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

NIA_SSEN_0085

Project Registration

Project Title

TEMPER - Transition & Exposure Modelling for Planning & Energy Resilience

Project Reference Number

NIA_SSEN_0085

Project Licensee(s)

Scottish and Southern Electricity Networks Distribution

Project Start

July 2026

Project Duration

0 years and 9 months

Nominated Project Contact(s)

Brian Wann, Innovation Delivery Manager

Project Budget

£437,500.00

Summary

TEMPER establishes the foundational data and modelling capability required for SSEN Distribution to quantify how a changing climate will alter the failure behaviour of its network. Using poles and overhead-line conductors as a proof-of-concept, the project will:

- Construct a new asset-failure methodology that apportions historical fault data to individual assets using asset information, maintenance and repair records, and engineer input.
- Train climate focused failure-probability models against forward climate projections.
- Recommend changes to SSEN's data, systems and processes to improve asset failure information.
- Model scenarios for future climate related regulatory metrics and ensure that the new models and data quality recommendations are working towards SSEN being in a proactive position going forward.

Third Party Collaborators

BARINGA PARTNERS LLP

Nominated Contact Email Address(es)

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Problem Being Solved

Climate change is altering the frequency and severity of weather hazards (high winds, lightning, snow loading, vegetation interaction) that impact failures on overhead distribution networks. Distribution Network Operators (DNOs) do not have a reliable method for predicting asset risk and prioritising maintenance and investment interventions due to climate impact. The industry standard Common Network Asset Indices Methodology (CNAIM) approach does not take a forward-looking climate impact approach, which means we

are unable to assess the impact climate change has on our assets.

Three core problems exist:

- Fault data is recorded at a level of aggregation (typically feeder/circuit level) that prevents direct attribution of failures to individual assets. This makes it challenging to train a credible asset-level failure model from available data alone.
- Common Network Asset Indices Methodology (CNAIM), does have asset-level failure view, but climate-conditioned probability-of-failure cannot be reliably estimated and therefore cannot be used to inform sub-regional decisions such as targeted material upgrades (for example wood-to-steel pole replacement in higher-hazard areas).
- DNOs do not gather sufficient evidence on climate related resilience, which makes it challenging to report on and seek investment to continue reliable operation of the network.

TEMPER aims to address these problems together: it builds a transparent failure method from currently available data, demonstrates climate-conditioned modelling on top of it, and defines what must change in SSEN's data and systems landscape to make this approach repeatable, auditable and scalable.

Method(s)

1. Mobilisation & Exploratory Data Analysis (2 weeks)
Ingest and review SSEN operational, geospatial, asset-register, maintenance and fault datasets, focusing on poles and overhead-line conductors. Assess external climate datasets (e.g. Met Office, Jupiter) and select projections aligned to Representative Concentration Pathway 8.5 (RCP8.5) for the relevant horizon. Identify data limitations and privacy considerations. Define vulnerability thresholds for each asset class/hazard pairing.

2. Failure Method Construction & Risk Modelling (7 weeks)
Construct the failure method: apportion feeder/circuit-level fault data to individual assets using a combination of feeder IDs, geospatial coincidence, asset maintenance and repair records, and structured engineer/SME input. Validate the apportionment with network SMEs. Train a supervised machine-learning model (empirical approach) where the initial data-quality assessment supports it; otherwise, produce forward failure estimates by overlaying climate projections onto the heuristic-derived asset failure view using documented rules. Combine the resulting failure view with climate projections to estimate forward failure probabilities.

3. Recommendations, Capability Embedding & Handover (3 weeks)
Finalise model documentation, including all assumptions, limitations and data-quality issues. Translate findings into data-quality and system-change suggestions describing how SSEN should record failure, condition and maintenance at the granularity required to scale this approach. Produce a set of outputs for asset level risk for review and socialisation. Conduct handover and training with SSEN data scientists on model use, maintenance and enhancement.

4. BAU Implementation (5 months)
Significant time has been allocated for transferring the innovation outputs into Business As Usual (BAU), which is a lesson learned from previous projects. This exercise is often the most challenging. The TEMPER system will be transferred into SSEN's Data and Analytics Team's existing architecture, so that it can be provided as a service to the rest of SSEN.

