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

NIA2_NESO089

Project Registration

Project Title

CASCADE - Communication Adaptive Systems for Coordinated Architecture and Data Exchange (Discovery)

Project Reference Number

NIA2_NESO089

Project Licensee(s)

National Energy System Operator

Project Start

February 2026

Project Duration

0 years and 7 months

Nominated Project Contact(s)

innovation@neso.energy

Project Budget

£300,000.00

Summary

The introduction of Active Network Management (ANM) has revealed conflicting sub-network behaviour, obstructing the balancing services coordinated by NESO. This highlights the need for better coordination and data visibility within Energy Management Systems. This project is phase one of a 2-part project to develop a Proof-of-Concept tool to connect NESO control room data with Transmission Operator (TO) and Distribution Network Operator (DNO) data, integrating ANM systems information. This first phase of the project will evaluate existing Supervisory Control and Data Acquisition (SCADA) systems and, if unsuitable, design a new software tool. This will inform future work to demonstrate and deliver the proposed system in a simulated environment, promoting ANM schemes, reducing conflicts, and providing benefits to TOs, DNOs, and customers.

Nominated Contact Email Address(es)

Innovation@neso.energy

Problem Being Solved

The spread of ANMs (Active Network Management Systems) across DNO networks has brought significant benefits in terms of constraint management among Distribution Networks. Though, on the other side, this has led to conflicting NESO-DNO operations.

NESO's main role is to balance energy flows across the national system, ensuring electricity demand matches supply at any point in time and guaranteeing specific standards in terms of quality and supply. To achieve this, NESO, through its balancing mechanisms instructs units alongside GB to ensure safe operations.

Emerging, and will be even more evident in the future, is an obstruction in the balancing services coordinated by NESO, resulting in an estimated balancing cost impact of £70M (https://www.nationalgrid.co.uk/downloads-view-reciteme/639745) per annum. This issue underscores the need for enhanced coordination and data visibility within grid management control architectures.

Method(s)

To manage project risks and assure maximum value for money, the proposal is to deliver the programme in two phases: Discovery and Proof-of-Concept. Further phases to develop the system for future deployment may be agreed and scoped in collaboration with project stakeholders assuming the current programme has been successfully completed.

This PEA concerns the discovery phase of work and will include the following work packages within a 5 month timeline. The main activities are collective requirement definition, Definition of Need and use-case gathering through workshop and stakeholder engagement with key stakeholders:

- Definition of Need (Use Cases) - Stakeholder engagement with key teams within NESO and network partners to define the problem that we are solving, user groups and use cases specifying the overall uses of the tool.

- System Specification & Test Requirements - Denote fixed requirements and those that can be further defined as the proof of concept is developed in the next phase e.g. security should be fixed; UI can be further defined later.

- Business as Usual Roadmap - Definition of potential routes to BaU based on the information available.

- Cost Benefit Analysis – Desk based analysis to quantifying the benefit the tool will provide compared with its costs

- Optioneering – Identify and discuss technology options with key stakeholders to identify those to be taken forward to the prototype stage.

- Project Management, Governance and Quality Assurance

The second Phase of the project which will be scoped and registered as a separate project, will focus on POC delivery. This will involve designing the full architecture and features, so that everything can then be translated into a demo tool, which will be trialled and used for demonstration.

In line with the ENA's ENIP document, the risk rating is scored Low.

TRL Steps = 1

Cost = 1 (£300k)

Suppliers = 1 (1 supplier + Network Partners)

Data Assumptions = 1

Total = 4 (Low)

Scope

The scope of the two CASCADE phases is to develop a proof-of-concept platform able to share ANM data, coming from different DNOs, towards NESO, regardless the different format and standard that those data might be presenting. This product will draw all the possible experience from other ongoing industry initiatives operating in this space. The tool will allow data to be exchange in a secure and reliable way at both operational and longer time scales. This will have multiple benefits:

- Enhanced Transmission-Distribution coordination. Sharing ANM data is the first step towards a more efficient coordination between the NESO and Distribution companies. The development of this tool will be extremely helpful to optimise dispatching instructions to units.
- Cost Reductions for final consumers. By being able to achieve a greater visibility on DNOs ANMs systems, more efficient procurement might be provided by the NESO, and at the same time avoid any conflicting actions between NESO and DNOs running arrangements and instructions.

