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

Feb 2024

Project Reference Number

NIA2_NGESO064

Project Registration

Project Title

Generative AI Discovery

Project Reference Number

NIA2_NGESO064

Project Licensee(s)

National Grid Electricity System Operator

Project Start

February 2024

Project Duration

0 years and 2 months

Nominated Project Contact(s)

Vikaran Khanna

Project Budget

£36,000.00

Summary

Generative AI (Gen AI) creates diverse, realistic artifacts across various domains, including images, video, music, speech, text, etc. Its applications range from common tasks like composing emails to complex data analysis. This project will explore high impact use cases appropriate for Gen AI deployment across the ESO. Open Data initiatives will then be used to lab test three priority use cases on publicly available data. This comprehensive approach will underscore the transformative potential of Gen AI in producing scalable, diverse artifacts reflective of its training data without replication.

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

Gen AI is a disruptive technology and the potential benefits and risks of its use within the ESO and the wider energy industry are not currently well understood. Before adoption, use cases must be tested and validated in an iterative way using clear data sets, and the benefits and risks of the technology need to be identified and analysed before being applied into operational environments. The project aims to discover and qualify how Gen AI can add value to ESO's strategic objectives. This involves leveraging Azure's cloud infrastructure and harnessing the capabilities of Azure OpenAI generative models.

Method(s)

This project aims to discover and qualify how Gen AI can potentially add value to the ESO's strategic objectives, leveraging Azure's cloud infrastructure and harnessing the capabilities of Azure OpenAI generative models.

The core technical aspects of the project include –

- Identification of more than 15 use cases across the business, where Gen AI can augment current workflows and aid in improving processes. Through this engagement the project will deepen awareness and understanding of technology.

- Testing and validating: We will prototype Gen AI solutions for 3 high priority use cases. This will enable the testing and validating of the technology and identify ways of working with technology. The prototypes will be demonstrated to a wider audience within ESO to share learnings and inform future actions.

Representative public datasets (e.g. ESO data portal) will be used for lab testing. The solutions will be built and tested on supplier's environment.

Importantly from a data governance, security and privacy point of view the data is ring fenced. Therefore, data from our lab tests – prompts (inputs) and completions (outputs), embeddings, and training data

- are not available to OpenAI
- are not used to improve OpenAI models
- are not used to improve any Microsoft or 3rd party products or services
- are not used for automatically improving Azure OpenAI models

Furthermore, to reduce hallucinations (incorrect or misleading results that AI models generate), a Retrieval Augmentation Generation (RAG) will be implemented. RAG is an architecture that augments the capabilities of a Large Language Model (LLM) like ChatGPT by adding an information retrieval system that provides grounding data. Adding an information retrieval system gives control over grounding data used by an LLM when it formulates a response.

This project will be delivered within the following work packages:

Work package 1 – Discovery and write up of 15 use cases:

- Familiarisation with use case prioritisation framework developed within the AI CoE (NIA2_NGESO021).
- Identification and research of use cases through workshops with key stakeholders.
- Conduct use case initial prioritisation with ESO stakeholders.
- Finalise 15 use cases and identify top 3 priority use cases to take forward for lab testing

Work package 2 – Lab testing of 3 high priority use cases:

- Complete lab testing of 3 use cases.
- Conduct model testing and validation.
- Run demo sessions to showcase lab test results.

Work package 3 – Develop high level business case:

- Document and share final results

This project will utilise representative public data sets for the development and lab testing of the use cases. Benchmarking of lab testing outputs will be performed were possible by comparing with existing quantitative or qualitative data available from business owners, considering the time, effort, and quality of existing outputs.

In line with the ENA's ENIP document, the risk rating is scored Low.
TRL steps = 1
Cost = 1 (<£500k)
Suppliers = 1 (1 supplier)
Data assumptions = 1 (Defined assumptions & principles)
Total = 4

Scope

This project will utilise representative public data sets for the development and lab testing of the use cases. Benchmarking of lab testing outputs will be performed were possible by comparing with existing quantitative or qualitative data available from business owners, considering the time, effort, and quality of existing outputs.

In-scope: Generating unstructured text data, interpreting plots, graphs and figures embedded within reports, and synthetic data generation/exploration (tabular data containing text and numeric data) are marked as in-scope.

Out of Scope: Generating images/audio/video are marked as out-of-scope, as those solutions will require more sophisticated generative models and evaluation.

Objective(s)

The objective of this project is to identify and test use cases for Gen AI technology across a range of core ESO roles: knowledge management, stakeholder engagement and customer operations. Prototyping use cases will identify additional business uses and ways of working responsibly with the technology and uncover limitations and opportunities of using Gen AI in workflows.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

This project has been assessed as having a neutral impact on customers in vulnerable situations because it is a transmission project.

