

NIA Project Registration and PEA Document

Date of Submission

Nov 2025

Project Reference Number

NIA_UKPN0116

Project Registration

Project Title

Aero Prune

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NIA_UKPN0116

Project Licensee(s)

UK Power Networks

Project Start

December 2025

Project Duration

0 years and 10 months

Nominated Project Contact(s)

Naiya Hirji

Project Budget

£146,000.00

Summary

Vegetation encroachment around overhead lines poses significant risks to electricity reliability, public safety, and operational efficiency. UK Power Networks currently relies on manual tree cutting operations, which are labour-intensive, high-risk, and costly – particularly in rural and hard-to-access areas. This project aims to address these challenges through the design, prototype, and evaluation of drone-based tree cutting solutions that improve the safety, efficiency, and scalability of vegetation management around HV overhead lines. The key objectives being to reduce Customer Interruptions (CIs) and Customer Minutes Lost (CMLs), minimise safety risks to personnel and the public, and lower operational costs, whilst ensuring compliance with regulatory and environmental standards.

Nominated Contact Email Address(es)

innovation@ukpowernetworks.co.uk

Problem Being Solved

In the context of the energy transition and the growing integration of renewable generation such as solar and wind, network reliability and resilience are more critical than ever. Overhead lines play a vital role in connecting these distributed energy resources, yet vegetation, particularly trees, pose a significant risk.

If this vegetation is not routinely cut back or cleared from the vicinity of overhead lines, they can grow into or fall onto the lines, leading to:

- Electrical faults and outages, disrupting service to our customers' homes and businesses
- Safety hazards, including fire risks and electrocution dangers for the public and maintenance crews
- Increased operational costs, due to emergency repairs and reactive vegetation management
- Regulatory and reputational risks, especially in areas with strict compliance requirements for vegetation clearance

UK Power Networks currently relies on manual tree cutting operations to manage vegetation around overhead lines, particularly HV lines. This includes routine trimming to maintain safe clearance zones and rapid response clearing when trees do come into contact with lines.

Proactive tree cutting and vegetation management are essential to prevent contact between trees and overhead lines, and is critical to preventing Customer Interruptions (CIs) and Customer Minutes Lost (CMLs). This process can be high-risk, labour-intensive, time-consuming, and costly, often requiring significant human resource deployment in challenging environments, particularly in rural locations where access for equipment used for working at height, such as mobile elevating work platforms, can be difficult.

Method(s)

This project will seek to develop and trial innovative tree cutting drones equipped with cutting mechanisms that could reduce vegetation management costs and time, reduce CIs and CMLs, and improve safety by minimising the safety risks associated with personnel manually operating power tools and working at height or in hazardous terrain

Method

The project will explore deploying aerial drones equipped with cutting mechanisms either mounted directly or suspended from the drone body, develop prototype solutions for trial in the field and understanding the relevant compliance necessary for trials and definition of possible business-as-usual (BAU) roll out plans.

The project will investigate, develop and prototype different cutting mechanisms:

- Add-on to existing drones
- Customised drone platform

An initial design and feasibility will be conducted for a customised drone platform that is tailored to a DNO operational needs, this will entail:

- Defining technical and functional requirements
- Collaborating with academic and industrial partners on design
- Developing CAD models and simulation environments
- Building and testing a working prototype

A demonstration unit will also be developed using off-the-shelf drones and adding integrated cutting tools:

- A suitable drone platform will be investigated, reviewed and selected
- Investigate how and what cutting tools can be integrated into the drone
- Bench testing and controlled environment trials will be undertaken to ensure suitability
- Safety, stability, and cutting performance will be evaluated to validate the most effective solution for trial

The project will review existing governance and compliance requirements to ensure the safe use of the prototype devices in the field during trials.

The project will undertake pilot trials and evaluate once the solutions have been tested. Trial locations will be at a UK Power Networks' training centre or a chosen UK Power Networks site location. The trial will review performance, measuring and monitoring cutting efficiency (branches per hour), operator safety improvements and cost and time savings vs. manual methods.

