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 2026

Project Reference Number

NIA3_NGET0014

Project Registration

Project Title

DRB Aero Insulator Testing Robot (AEROINS)

Project Reference Number

NIA3_NGET0014

Project Licensee(s)

National Grid Electricity Transmission

Project Start

August 2026

Project Duration

0 years and 4 months

Nominated Project Contact(s)

Prem Ranjan, Box.NG.ETInnovation@nationalgrid.com

Project Budget

£70,000.00

Summary

DRB Aero Insulator Testing Robot (AEROINS) is a short research and demonstration project assessing a drone-mounted robotic solution for testing porcelain and composite high-voltage insulators on live overhead lines. The method combines a standard UAV, DRB's crawler payload and the Positron E-field tester to collect repeatable condition data with far less tower access and manual live-line intervention. The project will validate whether AEROINS provides a safer, faster and more flexible alternative to labour-intensive manual testing constrained by outage availability. It will focus on NGET overhead-line assets where unknown porcelain insulator condition increases asset risk and potential circuit constraints. Findings will inform technical, operational and safety feasibility, asset management, outage dependency and working-at-height exposure.

Third Party Collaborators

DRB srl

Nominated Contact Email Address(es)

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Problem Being Solved

A large number of porcelain and composite insulators on the overhead-line network are in an unknown or insufficiently characterised condition. Insulator degradation can lead to faults, emergency response situations, loss of supply and wider asset management uncertainty. This is particularly relevant for porcelain and composite insulators where visual inspection alone may not reliably identify internal or electrical degradation.

Current condition testing is typically performed manually by overhead-line teams during outage periods. This creates several

constraints: limited outage availability, slow data collection, dependency on specialist OHL staff, working-at-height exposure, manual handling risks and the need to prioritise capital works during scarce outage windows. As a result, planned condition monitoring may be delayed, reduced to spot testing or cancelled.

Alternative inspection approaches such as helicopter operations can provide useful access and productivity in some cases, but they are costly, have operational limitations, can introduce safety and environmental concerns, and may not be able to test all insulator positions. Visual, UV or IR inspection by drone does not provide equivalent electrical condition evidence for insulators and may miss defects that require direct E-field testing.

The problem to be solved is therefore the absence of a practical, scalable and lower-risk method for collecting electrical condition data on HV insulators while reducing outage dependency and manual live-line intervention.

Method(s)

The project will use a demonstration-led research method. DRB will adapt and prepare its drone-mounted robotic insulator testing solution for a controlled NGET evaluation. The AEROINS method consists of: a UAV platform, a patented self-balancing robotic payload/arm, a crawler mechanism for controlled movement along the insulator, and a Positron E-field testing device for condition assessment of porcelain and composite insulators.

The method will be developed and assessed through the following steps:

- confirm test requirements, candidate asset types and operational constraints with NGET;

- define the safe test procedure, data capture requirements and acceptance criteria;

- prepare the drone, payload, crawler and Positron integration for the selected trial use case;

- perform controlled trials and/or field demonstrations in accordance with NGET safety requirements;

- collect operational data, measurement data and operator feedback;

- assess performance against safety, productivity, repeatability, accessibility and data-quality criteria;

- produce a final report with recommendations for further development, operationalisation and potential rollout.

The project is not intended to complete a full commercial deployment, but to generate evidence on whether the technology and associated operational practice can provide value for NGET and other GB network licensees.

Scope

The project scope includes planning, adaptation, demonstration and assessment of the AEROINS drone-mounted insulator testing method for NGET overhead-line assets.

In scope:

- definition of the test use case and operational requirements;

- review of candidate insulator types and representative overhead-line configurations;

- integration/preparation of the drone-mounted robotic/crawler testing approach;

- preparation of safe method statements, test plans and data collection templates;

- controlled trial and/or field demonstration activities agreed with NGET;

- collection of evidence on accessibility, productivity, measurement repeatability, safety impacts and data quality;

- analysis of results and preparation of final learning report.

