SIF Discovery Round 2 Close Down Report Document

Date of Submission

Jul 2025

Project Reference Number

10061340

Project Progress

Project Title

CReDo+ Climate Resilience Demonstrator (extension to new climate risks)

Project Reference Number

10061340

Lead Funding Licensee

UKPN - Eastern Power Networks Plc

Project Start Date

April 2023

Project Duration

3 Months

Nominated Project Contact(s)

innovation@ukpowernetworks.co.uk

Project Summary

The original CReDo project produced failure models from elicitation interviews with operatives familiar with the asset and then translating these into a mathematical model. Whilst this generated useful failure models the process was found not to be scalable due to the time and specialist expertise needed to conduct them.

To address this the project will develop a user-friendly tool (e.g. configurable questionnaire or interface) which asset specialists will interact with to generate probabilistic models of asset failure from climate risks, enhancing the digital twin's capabilities and scope for application. This tool will enable asset engineers to better quantify and understand climate risks and networks robustness, enabling more targeted investment to build resilience and robustness and protect supply for customers.

During the Discovery Phase, we will investigate the suitability of different extreme weather conditions (wind or heat) for this work and then focus on the selected condition in the Alpha Phase.

The project addresses Innovation Challenge 3: Improving Energy System Resilience and Robustness, scope 2.

The network innovation lies in the transformative capabilities for DNOs to understand the risks and modalities of asset failure, which currently exists only as tacit knowledge held by asset specialists. Providing quantitative failure risks enables resilience and robustness to be incorporated as a key measure in network operation and planning. DNOs will therefore be able to make more informed decisions for capital investments and asset planning, strengthening their infrastructure to ensure smooth adoption of multi-energy systems and a robust energy transition towards net zero.

This consortium is uniquely well placed to deliver this project:

1.The partners involved delivered the original CReDo, which included the first creation of Bayesian failure models from elicitation interview.

2.UK Research and Innovation - Science & Technology Facilities Council (STFC) through its Hartree Centre and DAFNI platform, will provide the project with crucial data science and software engineering expertise, and secure hosting.

3.UK Power Networks (UKPN) will support the project from a Distribution Network Operator perspective, supplying relevant data and engineering expertise.

4.Computational Modelling Cambridge Ltd (CMCL) will use their experience developing semantic knowledge graphs to represent the critical assets, the impact of asset failure and the cascade of failures throughout the system

5. Connected Places Catapult (CPC) lead the current phase development of CReDo and bring deep experience in identifying market failures and convening stakeholders to solve them.

Project Description

Electricity networks are at the heart of the critical infrastructure system and individual asset failures can cause a cascade of failure across the entire system. The Committee on Climate Change recently reported that "Connectedness of infrastructure systems means that climate and weather-related impacts in one system can cause large and cascading failures in connected systems" and that "many organisations are struggling to fully assess risks from infrastructure interdependencies."

CReDo is a climate change adaptation digital twin focused on "exploring how infrastructure interdependencies impact system resilience, and how data sharing can improve overall system resilience". However, further innovation is required to enhance its capabilities into additional causes of asset failure under different extreme weather scenarios through the proposed project extension in this bid, CReDo+.

In this project, a 'user-friendly' tool will be developed to extract tacit knowledge from asset specialists to generate probabilistic failure mode models for a selection of prioritised energy network assets, using an extreme weather event (to be selected in the Discovery Phase) as an investigative exemplar climate risk. The value of the proposed approach will be demonstrated by implementing the models into CReDo, enabling asset engineers to identify vulnerabilities and develop mitigation strategies leading up to an event. As CReDo develops, the portfolio of assets modelled, and the types of extreme weather scenarios analysed, will increase to create a system appreciative of the multi-faceted nature of climate resilience. CReDo+ will build on a cross-sector collaboration between utility companies (electricity, water, and telecommunications) to improve granularity of asset interdependencies in their individual networks and unlock the value of climate resilience for both infrastructure and to society.

See the solution diagram appended as a visual overview of the proposal.

This project is valuable and innovative because it will:

1. Create entirely new probabilistic failure models under conditions of extreme weather -- events which will increase in frequency and severity as climate change continues.
2. Increase the granularity of data access available to DNOs for their asset portfolio and its interdependencies with other utilities' assets to prioritise and develop cross-sector shared responsibility models for resilience upgrades.
3. Produce a user-friendly tool to facilitate the creation of models for other assets and risks.
4. Incorporate economic and societal cost data to quantify the implications of failure (e.g. costs of recovery, repair, impact on supply continuity). This will support the business case for investments designed to build resilience.

Summary Key Findings

See End of phase report

User needs

See End of phase report

Impacts and benefits

See End of phase report

Risks, Issues and Constraints

See End of phase report

Working in the open

See End of phase report

Costs and value for money

See End of phase report

Special conditions

See End of phase report

Documents uploaded where applicable

Yes

Documents:

SIF Round 2 Discovery - CReDo+ End of Phase (for upload).pdf (1).pdf