Data Quality Statement (DQS): -
The project will be delivered under the NIA framework in line with Ofgem, ENA and SSEN internal policies. Data produced as part of this project will be subject to quality assurance to ensure that the information produced with each deliverable is accurate to the best of our knowledge and sources of information are appropriately documented. All deliverables and project outputs will be stored in Baringa's internal systems with appropriate backup and version management. Relevant project documentation and reports will also be made available on the ENA Smarter Networks Portal and dissemination material will be shared with the relevant stakeholders.

Measurement Quality Statement (MQS): -
The methodology used in this project will be subject to supplier quality assurance checks. This includes reviewing the source of data, assessing measurement processes and equipment used as well as quality checking data processing. These checks will be clearly documented and verifiable. The measurements, designs and assessments will also be clearly documented in the relevant deliverables and final project report made available for review.

Scope

In scope:

- Construction and SME-validated calibration of a new asset-failure method for poles and overhead-line conductors, drawing on feeder-level fault data, asset register, maintenance and repair records, geospatial data and engineer input.

- Training and evaluation of a climate-focused probability-of-failure model for the chosen asset classes, using forward climate projections.
- Documented recommendations for the data-recording, data accuracy, system and process changes needed to scale the approach across asset classes.
- Consideration of emerging Ofgem climate-resilience metrics and an assessment of how the method and data recommendations align with anticipated future requirements.
- Exploration of whether and how modelling outputs could support sub-regional intervention decisions, such as targeted structure replacement (e.g. wood-to-steel).
- Documented model code, outputs, methodology, and a handover and training session with SSEN data scientists.
- Integration into SSEN BaU Systems

Out of scope:

- Modelling of asset classes other than poles and overhead-line conductors (these are the proof-of-concept; the methodology is designed to be extensible, but extension is a follow-on activity).
- Modifying CNAIM.

Net consumer benefits:

- Reliability and environmental - earlier identification of climate-vulnerable assets enables a more targeted intervention, reducing weather-related Customer Interruptions (CIs) and Customer Minutes Lost (CMLs).
- Financial - better targeting reduces both avoidable repair work and over-investment where climate exposure is low; the data and system recommendations also lower the long-run cost of standing up climate-resilience analytics.
- Regulatory readiness - positions SSEN to respond efficiently to evolving Ofgem reporting requirements, reducing the likelihood of future non-compliance and rework costs.
- Reduction in outages as a result of improved asset management intervention strategies.

Objective(s)

- Develop and validate a new asset-failure methodology that uses an asset-level view of historical failure for poles and overhead-line conductors, drawing on existing SSEN data sources, maintenance and repair records, and structured SME input.
- Demonstrate, through a working proof-of-concept model, that climate-conditioned probability-of-failure can be modelled for the chosen asset classes using SSEN data and forward climate projections.
- Recommend the data-quality, system and process changes SSEN must make to enable climate impact modelling across asset classes.
- Assess how the climate model and data recommendations map against anticipated Ofgem climate-resilience metrics, identifying where SSEN is well-positioned and where gaps may exist.
- Document how modelling outputs could inform targeted, location-specific intervention decisions.
- Hand over the methodology, model, documentation and training to SSEN data scientists so the capability can be extended to additional asset classes and hazards over time.

Consumer Vulnerability Impact Assessment

The project has a relative impact score of 5.8 out of 10 on customers, with no high-level mitigation steps required. This is relatively low impact due to the project only targeting improved resilience through fewer outages.

See figure 1

Success Criteria

- Asset failure model creates a climate risk score for all overhead lines and poles in SSENs licence areas.
- Asset failure model outputs are validated using machine learning techniques and determined to be accurate enough for recommending interventions.
- Report created making recommendations for improving asset data quality for poles and overhead lines and how this applies to all asset classes across all SSEN to enhance future climate modelling outputs.
- Report created detailing how new climate risk scoring capabilities match Ofgem’s objectives with detail on where any gaps exist.
- Report created that details how risk scoring can be used to implement asset interventions on high-risk assets.
- Provide model to SSEN Data and Analytics team for future integration into SSEN internal systems, alongside training and work instructions.

