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

Oct 2025

Project Reference Number

NIA_UKPN0115

Project Registration

Project Title

Hydra

Project Reference Number

NIA_UKPN0115

Project Licensee(s)

UK Power Networks

Project Start

October 2025

Project Duration

2 years and 7 months

Nominated Project Contact(s)

Wayne Saggers

Project Budget

£4,535,345.00

Summary

Hydra is developing an innovative disaster recovery platform to ensure rapid restoration of electricity distribution control systems following cyberattacks, system failures, or infrastructure loss. As we transition to Net Zero, the network will become more complex and digitally controlled to accommodate increasing volumes of low carbon technologies and flexible demand. Maintaining reliable system oversight and response capabilities becomes ever more critical.

By maintaining a live, air-gapped, view-only replica of the Advanced Distribution Management System (ADMS), Hydra enables near-instant failover and recovery. Unlike existing backup and recovery systems that have redundant nodes, its architectural innovation, combining real-time data streaming, automated server builds, and transaction roll-forward capabilities, sets a new industry benchmark for operational resilience that is currently not in use by the electricity distribution sector today.

Nominated Contact Email Address(es)

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Problem Being Solved

Cyber threats to critical national infrastructure are growing exponentially: Last year 93% of critical national infrastructure (CNI) organisations experienced a rise in cyber-attacks, and a 2025 report found 62% of UK energy organisations experienced a cyber breach or attack in the past 12 months, significantly higher than the UK business average.

In addition to the dangers presented by nefarious actors, as networks move towards smart platforms to support the net zero transition, increasing digital footprints mean that issues such as failed or faulty software updates, and hardware failures, can leave key systems inaccessible to customers. For example in March 2025 customers of several UK banks were unable to access their accounts due to technology issues, and a July 2024 update to CrowdStrike's Falcon Sensor crashed 8.5 million Windows systems globally, grounding airlines, disrupting emergency services, and causing an estimated $10 billion in losses

The current standard disaster recovery approach across GB DNOs includes elements that provide an opportunity for improvement in preparation for an increasing level of digital complexity. Recovery procedures can also entail manually rebuilding servers from a bare-metal state, which is very time consuming, and control of the system is not available until it is complete.

These growing challenges mean that distribution networks need to find innovative new ways to increase resilience and security, and recover from failures when they occur in order to protect the system. It is also vital that DNOs are able to return service to customers as promptly as possible if issues do occur.

Method(s)

The project is exploring the design, development and deployment of an enhanced disaster recovery platform which can drastically reduce recovery times in the event of a failure. The project will undertake a technical method to deliver the project, based on the following framework:

Hydra Detailed Design

The project will begin by investigating the best approach for enhancing the security and recoverability. This will involve investigating a novel approach amongst DNOs, whereby a live, read-only copy of the system is maintained within an isolated remote environment, with independent maintenance procedures. It will also look at a new approach for server build provision amongst DNOs, which will introduce automation to prove ability of such technologies to drastically reduce the time to recovery of electricity network control systems.

The output of this phase will be the creation of a detailed design for the platform.

Hydra Solution Delivered to Test Environment

Once the detailed design has been produced, the second phase will look to build out the design in a test environment. As this is a new approach for control system resilience, it is critical that the project ensure that the proposed solution operates as expected, and can scale to the volume of transactions that take place on the production network.

Hydra Testing

This step will review testing ensuring that the results show that the capability has been successfully developed. Any required refinements will have been identified and integrated into the solution, and further testing undertaken to ensure that the platform meets the success criteria.

Hydra Solution Deployment

Upon completion of the testing phase, sign-off will be obtained from the relevant business and solution owners before migrating the platform to business as usual

Scope

The scope of the project will encompass the following defined areas:

Resilience – activities which contribute to the ability of DNO control systems to withstand attempts, by nefarious actors to disrupt operations. Also in scope are activities which enhance the ability to assist in protecting against complications from technology-based issues such as software update failures.

