Notes on Completion: Please refer to the appropriate NIA Governance Document to assist in the completion of this form. The full completed submission should not exceed 6 pages in total.

NIA Project Registration and PEA Document

Date of Submission

Jan 2026

Project Reference Number

NPG_NIA_059

Project Registration

Project Title

SAFEGRID: Strategic Assessment for Flood Events across the Grid

Project Reference Number

NPG_NIA_059

Project Licensee(s)

Northern Powergrid

Project Start

December 2025

Project Duration

1 year and 7 months

Nominated Project Contact(s)

Deepu.sanjayan@northernpowergrid.com

Project Budget

£414,580.00

Summary

Project SAFEGRID is an innovative Flood Prevention System project designed to transform how flood risk is assessed, monitored, and mitigated across the electricity distribution network. This initiative builds on NPg's strong track record of achieving compliance with the national flood resilience standard (ETR138) but recognises the urgent need to move beyond traditional, carbon-intensive physical mitigations such as concrete walls and site relocation.

Nominated Contact Email Address(es)

yourpowergrid@northernpowergrid.com

Problem Being Solved

Climate change is increasing the frequency and severity of flooding, posing growing risks to electricity distribution assets. Flooding events that disrupt substations can lead to prolonged outages, disproportionately affecting vulnerable customers, critical services, and local economies. While the grid and primary substations are currently compliant with national flood resilience standards (ETR138), this compliance has historically been achieved through measures such as concrete flood walls, site relocation, and equipment elevation — all of which carry a high carbon footprint, potential environmental drawbacks, and limited adaptability to evolving climate impacts. This project addresses the growing need to both quantify and adapt to changing flood risks across the wider network, particularly in the context of climate change, while aligning with the ambition to reduce environmental impact, minimise customer disruption, and optimise operational cost.

Method(s)

The project seeks to create a dynamic, risk-based approach to flood mitigation, enabling timely, targeted, and cost-effective interventions that align with sustainability goals and adapt to evolving climate change risks. It will deliver:

- A comprehensive reassessment of flood risk for grid, primary, and selected distribution substations, incorporating the latest

Environment Agency datasets and climate change projections.

- A unique, quantified risk matrix methodology, considering asset criticality, societal impact, and interdependencies with other infrastructure providers.

- The deployment of advanced flood monitoring devices at high-priority sites, enabling real-time data capture, predictive alerts, and integration with NPg's non-operational iHost Innovation system ahead of BAU integration and implementation.

The work will be delivered in distinct phases:

Baseline assessment of current and future flood risk against latest projections, identifying assets where existing mitigations may be insufficient.
Development of the risk matrix and methodology for prioritising intervention at critical distribution substations not covered by ETR138.
Targeted deployment of monitoring devices at highest-risk sites, enabling proactive flood response and operational efficiency gains.
During the project, data will be made available via NPg's non-operational iHost Innovation system.
Evaluation of future expansion to other environmental perils and at-risk asset classes (e.g., cable bridges, embankments), where climate-related risks are currently unquantified.

Scope

Identified portfolio of Grid and Primary substations (initial cohort size to be set in Stage 1: indicative 30–60 sites).
Flood risk types: fluvial, pluvial, surface water, groundwater emergence, drainage exceedance, tidal (where applicable).
Data integration from public and commercial sources (EA/NRW/SEPA flood mapping, LiDAR/DEM, Met Office rainfall, historical incidents, site records).
Monitoring: water level, rainfall, ground saturation, doorway thresholds, sump/pump telemetry, access road sensors, CCTV (condition, not security), communications and power resilience.
Dashboards/alerts into control/ops (e.g., integration plan or API spec for existing systems like DNO GIS/EMS/OMS/EDMS/PowerOn—exact system naming to confirm).
Development of risk-based investment options, business case, and adaptive pathways aligned to climate scenarios.

Objective(s)

Stage 1 – Baseline Assessment

· UDlive to undertake flood risk analysis for each site using the latest Environment Agency datasets covering main river, coastal, and surface water.

· UDlive to identify sites where existing mitigation measures are no longer adequate under projected future conditions

Stage 2 – Risk Matrix Development

·UDlive to develop a quantified, risk-based matrix which incorporates a variety of factors including for example, customer numbers and type (including vulnerable customers), geographic location and environmental context, equipment type and condition, fault history and operational performance, interdependencies with other infrastructure providers and stakeholder and community feedback.

· UDlive to apply Risk Matrix to NPg assets; prioritised list of substations for monitoring/mitigation interventions shared with NPg.

Stage 3 – Monitoring Deployment

· UDlive to install 110 flood monitoring devices at high-risk sites.

· Real-time monitoring integrated into NPg's iHost innovation system

Stage 4 – Adaptive Pathways & Expansion

·UDlive to define operational trigger points and deliver adaptive pathways/site-specific resilience roadmaps allowing for the cost-effective sequencing of mitigation measures.

Feasibility of expanding methodology to other assets assessed; collaboration opportunities explored with external utilities for shared monitoring.

Consumer Vulnerability Impact Assessment

Impact on Vulnerable Customers:

Who is affected? Medically dependent, elderly, low-income, and rural customers.
Benefits:Health & Safety: Reduced risk of harm during floods (High likelihood).
Service Continuity: Fewer and shorter outages for vulnerable customers (High likelihood).
Confidence: Customers trust Northern Powergrid's proactive resilience (Medium likelihood).
How benefits are delivered:

Real-time flood monitoring and early warning systems.
Prioritisation of critical sites serving vulnerable customers.
Adaptive resilience strategies for future climate risks.
Negative impacts: None anticipated.
Monitoring: Track outage reduction, sensor coverage, and vulnerable customer protection.

