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

NIA2_NGET0092

Project Registration

Project Title

DCConnect

Project Reference Number

NIA2_NGET0092

Project Licensee(s)

National Grid Electricity Transmission

Project Start

June 2025

Project Duration

1 year and 1 month

Nominated Project Contact(s)

Neha Moturi

Project Budget

£230,000.00

Summary

Data centres are rapidly emerging as a concentrated and growing source of electricity demand. Their scale, speed of deployment, and clustering tendencies pose a unique set of challenges for NGET's transmission network planning. As this demand accelerates, it becomes critical to understand not only the total load increase, but also the location, timing, and operational characteristics of new facilities. This project focuses on understanding and visualising data centre projections, alongside a review of possible network mitigation strategies. The objective is to support NGET's understanding of the key factors influencing data centre siting and operation, and to inform strategic planning by improving visibility of potential future scenarios – both across the England & Wales transmission network and at the GSP level within distribution networks.

Third Party Collaborators

TNEI Services Ltd

Nominated Contact Email Address(es)

box.NG.ETInnovation@nationalgrid.com

Problem Being Solved

The rapid growth of data centres, driven by digitalisation, AI and cloud services, is creating significant and spatially concentrated demand on the electricity network. This growth is often clustered near urban or industrial areas, where existing grid capacity is limited and reinforcement lead times are long. Data centres typically seek early and firm connections, often well ahead of when network upgrades can be delivered. This mismatch between demand timelines and infrastructure readiness leads to several challenges. These include but not limited to network congestion and connection delays, inefficient or reactive infrastructure investment, underutilised or stranded assets and increased cost to consumers and the wider system. Existing planning tools and processes are not designed to assess the long-term impacts of this demand or to identify the full range of grid and non-grid solutions available to network operators. Without the targeted tools and foresight, Network Planners may struggle to respond effectively to this rapidly growing and high impact

demand type.

Method(s)

R&D has been selected as the approach for this project as it enables a thorough investigation of long-term drivers for data centre growth, market trends, emerging technologies, future uncertainties etc. that standard methods may not adequately address. R&D allows for the development of tailored forecasting models and the identification of innovative grid and non-grid solutions to manage these connections.

Data Quality Statement (DQS):

· The project will be delivered under the NIA framework in line with OFGEM, ENA and NGGT / NGET internal policy. 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 on our internal sharepoint platform ensuring access control, 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 our supplier's own quality assurance regime. Quality assurance processes and the source of data, measurement processes and equipment as well as data processing will be clearly documented and verifiable. The measurements, designs and economic assessments will also be clearly documented in the relevant deliverables and final project report and will be made available for review.

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

TRL Steps = 2

Cost = 1

Suppliers = 1

Data Assumption = 2

Scope

WP1 focuses on establishing an evidence base for data centre developments, including existing and pipeline projects, siting drivers, growth patterns, and developer perspectives. It will consolidate publicly available data, engage with key industry stakeholders, and explore both technical and commercial considerations shaping data centre demand. The outputs of this work package will inform scenario development and grid-level mitigation strategy design in WP2.

WP2 builds on the research phase and stakeholder insights to develop future data centre growth scenarios and assess potential grid side mitigation strategies. Scenarios will be informed by market understanding, developer insights, and regional planning trends, with spatial modelling used to identify potential zones for data centre development. Additionally, this work package will explore the use of statistical modelling to predict data centre capacity and siting.

WP3 focuses on the development of an interactive visualisation tool to support scenario exploration and inform strategic planning, building on the spatial and temporal modelling conducted in WP2. The dashboard will integrate data centre growth scenarios with network development plans where applicable, enabling NGET to observe potential network impacts and identify emerging constraints in a user-friendly interface.

WP4 builds on the scenario projections and visualisation tools developed in WP2 and WP3 to enable assessment of the network impacts associated with future data centre growth. It involves constructing a simplified static AC load flow model of the England & Wales transmission system and evaluating the thermal and voltage impacts of different data centre scenarios. This will be provided alongside the visualisation tool and will support in anticipating where constraints may emerge under different scenarios and what mitigation measures may be required.

Objective(s)

The objective of this project is to extend existing modelling tools within NGET with long-term data centre demand forecasts and investigate the mitigation strategies, both grid and non-grid, to alleviate congestion on the network.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

An assessment of distributional impacts (technical, financial and wellbeing related) for this project has been carried out using a bespoke assessment tool, which assesses the project as having a positive, negative or neutral effect on consumers in vulnerable situations. To help inform the assessment, this tool considers the categories of consumers identified in the Priority Services Register.

This project has been assessed as having an overall positive impact on consumers in vulnerable situations. The assessment has identified that this project will look to (please select/delete as appropriate) reduce the costs for households, improve the exchange of information between networks and customers while reducing the amount of disruptions to them in the home. Other considerations including the projects impact on supply, immediate health and safety in the home have been made in carrying out this assessment.