Out of scope unless separately agreed:

- full network-wide rollout;

- certification or regulatory approval of a final commercial service;

- procurement of a fleet of operational drones;

- live operational decisions based solely on project data;

- replacement of existing asset policy before NGET review and acceptance.

Objective(s)

The project objectives are:

1. Demonstrate the feasibility of using a drone-mounted robotic/crawler system to support E-field testing of porcelain and composite HV insulators on overhead-line assets.

2. Assess whether the method can reduce or avoid tower access for specific inspection/test activities.

3. Evaluate the quality, repeatability and usability of the condition data generated by the system.

4. Compare the method qualitatively and quantitatively with current manual and helicopter-based approaches in terms of safety, cost, productivity, accessibility and outage dependency.

5. Identify the operational, safety, training, governance and technology requirements for potential future rollout.

6. Generate learning that can be shared with NGET and other GB network licensees under the NIA learning framework.

Consumer Vulnerability Impact Assessment

This project has been assessed as having a neutral impact on customers in vulnerable situations.

Success Criteria

The project will be considered successful if it delivers the following:

- A documented safe trial method agreed with NGET stakeholders.
- Demonstration of the drone/crawler/Positron approach on representative insulator configurations, subject to site and safety constraints.
- Evidence that the system can reduce tower access requirements compared with manual testing for selected use cases.
- Collection of repeatable measurement data suitable for condition assessment and future trend analysis.
- Clear assessment of productivity, accessibility and operational constraints.
- Identification of safety benefits, residual risks and practical requirements for operational use.
- A final report containing benefits assessment, recommendations, rollout considerations and learning suitable for dissemination to other network licensees.

Quantitative KPIs to be confirmed with NGET may include number of insulators tested per day, percentage of accessible insulator positions, setup time, test duration, data completeness, repeatability of measurement and estimated cost per tested insulator.

Project Partners and External Funding

DRB srl / DRB Aero will provide the technical solution, engineering support, drone/crawler/payload expertise, system preparation and trial support. National Grid Electricity Transmission (NGET) is the network owner, providing the trial insulators, operational input and safety oversight for trials. The project is funded through NIA and does not rely on any external funding sources or third-party financial contributions.

Potential for New Learning

The project is expected to generate new learning in the following areas:

- Feasibility of drone/crawler-assisted E-field testing for porcelain and composite HV insulators.
- Practical limits of access to different insulator positions and tower geometries.
- Operational comparison against manual testing and helicopter-assisted approaches.
- Safety benefits and residual risks of reducing tower access for testing activities.
- Quality and repeatability of digitally captured insulator condition data.
- Requirements for integrating the method into asset management workflows.

- Evidence required to support a future larger-scale trial or rollout.

This learning is valuable because current methods do not provide a fully scalable, flexible and low-risk way to perform electrical condition testing of insulators across the overhead-line network while minimising outage constraints.

Scale of Project

This technology reduces the exposure of working at height for the line workers and removes the requirement for line workers to work while working on OHL towers. After the project, a technology and process rollout across all OHL insulators is expected enabled through the regulatory funding.

Technology Readiness at Start

TRL5 Pilot Scale

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

Laboratory based studies and manufacturing will be carried out at the innovation provider's facilities at DRB Aero in Italy. The trial and design approval will be carried out at transmission OHL route of NGET in GB. Specific trial location(s), circuits, towers and insulator types are to be confirmed by NGET based on safety, access, asset condition priorities and operational availability. The learning is expected to be applicable across GB electricity transmission networks and potentially relevant to electricity distribution networks with comparable overhead-line assets.

Revenue Allowed for the RIIO Settlement

Not Applicable

Indicative Total NIA Project Expenditure

£63,000

Project Eligibility Assessment Part 1

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

The transition to a net-zero electricity system requires a reliable, available and optimised transmission network capable of connecting and transporting increasing volumes of low-carbon generation. Overhead-line asset condition is therefore critical: failures or uncertainty can lead to outages, constraints, emergency works and delayed intervention decisions.