Measurement Quality Statement:

All data used within this project is for the purposes described above, and therefore quality will be measured on this basis. The project will follow all data quality rules, logging, and prioritising issues as they arise in line with the approved methodology set out in our Enterprise Data Management Policy, which forms part of the UK Power Networks Integrated Management System. Data quality will be measured across five dimensions where applicable: Accuracy, Completeness, Consistency, Validity and Uniqueness.

Data quality rules for each of the appropriate data quality dimensions above will be set by the project, measuring them closely on a regular basis to identify quality issues.

Data Quality Statement:

Data quality issues will be logged in a central location and prioritised using an approved matrix which combines the importance of the issue, and the amount of data affected, this gives an indication of the issue's impact on the project and wider business, considering factors such as:

- The impact on the health and safety of the public and employees
- Whether it may result in a breach of our licence conditions or relevant regulations
- The impact on UK Power Networks' reputation
- The impact on our operations and efficiency
- The financial impact, including project delays and charges from external service providers.

The project will then seek support for resolving the issues in priority order. All data and background information will be stored centrally and securely in a project specific SharePoint folder or in our Enterprise Data Store if required by the wider business in accordance with data protection requirements.

Scope

This project will develop, test, and evaluate two drone-based solutions for tree cutting:

- Option 1: Retrofit commercial drones with cutting tools (e.g. rotary hedge cutters, alligator saws)
- Option 2: Design and prototype a bespoke drone platform optimised for vegetation management near overhead lines

Where Option 1 solutions will be tested during field trials

The project will progress through the following stages:

1. Feasibility, Design and Prototyping

Objective: Production of a prototype solutions for test and validation

Option 1:

- Define and produce technical and functional specifications
- Investigate and identify the suitable drone platform for the off-the-shelf drone and the cutting tools to be integrated into the drone
- Develop a demonstration unit using off-the-shelf drones

Option 2

- Define and produce technical and functional specifications
- Initiate early-stage design and feasibility work for bespoke drone platform, including CAD modelling and simulation, leveraging industrial partners for a collaborative design
- Build a working bespoke drone platform prototype

2. Testing and Validation

Objective: Validate suitability of the chosen solutions

Option 1:

- Conduct bench testing and controlled environment trials to assess cutting performance, flight stability, and safety
- Evaluate effectiveness in cutting branches up to four inches in diameter, with three inches as the minimum viable threshold
- Explore mechanisms to restrain branches during cutting to prevent recoil and improve precision

Option 2:

- Assess the designs feasibility to cutting performance, flight stability, and safety using CAD analysis, initial prototyping and engineering judgement
- Evaluate whether the conceptual design could feasibly cut branches up to four inches in diameter, with three inches as the minimum viable threshold
- Explore conceptual mechanisms to restrain branches during cutting to prevent recoil and improve precision

3. Governance and Compliance

Objective: Ensure solution designs are compliant with all relevant regulatory and operational guidelines

Option 1:

- Ensure the solution prototypes are compliant for deployment in the field trials and BAU.
- Ensure alignment with UK Power Networks' Health, Safety and Sustainability (HSS) standards and arboriculture competency requirements and any other standards applicable.
- Secure legal agreements to use the developed IP in the powerline sector.
- UK Civil Aviation Authority (CAA) approval of drone operation in the field trials and requirements for BAU operation

Option 2:

- Ensure designs take into consideration UK Power Networks' HSS standards and arboriculture competency requirements and any other standards applicable.