Recovery – Activities which accelerate the recovery of the technology components. It will encompass automation technologies that provide more rapid recovery to a previous system state than standard DNO recovery practices

Restoration – Aspects around recovery of transaction state, focussing on the ability, after a server recovery, to roll forward to a point in time very close to when the issue occurred.occurred.

The benefit to consumers is that such a system will mitigate against outages from cyberattacks or technical issues, meaning that they are less likely to have impactful consequences to customers. Where outages do occur, it is anticipated that recovery will be quicker so customers will experience less downtime.

This scope has been defined to be effective within the following scenario boundaries:

- Ransomware attack (with or without Hydra environment compromised)
- System administrator mistakes (with or without Hydra environment compromised)
- Loss of communications on main system
- Full loss of control system
- Active Directory / dependent infrastructure issues in main system
- Transactional lockup issues on main system
- Application hard limit breach
- Operating system hard limit breach

Objective(s)

The core objectives of the project are:

- To prove that a real-time, securely isolated hot standby disaster recovery solutions can scale effectively to replicate high availability (HA) clusters at production levels of transactions
- To develop a control system which is objectively less vulnerable to cyber threats and technical issues
- To deliver a platform evidencing that it can be recovered more quickly than is currently possible using standard DNO practices by deploying automation
- To create and demonstrate the capability to quickly restore the system state to a known-good point in time
- To create and demonstrate the capacity to roll-forward and restore transactions to a time as close as possible to the time of failure
- To prove that the supporting business processes defined by the project are effective

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

The key impact on vulnerable customers is expected to be a reduction in the likelihood of an outage, and faster resolution when incidents that are within the scope of the project occur. Whilst this is true for all customers, the impact is expected to be far higher for some vulnerable customers who are disproportionately affected by the length of an outage. For example, those who are reliant on electricity for medical devices are likely to experience greater impact during a prolonged outage. The objectives of the project therefore present a particularly positive impact to consumers that fall within these categories.

Success Criteria

Disaster recovery approaches are typically measured in terms of Recovery Time Objective (RTO) and Recovery Point Objective (RPO).

- RTO is a measure of how quickly after an outage an application or service must be available again before it significantly impacts business operations
- RPO is concerned with how much data can afford to be lost if something goes wrong. Another way to think about RPO is how old can the data be when this application is recovered?

The success criteria for the project are as follows:

- Evidence that the platform is capable of recovery that supports continuity of service with minimal disruption and limited data exposure
- Evidence that the deployment of automation reduces the time taken to rebuild control server infrastructure
- Business procedures and processes have been created or updated and signed off by the BAU owner and implemented into BAU

Project Partners and External Funding

The external supplier for this project is GE Vernova who are the software providers of our Advanced Distribution Management System (ADMS) used by our control room. They are acting in the capacity of technical delivery agent.

No external funding is applicable for this project

Potential for New Learning

The project expects to learn the following:

- Whether the deployment of an isolated hot standby solution, updated in real-time, can improve the resilience of control systems which currently rely solely on HA clusters within the same network
- Whether, by separating transaction and system state backups, and increasing the frequency of these, it is possible to recover to a known-good point in time and roll-forward transactions to produce a recovered control system much more quickly that through current solutions
- Whether the deployment of automation in server build provisioning can dramatically reduce the time it takes to recover control systems when compared to the current solution.

The project will communicate about the project to disseminate learnings via press releases, social media posts and project documentation made available on the ENA Smarter Networks Portal. If the opportunity arises, it will also share learnings about the project at relevant industry events.

Scale of Project

One of the key objectives of the project is to prove that such a solution can operate at production levels of transactions. Carrying out the project at any less than production scale would not allow this and may mean that we miss learnings around issues that occur, and improvements that can be made, when scaling to these volumes. This would also mean that we could not implement the project into business-as-usual. The solution will be delivered on a combined platform shared across our regions, due to architectural requirements, and therefore all UK Power Networks' licence areas need to be in scope to test and assure the innovation's operational performance and scaling meets expectations

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL9 Operations

Geographical Area

The project will include all three of UK Power Networks' licence areas.