Project Partners and External Funding

Baringa LLP are Project Partners and will be carrying out the climate modelling work packages.
No External Funding

Potential for New Learning

Learning:

- Whether and how feeder/circuit-level fault data can be reliably apportioned to individual assets using a combination of operational records and structured SME input
- The specific data-recording and system gaps that limit asset climate-resilience analytics for SSEN and the set of remediations to help unlock increased granularity in future modelling.

Dissemination:

- Project Eligibility Assessment and final close-down report published on the ENA Smarter Networks Portal.

Scale of Project

The project is deliberately scoped as a tightly time-boxed (12 weeks) proof-of-concept on limited asset classes (poles and overhead-line conductors). This is the minimum scale at which a new failure method can be meaningfully constructed, and at which a climate-conditioned model can be trained and evaluated end-to-end. A smaller-scale effort would not generate sufficient evidence about the model's reliability, would not produce a defensible data and systems roadmap, and would not give SSEN a tested capability to build on. A materially larger initial scope (multiple asset classes simultaneously) would increase cost and duration without necessarily changing the foundational learning. The chosen scale is therefore the smallest investment that produces transferable learning and a usable methodology that could be rolled out across SSEN and other DNOs should they choose to follow.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL6 Large Scale

Geographical Area

The project will take place across SSEN Distribution's SHEPD and SEPD Licence areas.

Revenue Allowed for the RIIO Settlement

There is no funding available within the RIIO-ED2 settlement period to carry out this activity outside of NIA.

Indicative Total NIA Project Expenditure

The total project expenditure is expected to be £437,500

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 low-carbon, highly electrified energy network, requires systems that are resilient to climate change and able to handle increasing demands. Climate change and electrification are adding network stress leading to asset failure.

The project integrates asset, failure, and maintenance data with forward looking climate projections to produce climate-adjusted asset-level probabilities of failure. By moving beyond historical data alone, the project equips SSEN with a forward-looking understanding of how climate change will affect asset failure. This will enable more cost-effective, targeted resilience interventions, ensuring the network can remain reliable under increasing extreme weather.

This project supports the energy system transition by strengthening the resilience and investment efficiency of the distribution network.

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

Customers in vulnerable situations are disproportionately affected by power outages, particularly during extreme weather events, due to health needs, limited mobility, financial constraints, or geographical isolation.

While traditional asset management practices do not adequately anticipate where future disruptions will affect the most vulnerable customers, this project will enable SSEN to identify assets and locations where climate-driven failures are most likely to lead to prolonged or high-impact outages, enabling targeted resilience interventions and smarter prioritisation of investments.

By reducing the likelihood and severity of outages in high-risk areas, vulnerable customers are more protected from loss of essential services.

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

Base Cost

This is the do-nothing scenario. We have conservatively assumed that climate related power outages will remain similar over ED3 to that of the last 8 years. Arguably this could be increased due to increasing impacts of climate related outages.

Method Cost

This is the TEMPER investment scenario. Project costs are £437,500. Estimated savings are based on 11kV and 33kV Customer Interruptions (CIs) and Customer Minutes Lost (CMLs) avoided due to pro-active intervention on high-risk assets e.g. replacing wood poles for steel poles. We assume a 0.5% reduction in CIs and CMLs for each year over the 5 years of RIIO-ED3. This produces an annual saving of £1.65m or an NPV of £6.08 million over 10 years. See CBA for more details.

SSEN's customers will be the main beneficiaries of this project, as they will experience fewer outages as a result of climate induced outages.

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

The problem addressed in this project is experienced by all electricity distribution networks and has the potential to create positive benefits for all UK DNOs. At the point of registration, we have identified no barriers to replication across Great Britain. The lessons learnt and the innovation tool may be transferable to other TOs/DNOs with similar data maturity.