4. Field Trials

Objective: Evaluation of suitable drones through closed field trials for BAU roll out

Option 1 only:

- Identification of suitable locations for trials
- Determine suitable performance metrics, e.g. cutting efficiency, operator safety improvements and cost and time savings vs. manual methods
- Additional risk assessments and on-site supervision that will be required during trials
- Conduct trials
- Analysis of the trial results and report on trial conclusions

5. Stakeholder Engagement

Objective: Ensure that solutions are fit for purpose at BAU roll out

- Produce internal engagement strategy
- Engage with Network Operations and legal teams to ensure cross-functional alignment
- Coordinate with Acuity Robotics for technical delivery and knowledge transfer
- Publish a publicly available press release to inform readers of the project and the potential cross sector benefits
- Participate in any presentation opportunities at industry wide events
- Produce all mandatory reporting under NIA requirements

Objective(s)

The project has the following objectives:

1. Validate technical feasibility of drone-based cutting

- Option 1 solution: Retrofitted commercial drones will be trialled in a live demonstration during field trials and assessed on payload capacity, flight stability, cutting precision, and branch restraint mechanisms in controlled and live environments
- Feasibility assessment on Option 2 solution: Bespoke drone platform solution will be assessed on payload capacity, flight stability, cutting precision, and branch restraint mechanism through CAD analysis, initial prototyping and engineering judgement

2. Enhance operational efficiency in vegetation management

- Reduce the time and cost associated with manual tree cutting around overhead lines, particularly HV networks

3. Improve safety for field personnel

- Minimise the need for operatives to work at height or in hazardous terrain by deploying aerial drones equipped with cutting tools

Reduce exposure to risks associated with chainsaw use and manual climbing

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

This project focuses on operational improvements in vegetation management which would benefit all customers including vulnerable

customers through improved network performance.

Success Criteria

The success criteria for the project are outlined below. Option 1 will produce a prototype fit for a direct demonstration against these criteria. Option 2, while remaining at the conceptual stage with initial prototyping, must still be designed with the intention of meeting the same criteria although it won't be demonstrated in trials.

Technical Performance

Option 1:

- The solution must demonstrate the capability to perform vegetation cutting or clearance tasks with a defined level of precision, control, and consistency appropriate for operational use.
- The system must operate safely and in compliance with all relevant regulatory and operational guidelines governing its deployment and use.
- The system should achieve a minimum operational endurance or runtime sufficient to complete a representative field task (e.g., a minimum of 20 minutes per deployment or equivalent performance benchmark).

Option 2:

- The solution must be designed to have the capability to perform vegetation cutting or clearance tasks with a defined level of precision, control, and consistency appropriate for operational use.
- The system must be designed to be compliant with all relevant regulatory and operational guidelines.

Operational Efficiency

Option 1:

- Demonstrated reduction in time and cost compared to traditional manual vegetation management methods

Option 2:

- Designed to reduce time and cost compared to traditional manual vegetation management methods.

Safety Improvements

Option 1:

- Reduction in the number of field operatives required to manually operate power tools, work at height or in hazardous terrain, compared to traditional manual vegetation management methods.
- No reportable incidents or near misses during trial phases, with full compliance to relevant company standards

Option 2:

- Designed to reduce the number of field operatives required to manually operate power tools, work at height or in hazardous terrain, compared to traditional manual vegetation management methods

Scalability and Future Readiness

Option 1:

- Subject to successful trials, inclusion of a roadmap for transitioning from innovation to BAU deployment, including training and procurement pathways
- Development of a technical specification to inform future tendering and procurement activities

Option 2:

- Subject to successful design solutions, inclusion of a roadmap for future development.
- Project Partners and External Funding

Details of actual or potential Project Partners and external funding support as appropriate.

The project will be delivered by our Project Partner, Acuity Robotics. They are not providing any funding, nor is there any other external

funding being used for the project.