Revenue Allowed for the RIIO Settlement

No funding was provided within the current RIIO-ED2 settlement that will become surplus to requirements as a result of this project.

Indicative Total NIA Project Expenditure

We estimate UK Power Networks' total project budget will be £4,535,345, of which £4,081,810 (90%) will be recovered from NIA.

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:

The Hydra project supports the UK's energy system transition by enhancing the resilience and operational continuity of the electricity distribution control systems. As the network evolves to become more complex and digitally controlled to accommodate increasing volumes of low-carbon technologies, generation and flexible demand, maintaining reliable system oversight and response capabilities becomes ever more critical. This project directly supports that need.

Hydra delivers a secure, cloud-hostable secondary environment for the Advanced Distribution Management System (ADMS), designed to be restored and activated during severe disruption to the primary control system such as ransomware attacks, system misconfigurations, or catastrophic infrastructure loss. This ensures continuity of situational awareness and operational control in emergencies, protecting both the network and connected low-carbon technologies. Even short outages can disrupt distributed generation, demand-side response, and smart grid services.

By mitigating the risk of prolonged outages and enabling secure fallback operations, Hydra enhances the confidence and capability of network operators to manage increasingly decentralised, dynamic energy flows and to integrate novel technologies and flexible services.

Hydra is a strategic enabler of the energy system transition, safeguarding the digital infrastructure and functionality needed to support Net Zero goals, consumer flexibility, and future energy innovations.

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

The project is expected to reduce the likelihood of outages and improve response times when incidents occur. These benefits apply to all consumers, but they are especially important for those in vulnerable situations. For example, individuals who rely on electricity to power medical equipment are likely to be more severely affected by long outages. By addressing these risks, the project offers meaningful and positive outcomes for consumers who are most at risk during service disruptions.

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)

RIIO-2 project - Not applicable

Please provide a calculation of the expected benefits the Solution

The benefits of the project occur through risk mitigation due to avoidance of adverse events, and accrue to both UK Power Networks and our customers.

The direct financial savings to UK Power Networks is £3,228,000 across ED2 and ED3.This is in relation to a reduction in quantified risk in the following areas:

- Reputation
- Legal/regulatory
- Health, safety & environment
- Customer and business operations
- Employees

The societal benefits are calculated based on the potential cost to the economy of an outage. These savings are £293,391k across ED2 and ED3. The following assumptions have been made:

- The outage lasts for 24 hours and impacts the entire distribution electricity network across UK Power Networks' three licence areas
- The Value of Lost Load (VoLL) is £28k/MWh (inflated for today's prices based on "RIIO-ED2 Final Determinations Core Methodology Document" RIIO-ED2 Final Determinations Core Methodology Document and "RIIO-ED2 Methodology Decision: Annex 1 - Delivering value for money services for consumers" (paragraph 7.36) as £21k in 2018/19 prices)

The overall expected benefits for the project across ED2 and ED3 is as follows:

- Base Cost (NPV) – £9,258k
- Method cost (NPV) – £6,030k
- Method benefits (NPV) – £293,391k
- **Total NPV – £296,619k**

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

It is expected that this method could be deployed to all GB Network Licensees who utilise similar control systems. Whilst direct replication of the method is reliant on the deployment of GE control system components, which are deployed by the vast majority of GB DNOs, the broader approach is expected to be valid, valuable, and informative even for licensees who choose to deploy alternative control system software options.

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

The method described for this project includes design, testing and deployment phases. Each licensee's requirements will be slightly different, and they will want to verify integration with their own existing systems so we expect that each would likely pursue a similar programme of work to roll out to their area. This being the case, it is likely that the project costs for this project would be an indicative cost.

