number of their assets that are accessible via the

images as well as build a map interface to capture of inspection measurements.

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

The cost of rolling out the Method across GB would be similar to the project costs for UK Power Networks, i.e. £166k per DNO. This will cover the cost of carrying out an initial assessment of Google Street View coverage per DNO, trialling alternative 360-degree image captures for overhead line locations and building an interface to carry out desktop assessment of overhead lines.

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

Google Street View has 96% coverage of all roads in the UK. A significant proportion of LV and HV overhead wood pole lines in DNOs, run along the roadside hence are likely to be accessible via Street View. The learning from the project will enable other DNOs adopt a similar solution to the one being developed on this project to assess their overhead line supports.

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 a number of areas identified in our innovation strategy including:

1. Increasing efficiencies: By validating and applying this alternative method for inspections, UK Power Networks aim to reduce cost of inspections and also increase the number of wood poles/spans that can be assessed at any given time;

2. Reduce carbon footprint: By carrying out desktop assessments of overhead lines UK Power Networks aim to reduce the amount of travel required with regards to inspection activities; and

3. Continuous improvement: This project is implementing a novel application of existing technologies and will continuously explore approaches that are innovative and increase efficiencies.

☑ 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