In the Discovery phase the main activities are collective requirement definition, Definition of Need and use-case gathering through workshop and stakeholder engagement with key stakeholders from partner TO and DNO's; Northern Power Grid, Scottish and Southern Electricity Networks-Distribution and Scottish and Southern Electricity Networks-Transmission. This will lay the project foundations and ensure all stakeholders needs are coordinated. Learnings from similar projects will be also considered, to draw on

lessons learnt. This follows the general method for designing and developing of technical tools, hence the approach and the method should be considered as to be technical.

Objective(s)

Project objectives are:

Phase 1 (Discovery)

- Define and assess use cases for interfacing NESO control room data with TO, DNO, and Grid Supply Point systems.
- Evaluate existing SCADA and ANM data-sharing solutions; where unsuitable, identify the need for a new software tool.
- Demonstrate a Proof-of-Concept in a simulated environment to test feasibility and validate system design choices.
- Ensure stakeholder alignment across NESO, TOs, and DNOs on operational data requirements and constraints.
- Provide initial insights into sub-network characteristics, including headroom, ramp-rates, and supply reliability.

Longer-term (beyond Discovery phase)

- Develop a sophisticated software tool capable of seamless integration across NESO, TO, DNO, and Grid Supply Point data (a 'common adapter').
- Enable secure, reliable, and scalable data exchange to support transmission-distribution coordination.
- Support cost reduction for consumers by optimising dispatching and minimising conflicts in ANM operation.
- Contribute to a BAU pathway for wider deployment of CASCADE, building on learning from the Proof-of-Concept.
- Inform understanding of how ANM systems interact with external impacts (e.g., transmission constraints), shaping future industry standards.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

NESO does not have a direct connection to consumers and therefore is unable to differentiate the impact on consumers and those in vulnerable situations.

Success Criteria

- Delivery of a set of core documents including initial use-stories, use-cases, requirements, a cost benefit analysis and proposed solution architecture optioneering. This phase will also start to define the success criteria and development stages required if phase 2 of the project is to go ahead to ensure that the developed proof of concept tool delivers data visibility to network partners in a way that is useful for system operation.
- A clear list of success requirements agreed among all the different stakeholders and a streamlined approach to the POC stage
- Strong alignment with strategic industry initiatives and the possibility to provide useful outputs for other projects to lean-on future developments.

Project Partners and External Funding

· SSEN-T, SSEN-D

· Frazer Nash Consultancy

· Northern Power grid

No external funding will be required.

Potential for New Learning

The project will generate new learning on how ANM data can be shared consistently and securely across different timescales. By developing and testing a Proof of Concept, CASCADE will provide the first practical evidence of how ANM data sharing can operate in real time, forecasting, planning and market contexts.

CASCADE will also establish validated principles, models and requirements that can support industry wide standards currently under development. This will clarify what is technically feasible, what is operationally required, and which interfaces or processes need to be standardised.

Learning from CASCADE will be disseminated through:

- Formal project reports, including use cases, specifications, optioneering outcomes and success criteria.

- Industry working groups and partner workshops, enabling TOs, DNOs and the SO to adopt emerging practices
- Sharing via national innovation platforms, such as the Smarter Networks Portal and NESO's Innovation website.
- Integration into wider programmes, such as RDPs and DSI, where CASCADE evidence can accelerate delivery and refine their approaches.

The project will also produce new insights into operational coordination between TO, SO and DNOs, which will be compiled into clear guidance and shared across the sector to inform future operational and design approaches.

Scale of Project

The project spans across a 5-month Discovery, with the support granted by the partners. Discovery will consist of desk-based research, use-case and requirements documentation from different partners, stakeholder engagement and a cost benefit analysis that will lead to optioneering and solution assessment.

A new project will be registered for the proof-of-concept phase which we anticipate lasting 12-24 months.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL4 Bench Scale Research

Geographical Area

The project will be conducted in GB and there will be a particular focus on the regions that represent NESO's partners license area (NPg, SSEN).

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£300,000 for Discovery Phase.

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 CASCADE projects have the potential to significantly facilitate the energy system transition by addressing key challenges in data sharing and coordination among network stakeholders. By developing a Proof-of-Concept tool that connects NESO control room data with Transmission Operator (TO) and Distribution Network Operator (DNO) data, the project aims to improve visibility and coordination of Active Network Management (ANM) systems.

This enhanced coordination is expected to optimise dispatching instructions, reduce conflicts between NESO and DNO operations, and ultimately support the balancing of energy flows across the national system 2. The project also aims to leverage existing Open Network Programme (ONP) initiatives and Ofgem directives to ensure alignment with industry standards and regulatory requirements.

By providing a practical implementation of data-sharing procedures, CASCADE will help to create a more efficient and reliable energy management system, which is crucial for the transition to a sustainable and resilient energy future.