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

If successful, the project will demonstrate:

- The viability of a real-time, securely isolated hot standby disaster recovery solution that can replicate high availability clusters at production transaction volumes
- The effectiveness of automated server build provisioning in drastically reducing recovery times
- The ability to restore system state to a known-good point and roll forward transactions to near the time of failure

These capabilities represent a step-change in operational resilience and recovery speed, which are currently unmet by standard DNO practices. Network Licensees using similar control systems, particularly those employing GE Vernova's ADMS, could adopt the Hydra architecture with minimal adaptation, enabling them to:

- Enhance their disaster recovery strategies
- Improve service continuity for customers
- Reduce operational risk and downtime costs

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

RIIO-2 project – Not applicable

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.

We believe this project to be a first of its kind amongst GB DNOs. Horizon scanning on platforms such as the ENA Smarter Networks portal revealed no similar undertakings within the industry.

In addition, discussions with GE Vernova confirmed that none of their global customers have implemented a solution of this nature for a full-scale operational control system. This gives us confidence that Hydra is a genuinely novel approach and does not duplicate existing work.

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 Hydra solution developed by UK Power Networks marks a significant step forward in how the GB electricity distribution sector approaches operational resilience. Traditional disaster recovery models typically rely on restoring systems from backups after a major incident. In contrast, Hydra introduces a secure, continuously updated emergency control system that can be activated within minutes. This will help ensure continuity of control in scenarios where human safety and critical infrastructure are at risk. For example, cyberattacks, full control centre loss, or systemic replication failures.

What sets this solution apart is its architectural innovation. UK Power Networks' current ADMS infrastructure already operates with redundancy across multiple data centres, offering high availability. However, the Hydra environment adds a new layer of protection: a one-way, secure architecture that feeds a parallel system in real time. Unlike a cold standby, this emergency system is a live, view-only replica that can be promoted to full operational status when needed. It is designed so that even if the emergency system must be rebuilt from an older backup, transactions can be rolled forward to a near-current state, dramatically improving recovery time and minimising data loss.

This approach is unprecedented among GB DNOs. While others may have test environments or dual-site replication, none have a production-ready, always-on emergency system with automated server build capabilities. The proposed use of automated server deployment on both the live and Hydra sides ensure rapid, consistent recovery. This automation, combined with secure backup repositories and real-time transaction and SCADA data streaming, enables a level of resilience and flexibility that sets a new benchmark for the industry in relation to disaster recovery systems.

Relevant Foreground IPR

It is expected that the solution designs and business process designs will be the main relevant foreground IPR generated by the project.

The project is based upon GE Verona's proprietary control systems, and therefore this background IPR would be required to replicate the project exactly. be required to replicate the project exactly.

Data Access Details

UK Power Networks recognises that Innovation projects may produce network and consumption data, and that this data may be useful to others. This data 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 aim to make available all non-personal, non-confidential/non-sensitive data on request, so that interested parties can benefit from this data.

To view the full Innovation Data Sharing Policy, please visit UK Power Networks' website here:

https://d1oyzg0jo3ox9g.cloudfront.net/app/uploads/2023/10/UKPN-InnovationDataSharingPolicy-Nov-23-v1.0.pdf

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

There is significant technical and operational risk associated with developing, testing and deploying such a disaster recovery system. Unlike incremental upgrades or routine system enhancements typically covered under business as usual, this initiative introduces a fundamentally new architecture (one that no other DNO globally has implemented or trialled).

UK Power Networks has over 2.5 million SCADA points, 6 million smart meters and serves 8.5 million customers that are managed daily. This new system must perform flawlessly under extreme conditions, such as cyber attacks or full control centre loss, further adding to the complexity and risks associated with delivering the solution.

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

As detailed in sections 3.5.1 and 3.5.2, the solution carries significant technical and operational risks given the nature of the project and NIA funding is needed to ensure it is suitable for business as usual.

This project has been approved by a senior member of staff

☑ Yes