AEROINS supports the energy system transition by providing a potential method for more flexible, data-driven condition monitoring of HV insulators while circuits remain in service. This can improve the evidence base for maintenance and replacement decisions, reduce reliance on outages for inspection activities and help prioritise investment towards assets that present the greatest risk.

By supporting earlier identification of degrading insulators, the project may reduce the probability of faults and unplanned outages, helping maintain network availability and capacity. It also supports optimised asset practices by shifting from limited spot testing to a more scalable, repeatable and digitally recorded inspection approach.

How the Project has potential to benefit consumer in vulnerable situations:

The project may benefit consumers in vulnerable situations indirectly by improving the reliability and resilience of electricity supply. Vulnerable consumers can be more severely affected by interruptions because of medical, heating, mobility or communication dependencies.

By enabling improved condition monitoring of overhead-line insulators, AEROINS may help identify defective assets before failure and reduce unplanned outages. If the technology also reduces the need for planned outages for inspection activities, it may reduce disruption for consumers. These benefits are not the primary objective of the project but are relevant downstream outcomes if the method is successfully developed and deployed.

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

n/a

Please provide a calculation and/or description of the expected benefits of the solution

The expected benefits include reduced inspection cost, reduced outage dependency, improved safety and improved asset management decisions.

A previous DRB/NGET business case assumption indicates that NGET has approximately 80,000 porcelain insulators and 3,000 composite insulators. Current manual testing with the Positron tester can be approximately 18 insulators/day with four live-line operators, while helicopter-assisted testing may reach approximately 80 insulators/day but cannot access all positions and is estimated at approximately GBP 120 per insulator. DRB MyPOWER has a target productivity of approximately 50 insulators/day with one drone operator, with an indicative cost of approximately GBP 60 per insulator.

On this basis, the solution may reduce cost per tested insulator versus helicopter-assisted testing and reduce the need for manual follow-up testing for inaccessible positions. An estimated annual benefit of GBP 7.5m/year is based on 100 working days where

outage is avoided in 15% of assumed constrained circuit. This can be treated as an indicative benefit case for validation during the project.

Additional benefits that should be assessed include avoided outage/constraint costs, reduced working-at-height exposure, reduced requirement for scarce OHL resources, improved defect prioritisation, and improved long-term asset data for intervention planning.

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

The method is potentially highly replicable across GB because overhead-line insulator condition monitoring is a common issue for transmission and distribution network operators. The technology is based on a standard commercial drone platform combined with a specialist robotic/crawler payload and E-field testing device, making it potentially transferable across different regions and asset portfolios after appropriate safety validation, training and operating procedure development.

Replication will depend on tower geometry, conductor configuration, insulator type, airspace constraints, site access, weather limits and network-specific safety rules. The project will identify these constraints and produce learning that other GB licensees can use to assess applicability to their own networks.

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

The cost of rollout across GB will depend on the number of insulators to be tested, required drone/crawler units, operator model, training requirements, safety governance, data management integration and whether the service is delivered by DRB, by trained network operators or through a hybrid model.

Indicatively, the DRB business case assumes a drone/crawler method at approximately GBP 60 per tested insulator and a potential requirement for around 15 rented drone systems to inspect the NGET population of insulators, with an approximate annual inspection cost of around GBP 4m. These figures require validation and refinement through the project.

Rollout costs would include equipment rental or purchase, operator training, mobilisation, maintenance and support, data platform/reporting integration, project management, safety assurance and any additional test campaign costs. The project will provide evidence to refine these rollout estimates.

Requirement 3 / 1

Involve Research, Development or Demonstration

Projects 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

Involve Research, Development or Demonstration - Please select all that apply

☑ 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 learning will help network licensees assess whether drone-mounted robotic insulator testing can become a practical method for condition monitoring of overhead-line insulators. Relevant licensees could use the learning to:

- assess the feasibility of reducing manual live-line testing and tower access;

- understand the productivity and cost implications of drone/crawler-assisted testing;

- identify safety considerations and residual operational risks;

- define asset selection criteria for future testing campaigns;

- understand data capture requirements for asset management systems;

- develop or update inspection procedures and training requirements;

- support future business cases for larger-scale trials or rollout.