Success Criteria

The project will be deemed successful once the required tasks within each work package are complete. These tasks include data gathering (including any relevant stakeholder interactions and data consolidation work), development of data centre growth scenarios, GIS outputs, identification of load management strategies, interactive dashboard tool & AC load flow capability embedded into the agreed platform within NGET. Outputs will be delivered alongside any relevant user guidance material, presentations and/or handover sessions.

Project Partners and External Funding

There are no other financial contribution from project partners.

Potential for New Learning

Data produced through the project will be embedded into existing planning tools within NGET such as Neptune and Triton alongside any relevant user guidance material. Learnings can also be disseminated through conferences, academic papers, webinars etc.

Scale of Project

This project has been graded as a high TRL project upon completion as learnings will be embedded into existing planning tools upon completion. A smaller scale project runs the risk of not being fully embedded into business-as-usual processes, which may limit its influence on strategic decision-making, particularly in critical areas such as long-term infrastructure planning.

Technology Readiness at Start

TRL4 Bench Scale Research

Technology Readiness at End

TRL8 Active Commissioning

Geographical Area

This is a desk-based project meaning the research and analysis will be conducted remotely and will involve in-person stakeholder meetings as necessary to meet the project objectives.

Revenue Allowed for the RIIO Settlement

N/A

Indicative Total NIA Project Expenditure

£207,000

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:

This project supports the energy system transition by providing long-term visibility of data centre demand and integrating both grid and non-grid solutions into planning. Through tailored visualisation capabilities and AC load flow modelling, it equips internal network planners and connection engineers with the data and insights needed to assess future demand impacts more accurately, test mitigation strategies and make faster, more informed investment and connection decisions. The data and strategies developed will also inform ongoing regulatory and connections reform, ensuring that policies and processes evolve in line with emerging demand. By enabling smarter, more flexible connections, the project reduces reliance on costly grid reinforcements, supporting a more efficient pathway to net zero. In doing so, it helps manage system costs benefiting all consumers. It also supports the infrastructure planning needed to deliver the government's AI and digital growth strategy.

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

The expected benefits of the solution will vary depending on how it is applied, as it supports a range of use cases from strategic planning to individual data centre connection assessments. In high impact applications, such as identifying alternatives to major infrastructure builds, the tool can help identify capital expenditure lifetime savings of up to 13%. More broadly, it offers other benefits such as accelerating customer connections, reduced planning effort and enhanced risk management. Importantly, the tool also enables better coordination across stakeholders due to better visibility of future data centre demand trends.

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

Whilst the study is focussed on the England and Wales region, learnings are transferrable to other regions across GB. In particular, any network congestion mitigation strategies identified are applicable to all other networks across GB.

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

N/A

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 learnings from the project could be highly valuable to NGET through improved demand forecasting for data centres and awareness of the grid and non-grid solutions available to manage demand. This enables engineers to plan network capacity more proactively and efficiently which could lead to more cost effective and timely reinforcement decisions. The methodologies and tools are to be integrated into the licensee's existing planning processes, helping to align strategic planning with evolving data centre patterns.

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.

Currently there are no other data-centre related initiatives that investigate the impact on the electricity grid in the long-term. Duplication is being avoided internally by ensuring any outputs from this project can be seamlessly integrated into existing planning tools within the business.

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 project is innovative as it addresses a rapidly evolving challenge, forecasting data centre demand, using a forward-looking, data

driven approach that goes beyond traditional network planning methods. It combines modelling techniques with scenario analysis to capture the complex and uncertain drivers of data centre growth. Additionally, the integration of the tool into existing internal platforms ensures the innovation has practical, ongoing impact, enhancing existing strategic decision-making practices.

Relevant Foreground IPR

The project is expected to deliver a demand forecasting model tailored to data centre growth scenarios, region-specific datasets compiled and refined through research, and a framework for managing impacts on the network via relevant mitigation strategies. The generated IPR can be used independently (without the need for background IPR) however it is expected that learnings can be seamlessly integrated into existing planning tools by the relevant experts within NGET.

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:

· 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 already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.

· Via our Innovation website at https://www.nationalgrid.com/uk/electricity-transmission/innovation

· Via our managed mailbox box.NG.ETInnovation@nationalgrid.com

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

External funding supports the collaboration, neutrality and resourcing required to gather comprehensive and well-informed datasets to support the modelling and visualisation capabilities being embedded into the business.

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 can only be done with innovation funding because it is a forward-looking project (i.e. 2050 energy landscape) that requires engagement with a broad range of stakeholders that fall outside the scope of routine business activities. Typically, only known/committed connections are assessed or considered within the business however there is a need to look ahead and model potential future connections and scenarios to enable strategic decision-making in the present day. External support is required in order to leverage these insights.

This project has been approved by a senior member of staff

☑ Yes