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

The modelling approach has the potential to be replicated across all DNOs. Assuming similar costs to this project for the additional 4 DNOs, the cost would be £437.5k x 4 = £1.75m.

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 generated by this project can be used by other electricity network licensees to inform the development of climate adjusted asset risk and reliance approaches.

Technical learning will demonstrate how asset, failure, and maintenance data can be combined with climate projections to derive forward looking projections of asset failure, including data requirements, assumptions, and treatment of uncertainty. Operational learning will show how outputs can be integrated into existing asset management frameworks, and investment planning.

By enabling more consistent, evidence-based resilience investment across networks, the learning supports sector wide improvements in reliability and value for money, delivering long term benefits for consumers, particularly those more vulnerable to power interruptions.

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.

There are several innovation projects considering the impact of climate change on electricity networks; however, TEMPER addresses a distinct gap and does not unnecessarily duplicate existing work.

We have engaged with UK Power Networks to understand potential overlap with their SIF Beta funded Climate Resilience Demonstrator (CReDo) project. CReDo is focused on understanding climate resilience at a system and infrastructure level, including interdependencies between sectors, to support strategic adaptation and long-term network planning decisions. TEMPER does not seek to replicate these capabilities. Instead, TEMPER develops a methodology for deriving climate-adjusted probabilities of failure for individual asset classes by combining climate projections with asset register information, maintenance history, repair records, fault data and structured engineering judgement. Its primary objective is to understand how climate change influences the deterioration and failure behaviour of specific assets and to identify the data, process and system improvements required for DNOs to implement this capability at scale.

Similarly, projects such as Predict4Resilience focus on forecasting near-term weather-related faults and improving operational preparedness and response. TEMPER is not intended as an operational forecasting tool. It considers longer-term changes in asset vulnerability over years and decades to inform proactive asset management interventions, such as targeted replacement, refurbishment and maintenance strategies.

WARN and other climate forecasting projects provide valuable insight into how climate hazards may evolve in the future, but they do not develop methodologies to attribute historical faults to individual assets, generate climate-conditioned asset-level probabilities of failure, or establish the data capture requirements needed to support repeatable climate-adjusted asset risk modelling.

TEMPER therefore complements existing innovation activity by addressing a currently unmet need: establishing an evidence-based methodology and supporting data roadmap that enables climate change to be explicitly reflected within asset-level probability-of-failure assessments and future resilience investment decisions.

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

This project goes beyond BAU asset risk management practises. This project introduces a novel methodology that integrates asset, failure and maintenance data with climate projections using advanced analytics to derive climate-adjusted, asset-level probabilities of failure and associated customer-impact metrics. This represents a marked change from current practises, which do not model how future climate hazards will affect network risk.

Relevant Foreground IPR

All foreground IPR related to how the methodology used to create the climate model forecasts will be shared as part of the closedown report.

Data Access Details

For information on how to request data gathered in the course of this project, see SSEN Distribution's Network Innovation Competition (NIC) and Network Innovation Allowance (NIA) Data Sharing Procedure at https://ssen-innovation.co.uk/innovation-strategy/

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

The project sits outside BAU as it involves the development and piloting of new climate-adjusted asset risk assessments that are not currently part of SSENs standard asset management processes. There is no current BAU process for integrating down-scaled climate projections with asset, failure, and maintenance data to derive forward looking asset level probabilities of failure.

This project combines a novel combination of climate analytics, probabilistic risk modelling and advanced data techniques, requiring

exploratory development, validation, and governance design to test data suitability, modelling assumptions, and regulatory applicability. This approach is unproven at scale and carries technical, operational, and integration risk. Due to this uncertainty and experimental nature, it is not appropriate to fund the project through BAU.

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

This project can only be undertaken with NIA support as it involves the development, and testing of unproven climate-adjusted asset risk methods that are not part of BAU. This approach is untested at scale, with uncertainty around data-quality, modelling assumptions, and integration. NIA funding is required to de-risk the methodology, demonstrate value, and generate learning prior to any BAU adoption. There is also no BaU funding available as part of the RIIO-ED2 settlement to carry out this work.

This project has been approved by a senior member of staff

☑ Yes