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

May 2025

Project Reference Number

NGED_NIA_080

Project Registration

Project Title

Connection Journeys AI

Project Reference Number

NGED_NIA_080

Project Licensee(s)

National Grid Electricity Distribution

Project Start

June 2025

Project Duration

0 years and 7 months

Nominated Project Contact(s)

Rios Smith

Project Budget

£418,859.00

Summary

The ‘Connection Journeys Artificial Intelligence (AI)’ project aims to assess the opportunity for AI across the High Voltage (HV) and Extra High Voltage (EHV) connection journeys through the delivery of an AI Roadmap and Proof of Concept (PoC). The project will continue the drive towards greater digitalisation and help achieve the RIIO-ED2 strategic outcome of ‘connectability’ in the wider context of connection reform.

Third Party Collaborators

EA Technology

baringa

Problem Being Solved

Within the energy sector, one of the biggest topics of the last three years has been the size of the queue to connect to the electricity grid. NGED’s queue is now over 50 GW and includes more than double the amount of generation needed for CP30. The challenge is greatest at the HV and EHV levels where the queue continues to grow and where both generation and demand connections are a time-intensive and multi-team process.

Currently there is limited understanding of where AI could be applied in the HV and EHV connection journeys, where it should be prioritised and the specific gaps which could prevent the full capability of AI from being realised.

Method(s)

The project will seek to understand where the opportunities for AI are, which we should prioritise, and select one to develop into a demonstratable Proof of Concept (PoC) through seven work packages (WP). Baringa are leading the project with EA Technology providing additional support and power systems engineering expertise. These work packages are outlined below.

WP1 – Customer Journey Analysis

The project begins with Baringa leading and EA Technology supporting a review of the HV and EHV connection journeys; identifying the commonalities, and understanding the detailed processes behind each stage of the connection journey. The first part of this is a high-level workshop with senior managerial stakeholders. The purpose of this workshop is to set the strategic outlook for the project and to get a high-level view of where the perceived pain points are. The subsequent three workshops are specific workshops to focus on the three connections tranches identified below:

1. pre-application,
2. application and offer, and
3. energisation.

WP2 – AI Use Case Prioritisation

The second work package focuses on determining how the use cases for AI should be prioritised. This will be achieved through a prioritisation workshop consisting of the same senior managerial staff who attended the mobilisation workshop. This will enable the project partners to understand the factors that affect business stakeholders' willingness to engage with AI in particular areas generally. It will also help to inform how to choose the most valuable PoC.

WP3 – Use Case Analysis

Once the general AI prioritisation criteria has been established, the project partners will need to investigate what is possible within NGED's systems through meetings with IT and Data stakeholders. There is also the need to understand what other AI projects may be happening throughout the business. This will start to inform thinking for the WP4 Roadmap but most crucially will enable a final use case ranking for AI which has considered technical constraints within NGED systems.

WP4 – PoC Design

This stage focuses on the design of the chosen PoC as identified in WP3. During this work package, the project partners will develop a first visual design of the PoC to present to key IT/technical stakeholders. Technical stakeholders will then be able to feedback on this. This will inform the stage gate and enable project sponsors to make a decision on whether to continue to the PoC demonstration stage.

WP5 – HV and EHV Connection Journeys AI Roadmap

WP5 will then consolidate the learnings from WP1, WP2 and WP3 in order to create a forward-looking roadmap for NGED to be able to have a view as to what needs to happen in two, five, seven years to implement or to prepare for AI in the HV and EHV connection journeys. If the PoC delivery stage does not go ahead, then this will be the key outcome from the project.

STAGE GATE – Decision to be made on whether or not to go ahead with PoC

WP6 – PoC Delivery

WP6 will deliver a PoC which can be demonstrated to stakeholders and will help determine whether the project goes on to further phases. This will be presented to stakeholders in combination with the AI Roadmap to provide a full picture as to the outcomes of the project.

WP7 – Learning Capture and Dissemination

WP7 will bring the project to a close with an external dissemination event and a final project report. This project report will capture all

the learnings gathered from stakeholders in WP1 and show how stakeholder knowledge and opinion has informed the development of the two key deliverables which are the AI Roadmap (WP5) and the PoC (WP6). It will end with the next steps in terms of recommendations and what further project phases could look like.