Success Criteria

Must:

Complete validated flood risk assessment for all targeted substations.
Develop and implement a risk-based prioritisation matrix.
Deploy 110 advanced flood monitoring devices and integrate live data into NPg's iHost system.
Deliver an evidence-based flood resilience framework for adaptive interventions.
Should:

Demonstrate cost and carbon savings versus traditional mitigation.
Show improved network resilience and reduced outage impact during flood events.
Provide training materials for NPg teams and confirm framework scalability for wider use.

Project Partners and External Funding

UDlive

Potential for New Learning

This project will deliver significant new learning for Northern Powergrid and the wider UK energy sector by introducing a criticality‐based flood risk matrix for distribution substations, pioneering forecast‐triggered sensor networks, and creating adaptive resilience pathways informed by real‐time monitoring. It will also enable potential cross‐sector data sharing and provide low‐carbon mitigation alternatives to traditional defences. As the first UK initiative to integrate these innovations at scale, it sets a new benchmark for proactive flood resilience, with transferable benefits across industries.

Scale of Project

The scale of the project will include the entire Northern Powergrid licence area. There are clear benefits to this project. If successful, the prevention of flood damage to just one or two NPg assets would result in cost savings that offset the initial investment. This demonstrates strong potential for return on investment and reinforces the value of proactive flood risk mitigation.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

Northern Powergrid licence area.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

The total NIA expenditure that the project expects to reclaim is: £414,580.10

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 project has the potential to facilitate the energy system transition by strengthening network resilience to ensure reliable operation of future lowlcarbon energy systems. Potential for real-time flood data to be integrated into operational systems ensuring continuity of supply for distributed energy resources (DERs) and EV charging infrastructure.

Provides a transferable resilience model for wider energy and infrastructure sectors. Evidence base and methodology can be replicated nationally, supporting system-wide adaptation.

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

The project has the potential to benefit consumers in vulnerable situations by improving supply reliability and service continuity during flood events, including for those most at risk. Integration of flood risk forecasts and live sensor data into operational decision-making prevents or shortens outages. Enhanced customer confidence and trust in Northern Powergrid's climate resilience and service quality. Proactive flood management ensures continued operation of critical services during events

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

If successful, the prevention of flood damage to just one or two NPg assets would result in cost savings that offset the initial investment. This demonstrates strong potential for return on investment and reinforces the value of proactive flood risk mitigation. Additionally, there will be improved supply reliability and service continuity during flood events

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

There are clear benefits to this project. If successful, the prevention of flood damage to just one or two NPg assets would result in cost savings that offset the initial investment. This demonstrates strong potential for return on investment and reinforces the value of proactive flood risk mitigation.

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

The project is using data that is both available and applicable to all parts of GB, the results are likely to give a reasonable indication of increased risk in the NPg geographical license area however, the method developed will be applicable to the whole of GB and can be replicated nationally, supporting system-wide adaptation. The final stage of the project will identify collaboration opportunities with other infrastructure providers for shared monitoring and intelligence.

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

Hardware & Installation per site: £2,600–£5,300

Connectivity & Data per site/year: £120–£240

Integration & Training per DNO: £150k–£300k

Estimated Total (Year 1):300 sites: ~£2.5m–£4.3m
900 sites: ~£4.1m–£8.4m
1,800 sites: ~£7.1m–£14.7m

Ongoing Opex per site/year: £220–£490

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

New learning will identify NPg assets at risk to flooding. It will enable NPg to deploy flood monitoring devices at high risk sites and consider future mitigations.

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.

National Grid's ERA project under the NIA framework exemplifies innovation in environmental risk management, using automated weather alerts and integrating multi-hazard datasets — including flooding, erosion, and forecasting data — to enhance control room decision-making. While both ERA and our initiative share the goal of proactive risk intervention, our approach extends beyond current

industry practice in scope, adaptability, and environmental sustainability. We are pioneering a bespoke risk matrix that quantifies substation criticality by factoring in customer impact, infrastructure interdependencies, and historical fault data to guide strategic sensor deployment. In addition, rather than relying solely on pre-configured hazard thresholds to trigger alerts, our system uses forecast-informed, trigger-based monitoring — enabling sensors to respond dynamically to predicted risks, accurately characterise event hydrographs, and support early, targeted interventions. By focusing on grid, primary, and selected distribution substations, and replacing carbon-intensive physical defences with a data-driven, scalable methodology, our project delivers a more adaptive, intelligence-led flood resilience model that reduces environmental impact while improving operational readiness

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

RIIO-1 projects must include description of why they have not been tried before.

The innovation lies not only in the technology but in the integrated methodology, which combines robust environmental modelling with targeted instrumentation planning and flexible service delivery. This approach enables NPg to:

- Replace reactive, blanket mitigations with intelligent, adaptive interventions.
- Reduce carbon footprint and minimise environmental impacts of physical works.

Deliver better outcomes for customers by reducing outage risk and improving resilience.

Relevant Foreground IPR

The project is expected to generate Relevant Foreground IPR primarily in the areas of flood risk modelling methodologies, dynamic risk matrix frameworks, and real-time monitoring and alerting systems. These innovations will enable DNOs to proactively assess, prioritise, and mitigate climate-driven flood risks, forming the core technical advancements of the SAFEGRID solution.

Data Access Details

Any data generated during the project can be made available to interested parties, via reports and publicly available links. The project team may select to de-sensitise some data where necessary and/or required. It is anticipated that this requirement will be met by the data sharing policy, link to the NIA Governance Document.

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

The project is considered innovation because of the TRL level – moving up to TRL 6

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 technical risk associated with the development and deployment of new technology within the business, and the associated uncertainty of the outcome

This project has been approved by a senior member of staff

☑ Yes