Project Partners and External Funding

n/a

Potential for New Learning

Expected Key Outputs

By the end of the project, the project will produce the following key outputs which containing the learnings as listed:

- Technical performance report that highlights the validation of the two options and the performance of these technical solutions through testing and trial validation conducted exclusively for Option 1.
- Operational efficiencies and safety improvement summary covering the efficiencies and safety improvements that could be made using the solution
- Regulatory and governance compliance report: covering the compliance requirements for BAU roll out

Dissemination approach

The planned dissemination activities include:

- Engagement with stakeholders: UK Power Networks will actively engage with internal stakeholders and Acuity Robotics throughout the project
- Acuity Robotics network: Acuity Robotics will leverage its network and contacts to disseminate the outcomes of the project, ensuring wide reach and impact
- UK Power Networks will share project progress via its social media channels with the possibility of publishing external press media where appropriate

UK Power Networks will produce all mandatory reporting under NIA requirements

Scale of Project

The scale of investment aligns with the potential benefits and safely manage vegetation on the overhead line network, especially in rural locations, where access is difficult. A smaller project would not provide sufficient scope to demonstrate the viability of the solution, as it would likely limit development to an early-stage prototype with no opportunity for field trials. Without such trials, the project would be unable to validate the effectiveness of the technology in conducting vegetation management, resulting in limited learning outcomes and insufficient evidence to assess its potential for deployment into BAU.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

Trials are planned to occur at a UK Power Networks’ Training Centre or a chosen UK Power Networks site location.

Revenue Allowed for the RIIO Settlement

No allowances were allowed in the RIIO settlement to address the specific issue targeted in this project as this is looking at addresses the challenge of providing a safer and more efficient approach to vegetation management through the use of technology, rather than manual operations.

Indicative Total NIA Project Expenditure

The total expenditure that UK Power Networks expects to incur for this project is £146,000 from NIA funding. The total project budget is £146,000 and 90% of this (£131,400) will be recovered from NIA expenditure, with the remaining 10% (£14,600) being contributed by UK Power Networks.

Project Eligibility Assessment Part 1

There are slightly differing requirements for RII0-1 and RII0-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RII0-2 / RII0-1).

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 RII0-2 projects only)

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

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

Increasing the integration of renewable energy sources is crucial in ensuring network reliability and resilience. This is becoming increasingly important as society's reliance on electricity grows through the electrification of transport, heating, and other sectors across both domestic and commercial settings. Overhead lines are essential for connecting these distributed energy resources; however, vegetation encroachment is a driver of network faults that disrupt customers and can curtail distributed renewable generation. By developing and trialling drone-based cutting solutions, the project aims to reduce tree-related outages, enhancing network reliability and maintaining customer's supply in safer and more efficient manner.

This innovative approach enables vegetation to be safely managed on the overhead network, especially in rural locations where access is often difficult. By enabling vegetation management to be carried out more rapidly and efficiently this can help decrease the likelihood of vegetation encroachment leading to faults. Overall, this improves network reliability and resilience as electrification and distributed generation increase. This project directly supports Ofgem's RII0-2 NIA objective to fund early-stage research and development that facilitates the energy system transition by enabling networks to operate securely with higher volumes of low-carbon technologies.

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

When consumers in vulnerable situations are impacted by power outages, essential services such as heating, medical equipment, and communication are affected. By reducing vegetation-related outages using innovative drone-based cutting solutions, this project will help improve the reliability and continuity of electricity supply.

Fewer outages mean that vulnerable consumers experience fewer disruptions, particularly during adverse weather conditions or in rural areas where restoration times can be longer. In addition, the improved efficiency and safety of vegetation management will help ensure that maintenance can be carried out proactively and at lower risk, further reducing the likelihood of unplanned interruptions.

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 (RII0-1 projects only)

N/A

Please provide a calculation of the expected benefits the Solution

The project will be demonstrating and evaluating a prototype and there will be no commercial product at the end of the project as indicated by the indicated TRL. The forecasted benefits are based on the assumption a commercially viable solution is available.