Scope

The HV and EHV connection journeys are distinct but have numerous commonalities and can be broken down into the following tranches: pre-application, application and offer, and energisation. Currently there is limited understanding of where AI could be applied in these connection journeys, where it should be prioritised and the specific gaps which could prevent the full capability of AI from being realised. The scope of the work is therefore, as given in the work packages, to understand the HV and EHV connection journeys and where AI could be applied, to determine the use cases and prioritise them for further development and to develop a PoC solution for a selected use case.

Within the last decade there has been huge change in the targets which have been set to the networks and the wider energy sector:

2019 – Climate Change Act 2008 (2050 Target Amendment) Order 2019 made reaching net zero by 2050 legally binding in the UK.

2021 – UK committed to decarbonise the electricity system by 20235.

2024 – Clean Power 2030 (CP30) has set a new target for Great Britain's electricity demand to be met by clean power by 2030.

It is impossible to know what new changes and targets the next decade may bring but it is clear that Distribution Network Operators (DNOs) like NGED will require modern and adaptable HV and EHV connection journeys to facilitate them. NGED has begun to implement efficiencies and greater digitalisation in its connection journeys, but by bringing the future of AI into the present, this innovation project will ensure that DNOs are creating ambitious and future-proofed connection journeys with the capability to take us to net zero.

Benefits for the DNO are expected to mostly relate to time savings for both the DNO and the customer. It is hoped that AI will also be able to identify erroneous data and provide an improved customer experience.

Objective(s)

1. Understand the current pain points within the HV and EHV connection journeys.
2. Understand the potential AI use cases and develop a suitable prioritisation criterion for ranking.
3. Design a proof of concept.
4. Create an AI roadmap which will act as a guide for stakeholders in understanding what steps to take to implement AI.
5. Deliver a proof of concept which can be demonstrated to stakeholders (after stage gate).
6. Create a plan for future phases of the project.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

The implementation of AI in the HV and EHV connection journeys could offer benefits to customers as well as to the wider business. This phase of the project is heavily focused on understanding the connection journeys – what are the processes, where are the pain points for staff and for customers and where might AI add the greatest value. This part of the project will therefore help us to understand more about how consumers in vulnerable situations could benefit from the implementation of AI in connections and embed this into further phases of the project.

Success Criteria

- To map out, using stakeholder workshops, the HV and EHV connection journeys from pre-application to energisation with the pain-points and opportunities for AI.
- To create a use case ranking which provides a long-term view on which AI use cases should be prioritised.
- To create a high-quality roadmap which will act as a guide for stakeholders in determining the sequential steps that should be taken to either implement AI or to get NGED systems AI ready for the HV and EHV connection journeys.
- To achieve good buy-in from IT stakeholders with a specific PoC design workshop so that deliverables like the roadmap take into consideration the IT project pipeline and so that the PoC developed can be developed with business-as-usual integration in mind.
- A well-informed stage gate which gives the opportunity to continue to PoC delivery or stop at the roadmap.
- If desired the delivery of a functioning and demonstratable PoC which gives stakeholders the opportunity to see an AI use case in action and then to determine whether to continue the project to further phases.
- A reasoned view including costings of what further phases of the project could look like.

Project Partners and External Funding

Baringa Partners

… Baringa Partners has extensive experience in the energy sector, providing strategic and operational consulting services to clients across the entire energy value chain. Their expertise includes advising on energy transition, renewable energy integration, market design, regulatory compliance, and risk management. They also specialize in leveraging AI, data analytics and machine learning to drive business transformation. They have proven experience in designing and delivering AI use-cases and were the team behind building and delivering the ENA Connect Direct solution. Baringa's approach is tailored to address specific business needs, combining deep industry insights with cutting-edge AI capabilities. This enables energy companies to unlock new opportunities, optimize processes, and achieve sustainable competitive advantages in an increasingly digital world.

On this project Baringa will:

- Lead the review of the end-to-end connections journey to explore AI use-cases across the end-to-end connections value chain with NGED stakeholders.
- Bring AI experts to build a backlog of AI use cases, further refine them, and develop an AI roadmap for NGED.
- Support NGED to identify the use-case for a PoC and then go on to design and deliver the PoC to support the identified use-case.