Because the problem is common across electricity transmission and distribution networks, the learning is expected to be relevant beyond NGET.

n/a

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. Networks must explicitly mention similar projects that they have considered and how these differ.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

The project does not unnecessarily duplicate existing BAU activities because there is currently no established scalable method within NGET for drone-mounted robotic E-field testing of porcelain and composite overhead-line insulators while reducing tower access and outage dependency.

In the proposed Beta phase of the SIF Project DELLTA. AEROINS is complementary rather than duplicative because it focuses specifically on the drone-mounted robotic/crawler testing of HV insulators and the operational learning required to assess this method for NGET overhead-line assets.

The risk of duplication will be addressed through dissemination of progress with other licensees and being open to co-operate with licensees working in this space.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

Not applicable

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

The project is innovative because it applies a drone-mounted robotic/crawler platform to a condition-monitoring task that is currently performed manually by OHL teams or through more limited alternative methods. The approach combines several elements in a novel operational configuration: a UAV, a patented self-balancing robotic payload/arm, crawler-based movement along the insulator and Positron E-field testing.

Unlike standard drone visual inspection, AEROINS is designed to physically position and move a test device along the insulator to collect condition data. Unlike manual testing, it aims to reduce tower access and live-line working exposure. Unlike helicopter-assisted inspection, it aims to improve accessibility and reduce cost and operational/environmental constraints.

The innovation lies not only in the equipment, but also in the potential new operating method for in-service condition monitoring of HV insulators at scale.

Relevant Foreground IPR

Expected Relevant Foreground IPR is likely to be limited. The project is primarily a research and demonstration activity using DRB's existing Background IPR.

Potential Foreground IPR may include: trial-specific procedures, test configurations, integration learnings, non-confidential operating method recommendations, data templates, safety observations and benefit assessment outputs.

DRB Background IPR will be required to use the full technology solution. This includes DRB's proprietary know-how and any existing rights relating to the drone payload, robotic/crawler system, control software, integration approach and associated technology. Positron-related Background IPR may also be relevant for the E-field testing device.

Data Access Details

Data for this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the new Strategic Innovation Fund (SIF) can be found or requested in a number of ways:

· A request for information via the Smarter Networks Portal at: https://smarter.energynetworks.org , to contact select a project and click 'Contact Lead Network'. National Grid already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.

· Via our Innovation website at: https://www.nationalgrid.com/uk/electricity-transmission/innovation.

· Via our managed mailbox: box.NG.ETInnovation@nationalgrid.com

Please identify why the Network Licensees will not fund the project as a part of it's business and usual activities

Network licensees would not normally fund this project as BAU because the method is not yet a proven operational practice on the GB electricity transmission network. It involves technical, operational, safety and commercial uncertainty, including whether the drone/crawler method can access the required insulator positions, produce suitable data quality, operate safely within NGET procedures and deliver the forecast benefits.

BAU expenditure is generally directed towards established inspection, maintenance and capital delivery methods. AEROINS requires a research and demonstration phase to de-risk the method and generate evidence before any business-as-usual adoption or rollout decision can be made.

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

NIA support is required because the project involves innovation risk and learning that is broader than a single BAU procurement activity. The key risks include:

- Technical risk: confirmation that the integrated drone/crawler/Positron system can perform the required test on representative NGET assets.

- Operational risk: definition of safe procedures, access requirements, operator roles and interaction with existing OHL work practices.

- Safety risk: assessment of residual hazards associated with UAV operation near overhead-line assets and reduction of manual tower access.

- Data risk: validation that measurement outputs are repeatable, usable and suitable for asset management decision support.

- Commercial risk: uncertainty over cost, productivity and rollout model until a trial is completed.

- Regulatory/governance risk: need to understand NGET operational approvals, aviation/UAV requirements and any site-specific constraints.

The project is appropriate for NIA because it will generate transferable learning for network licensees while de-risking a potential new method that could deliver customer benefits if successfully adopted.

This project has been approved by a senior member of staff

☑ Yes