Base Cost:

Annual activity rate for tree cutting under a shutdown ~ £1.3m

Annual overhead network length covered under by tree cutters under a shutdown ~ 2,100 km

Annual length of trees cut ~ 120 km

Method cost:

Implementation cost: Pilot training + (unit cost of drone* number of drones purchased) ≈ £130k

Annual activity rate for tree cutting using drone technology under a shutdown ~ £940k

Annual benefits: base cost – (method cost + implementation cost) ≈ £230k

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Qualitative benefits:

A number of as yet unquantified benefits also exist as no data exists on the use of drones for vegetation management:

- CI/CML improvements: Ability to trim vegetation in hard to reach and remote location savings
- Safety improvement: Reduction in the number of health and safety incidents
- Carbon savings: Reduction in number of vehicles required for each job

These identified qualitative benefits are anticipated to yield quantifiable benefits, which can be assessed upon development of a BAU rollout plan.

A detailed cost benefit analysis will be performed during the project.

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

If this project's approach works, all GB DNOs (save for London Power Networks who have an underground network) could adopt it for their vegetation management to reduce safety risks to operational staff and improve network reliability.

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

As a demonstration project to TRL 4, there will be no deployment of a method following the project. However, future roll-out costs would depend on:

- Unit cost per drone and quantity purchased
- Cost for training drone pilots
- Maintenance cost of drones

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

RIO-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 electricity networks across GB have to deal with the vegetation management of their network to improve safety and avoid interruption of supply to their customers. A potential success of the drone cutting technology demonstration means that an additional vegetation management option could be considered by the other DNOs. This could offer them the opportunity to reduce safety risks to operational staff as well as improve their network resilience.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIO-1 only)

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.

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

The solution proposed has not been used before and therefore will not result in any duplication. This was validated through a detailed desktop study on the existing technology in addition a review of the ENA Smarter Networks portal.

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 solution proposed has not been developed or trialled, as drone technology for conducting vegetation management near overhead lines does not currently exist. This was validated through a detailed desktop study on the existing technology, in addition a review of the ENA Smarter Networks portal.

Relevant Foreground IPR

Expected relevant foreground IPR includes:

- Two drone designs
- One working prototype for field trials and evaluation
- Trial data and analysis
- Roadmap for transitioning from innovation to BAU deployment, including training and procurement pathways
- Technical specification to inform future tendering and procurement activities
- Any new processes and procedures developed as part of this project

Background IPR required to use the Relevant Foreground IPR:

- Existing drone(s) selected for retrofit
- Existing partner systems and technology
- Relevant UK Power Networks processes, procedures and data

Data Access Details

Any data gathered during the project such as trial data and analysis, technical feasibility notes, and use case documentation will be stored securely within UK Power Networks' internal systems.

Where appropriate, de-sensitised data and non-confidential findings will be made available to interested parties in alignment with our Data Sharing Policy. UK Power Networks recognises that Innovation projects may produce network and consumption data, and that this data may be useful to others. This may be shared with interested parties, whenever it is practicable and legal to do so, and it is in the interest of GB electricity customers. In accordance with the Innovation Data Sharing Policy, UK Power Networks aims to make available all non-personal, non-confidential-sensitive data on request, so that interested parties can benefit from this data.

To view the full Innovation Data Sharing Policy please use the following link: [UK Power Networks Innovation Data Sharing Policy](#)

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

The project is not being funded as part of BAU activities because it involves exploratory research with an unproven business case and uncertain outcomes. It aims to develop new approaches to manage vegetation more safely and efficiently.

The NIA provides an appropriate framework to support this type of early-stage TRL level, enabling UK Power Networks to explore new approaches to vegetation management.

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 project requires innovation funding because it addresses unproven approaches with uncertain outcomes, where costs and benefits cannot yet be guaranteed. Support from NIA enables UK Power Networks to design, prototype, and evaluate drone-based tree cutting solutions that improve the safety, efficiency, and scalability of vegetation management around HV overhead lines.

The project does not have a proven business case and carries commercial and technical risks that make it unsuitable for BAU funding:

- **Technical risk:** The feasibility of developing a drone suitable for vegetation management for DNOs is unproven and carries unknowns that could limit deployment.
- **Commercial risk:** Due to technical uncertainty, it is unclear if a cost-effective, scalable product for DNOs can be produced for them to adopt.

This project has been approved by a senior member of staff

☒ Yes