EA Technology Ltd

…is a leading specialist in power systems engineering, focusing on innovation to support electricity networks in delivering a reliable, efficient, and net-zero future. With decades of experience in asset management, network automation, and advanced power system analysis, they provide cutting-edge solutions that enhance network resilience, optimise connections, and facilitate the integration of low-carbon technologies.

On this project EA Technology Ltd will:

- Bring experts involved in the existing connections process and power system analysis to identify barriers and opportunities.
- Support value mapping for AI solutions at different stages in the connections journey.
- Support the development of an AI roadmap and how integration steps with existing toolsets may be needed.
- Leverage their existing expertise provided through their VisNet Connect connections processing toolset to highlight integration opportunities across the complete HV and EHV connection journeys.

Potential for New Learning

How AI can best be deployed in the HV and EHV connection journeys is currently an unknown.

The project will generate the following learning:

- Mapping of the end-to-end HV and EHV connection journeys.
- High-level managerial view of the journey pain points and AI opportunities supported by workshops with those doing the day-to-day work.
- An understanding of where AI could be used and where it should not be used.
- A ranking of the AI use cases based on suitable prioritisation criteria.
- An AI roadmap to guide stakeholders as to the steps that they should take in 2, 5, 7 years' time. The point being that even if it is too soon to implement AI in DNO systems, stakeholders will understand what they need to do to get AI ready.
- How easy or difficult it may be to create proof of concepts from the AI use case ranking.
- A fuller understanding of the value (financial and non-financial) that AI can bring to the HV and EHV connection journeys.
- Understand next steps of how the project can be taken to the next phase and to BAU.

Scale of Project

The potential financial savings from AI could be huge. Learnings unlocked during the project will give a greater understanding of this, however preliminary analysis shows potential time savings of approximately £2.5 million per annum. There are further financial benefits for unlocking capacity and addressing connections reform. Additionally, in order to meet CP30 and Net Zero 2050, we need to invest in the technology that will allow us to deliver new demand and generation where it is needed.

A stage gate has been included reflecting the current lack of information on AI opportunities. Finishing at that stage would still enable

us to unlock many of the learnings and objectives outlined in this document including an AI roadmap. If the project continues to full completion, then the project will also have delivered a demonstratable proof of concept with a plan for delivering further project phases including making the PoC a part of business as usual.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL3 Proof of Concept

Geographical Area

This project is applicable to all of NGED's license areas (South West, South Wales, East Midlands, West Midlands). Whilst some of the recommendations and findings will be specific to NGED systems and processes, there will be relevant learnings for all networks to take away in terms of the opportunity that AI represents for HV and EHV connection journeys.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

Total Project Costs: £418,859.00

Total Partner contributions: £75,823.91

Funding from NIA: £376,973.00

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:

National Grid Electricity Distribution's (NGED) generation queue is now over 50 GW and includes more than double the amount of generation needed for Clean Power 2030 (CP30). The challenge is greatest at the High Voltage (HV) and Extra High Voltage (EHV) levels where the queue continues to grow and where both generation and demand connections are a time-intensive and multi-team process. We know that the demand for electricity will continue to grow with the increasing electrification of transport, heating and industry. NGED has begun to implement efficiencies and greater digitalisation in its connection journeys, but by bringing the future of AI into the present, this innovation project will ensure that DNOs are creating ambitious and future-proofed connection journeys with the capability to take us to net zero.

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

The implementation of AI in the HV and EHV connection journeys could offer benefits to customers as well as to the wider business. This phase of the project is heavily focused on understanding the connection journeys – what are the processes, where are the pain points for staff and for customers and where might AI add the greatest value. This part of the project will therefore help us to understand more about how consumers in vulnerable situations could benefit from the implementation of AI in connections and embed this into further phases of the project.

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)

N/A

Please provide a calculation of the expected benefits the Solution

Time Saving… One of the benefits of AI is the time-savings that it can bring. In assessing the opportunity for AI across the connections journey from pre-application, to application and offer, to energisation, we are looking at an opportunity to save company time across numerous teams and across all of NGED's license areas.