Success Criteria

The following will be considered when assessing whether the project is successful:

- The project delivers against objectives, timescales and budgets as defined in the proposal.
- 15 relevant use cases clearly documented, and 3 high priority use cases agreed for lab testing.
- Lab testing using smaller public datasets completed.
- Necessary technical and data enablement details for scalable implementation documented.
- Successful benchmarking against existing quantitative or qualitative business data.

Project Partners and External Funding

ITC Infotech. No external funding.

Potential for New Learning

Although the underlying technology for Gen AI has been around for some time, the use of Large Language Models (LLM) to address a diverse range of business functions is new. This project will provide learnings to understand the robustness and applicability of applying Gen AI to workflows and use cases within the ESO and the energy sector operational environment. The project will have the potential to inform best practice for integrating and scaling Gen AI into various domains while mitigating risks and maximising benefits.

Scale of Project

This is a 10-week project with one project partner which will provide an initial indication of Gen AI applications. The main project output will be a report which captures the main work package deliverables.

Technology Readiness at Start

TRL7 Inactive Commissioning

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

This project will be based upon the GB ESO area of operations.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£36,000

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:

Gen AI has the potential to facilitate the pace, scale and complexity of change required in the transition to a zero-carbon energy system through enhanced decision-making, increased productivity, and advanced data analytics. This project involves demonstrating use cases where Gen AI may be appropriate to improve productivity and efficiency when considering processes within the overall energy sector and to facilitate the transition to net-zero.

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

N/A

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

There are multiple benefits of this project such as:

- Improved decision-making based on early identification of any emerging trends, opportunities, or potential risks.
- Provide the ability to respond quickly to changes in the market.
- Increased efficiency and cost savings through the automation of the identified use cases.

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

The technology showcased in this project is designed for scalability and adaptability. LLMs are tailored for specific use cases and easily scalable to accommodate new users from diverse geographical areas.

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

This project will provide initial indications of applying Gen AI to relevant use cases, further work will be required following completion of this project to establish implementation of any specific use cases and results into BAU.

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 use of Large Language Models (LLM) to address a diverse range of business functions is new. This project will provide learnings to understand the robustness and applicability of applying Gen AI to workflows and use cases that can be applied in the energy sector operational environment. The project will have the potential to inform best practice for integrating and scaling Gen AI into various domains while mitigating risks and maximising benefits.

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 project is the first exploration of Gen AI solutions within the ESO. The governance of the project involves a Working Group (WG) comprising of teams which will be responsible for implementation of Gen AI in the business. The WG will be consulted and informed throughout the implementation of the project. Demos of lab tests will be open to teams across the ESO so that learnings can be widely shared and help inform future work with Gen AI. This is the first Gen AI project to carried out by the Network Licensees on the Smarter Networks Portal.

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

Gen AI and LLMs are rapidly changing the landscape of many domains and technologies. This project is based on applying these cutting-edge technologies capable of saving manual time and efficiency in the identified use case workflows. It can aid in analysing

vast amount of textual data to uncover insights for generating solutions which can aid in decision making process. The results of this project may help with early adoption of the technologies within the energy sector, strengthening the ability to meet net-zero objectives.

Relevant Foreground IPR

No Foreground IP is expected to be generated in the course of the project.

Data Access Details

Data for this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the 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 Grid ESO 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.nationalgrideso.com/future-energy/innovation
3. Via our managed mailbox innovation@nationalgrideso.com

Details on the terms on which such data will be made available by National Grid ESO can be found in our publicly available "Data sharing policy relating to NIC/NIA projects" at https://www.nationalgrideso.com/document/168191/download.

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

Gen AI (specifically LLMs) with human like conversational abilities is a recent development (ChatGPT was released on 30th November 2022) and involves a rapidly evolving landscape, impacting a number of domains. Gen AI is predicted to have a transformative impact on knowledge work, however since it is at a nascent stage, use cases must be tested and validated in an iterative way to identify risks, opportunities, and ways of working with the technology. Importantly, with data being a key enabler, data governance frameworks also need to be scoped before implementation.

Risks such as hallucination and non-deterministic outcomes may be realised if Gen AI is used within BAU projects. These risks can be identified and analysed within this project.

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

Gen AI is at very early stages of application; therefore, it is more beneficial for use cases to be rapidly tested and validated in an iterative way, this makes the project more suitable for development through NIA funding. The lab tests will provide proof of concept results, and by funding through NIA will enable these results to be published and more widely adopted by others within the sector.

This project has been approved by a senior member of staff

☑ Yes