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

This project will not deliver direct benefit to consumers in vulnerable situations, however the reduction in system operation costs that better coordination will result in will impact all energy consumers.

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)

This project will not deliver direct benefit to consumers in vulnerable situations, however the reduction in system operation costs that better coordination will result in will impact all energy consumers.

Please provide a calculation of the expected benefits the Solution

This will be calculated and taken into account in the cost benefit analysis in the discovery phase of the project.

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

How the solution can be used with all networks across GB will be considered within the discovery phase.

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

To be calculated in the discovery phase.

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

The success of the CASCADE projects will be measured by their ability to deliver an industry-wide practical methodology for ANM data-sharing across multiple timescales, supporting real-time operations, forecasting, planning, and market activities. CASCADE will act as the first demonstrator for these concepts and standards, proving their scalability and interoperability while setting a benchmark for future initiatives. The project's outputs should accelerate other industry-wide programs, such as RDPs and DSI, by incorporating learnings that significantly reduce their delivery timelines. Additionally, CASCADE will establish clear operational coordination rules between Transmission Operators, System Operators, and Distribution Network Operators, resulting in demonstrable improvements in network efficiency and reliability.

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

This will be the first tool developed specifically for NESO, designed to support future scenarios and deliver optimized network functionality. Although several projects within the energy innovation sector have explored aspects of this challenge, many of their findings and opportunities have been constrained by the absence of robust control and communication infrastructure. Our goal is to close this gap by adopting a Whole System perspective. Existing limitations in communication protocols and operational procedures risk restricting overall system capability. CASCADE will assess and mitigate these risks through a dedicated Definition of Need (DoN) sub-task.

Related Projects:

- Optimal Coordination of Active Network Management Schemes and Balancing Services Market [National Grid] [NIA_NGSO0035] highlighted the risks associated with uncoordinated ANM schemes and Balancing Services.
- ANM Balancing Coordination Demonstration (ABCD) [National Grid] [NIA_WPD_071] proposed functionality to manage these schemes but identified critical shortfalls in the control and communication infrastructure required for implementation.

ANM Good Practice Guide [ENA] identifies the lack of sub-network visibility – ANM 'Black Box' and discusses a lack of convergence on communication infrastructure.

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

This is the first tool that will be developed specifically for NESO and the future scenarios planned, including optimised network functionality. Several projects within the energy innovation sector have addressed elements of this issue. However, many of the conclusions and opportunities derived from these activities are restricted by the lack of control and communication infrastructure. We aim to address this gap from a 'Whole System' perspective. The DNO's utilise multiple ANM Scheme technologies this will provide one answer to this problem.

Relevant Foreground IPR

Report including:

- Definition of need and use cases
- System Specification
- Roadmap
- Test requirement and success criteria
- Cost Benefit Analysis
- Optioneering outputs

Data Access Details

Data for this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the new Strategic Innovation Fund (SIF) can be found or requested in a number of ways:

1. A request for information via the Smarter Networks Portal at https://smarter.energynetworks.org, to contact select a project and click ‘Contact Lead Network’. National Energy System Operator already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.

2. Via our Innovation website at https://www.neso.energy/about/innovation

3. Via our managed mailbox innovation@neso.energy

Details on the terms on which such data will be made available by National Energy System Operator can be found in our publicly available “Data sharing policy relating to NIC/NIA projects” at https://www.neso.energy/document/168191/download

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

The Network Licensee is not funding the CASCADE project as part of its business-as-usual activities because the project involves innovative elements that require a comprehensive whole-system approach, which is not feasible within the constraints of regular operations. The project aims to address specific challenges related to software and data communication infrastructure, which have not been fully tackled by previous initiatives. Additionally, the project introduces significant risks due to its multi-disciplinary nature, making it more suitable for a collaborative innovation environment.

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

Functional applications which link closely with the expected use case of this tool have been explored, in previous innovation projects.

DER Visibility, Fractal Flow (SIF) and COMMANDER. However, they have not yet been able to deliver a usable tool to provide ANM visibility due to a lack of software and data communication infrastructure required to interface NESO control with sub-network ANM boundaries. CASCADE will directly address this issue.

CASCADE's vision to unify NESO's operational requirements in a scalable and future proof software platform will require a comprehensive whole system approach not possible outside of an innovation environment. The benefits are expected to be significant, yielding realisation of functional elements proposed in a number of other innovation projects.

Delivering such a tool requires addressing complex, multi-disciplinary aspects, which introduces significant risk.

This project has been approved by a senior member of staff

☑ Yes