In a study of 35,000 workers across 27 global markets, it was found that employees saved on average an hour a day from the use of AI in the workplace. This was found to be highest in the energy, utility and clean technology sectors where the average time saving rose to 6.25 hours per week. When this is applied to NGED's staff working within the HV and EHV connections journey the time saving could be more than £2.5 million per annum. This was calculated by taking the salaries of staff who work on a part of the HV and EHV connection journey, assuming that 50% of their time is dedicated to HV and EHV connections, and applying the average hour a day AI saving found in the study above.

With this first phase of the project estimated to cost £418,859.10, this presents a strong initial case for investment. Time freed up would enable staff to focus on other tasks, increase accuracy and increase our efficiency as a business, which will ultimately benefit our customers. The Customer Journey Analysis (WP1) segment of the project will enable us to get a more accurate understanding of the scale of the time-saving benefit for future projects.

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

All DNOs can benefit from the use of AI in the HV and EHV connection journeys. Using AI in the connection journeys could support a quicker, smarter energy transition.

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

As the project is primarily research focused, there is not a cost of rolling out the method across GB. The cost of roll out in future phases will be heavily dependent on which AI use cases are identified and prioritised. This first phase of the project will provide us with this understanding.

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 learning generated through this project will provide Network Licenses with an understanding of where AI can be used in the connection process. In particular for DNOs it will provide a view of the best AI use cases specifically for the HV and EHV connection journeys. An AI roadmap will give a range of stakeholders an idea of the steps that their business needs to take to get ready for the world of AI. Some of the benefits that this learning will unlock are outlined below:

- Save staff time
- Minimise human error
- Improve customer experience
- Maximise incentives, minimise penalties
- Systems of the future
- CP30 and Net Zero

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.

There are innovation projects that have looked at the use of AI on the Networks, most commonly linked to storm and fault work. This, however, would be the first innovation projects to consider how we can use AI across the HV and EHV connection journeys all the way from pre-application, through to application and offer, through to agreement and energisation.

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

The integration of AI-driven solutions into the HV and EHV connection journeys represents a forward-looking approach to modernising energy infrastructure operations. While these journeys are currently undergoing substantial digitalisation and efficiency improvements, we need to leverage AI in innovation now to create the connection journeys of the future.

This project focuses on identifying and prioritising AI-driven solutions that offer the greatest value and developing Intellectual Property that leverages the latest advancements in AI, such as Generative AI. A range of AI solutions are available to support the connections journey, a few of which have been utilised by energy networks but all of which carry some risk in implementation. It is important to understand how each step of the connections journey can leverage AI solutions, the risks involved, and the potential value available to energy networks and consumers. This project will determine the most appropriate AI implementations for each step of the process.

Once these opportunities are understood, the focus can shift to developing an initial PoC in this phase and, ultimately, a suite of AI capabilities for the various stages of the connection journey that offer the greatest value, considering data requirements and consumer benefits. The ambition is that these can be taken forward to development to realise business-as-usual toolsets.

This demonstrates a strategic and methodical approach to innovation. By carefully evaluating the potential value of the latest advancements in AI, their subsequent impact and integration into existing processes, the project aims to ensure that innovation is purposeful and aligned with NGED's goals.

Relevant Foreground IPR

The relevant foreground IPR is:

- All deliverable reports and products produced during the project delivery.
- Based on the project partner costs, foreground IPR would be split 3.4:1 between Baringa and EATL.

Project partners do not have any specific background IPR but EATL does have other connection related products that have background IPR. These are VisNet Connect, VisNet ConnectLite and VisNet Design.

Data Access Details

There is no expectation that there will be data that cannot be released to interested parties. The only exception would be specifics relating to NGED IT systems which might need to be protected in relation to critical national infrastructure.

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

This is a research project which will have benefits to other Network Licenses. AI is seen to be at the cutting-edge of new technologies and it makes sense that we should share the learnings from the project with other Network Licensees. As AI is a new technology within connections, it is unproven and too high-risk to be a BAU activity. Learnings from the project will, however, be used to inform our RIIO-ED3 business plan so that we will be able to invest in AI in the HV and EHV connection journeys as part of business as usual.

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 would not be undertaken without NIA funding as AI in the HV and EHV connection journeys is still an unknown with a low technology readiness level (TRL).

Risks include, but are not limited to, the technology is too immature, our systems are not compatible with AI, customers and/or staff do not want to implement AI at this time.

This project has been approved by a senior member of staff

☑ Yes