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.
Network Licensees must publish the required Project Progress information on the Smarter Networks Portal by 31st July 2014 and each year thereafter. The Network Licensee(s) must publish Project Progress information for each NIA Project that has developed new learning in the preceding relevant year.

NIA Project Annual Progress Report Document

Date of Submission

Jun 2025

Project Reference Number

NIA2_NESO095

Project Progress

Project Title

Grid Connection Simulator tool (GridConnectX)

Project Reference Number

NIA2_NESO095

Project Start Date

October 2024

Project Duration

1 year and 7 months

Nominated Project Contact(s)

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Scope

The scope of this project is to develop a platform (tool) for efficient grid connection of renewable energy in GB system, ensuring grid stability, and safeguarding proprietary data during connection assessments. The platform will introduce a range of innovations that will significantly reduce the time and cost required for NDAs to be agreed upon between all parties involved in grid connection studies and allow for a process of carrying out system studies, enabling quicker and more efficient compliance studies for new connections.
The proposed Grid Connection Simulation Tool offers a multitude of advantages that could demonstrate a Mutually beneficial situation for an array of stakeholders within the energy sector:

For the NESO:

Operational Efficiency: They would experience enhanced operational efficiency through accurate EMT models, facilitating precise system planning and operation.
Integration of IBR: The platform expedites the integration of Inverter Based Resources, aligning with the NESO's goals for high renewable penetration.
For the Energy Sector:
Streamlined Processes: By reducing the reliance on NDAs, the Grid Connection simulation tool streamlines the process for new grid connections, enhancing overall sector efficiency.
Improved Decision-Making: It offers more accurate data for modeling, leading to informed decision-making and robust integration of renewable resources.

For Customers:

Cost Savings: Consumers can anticipate long-term savings through the enhanced efficiency of the grid connection process and the swift adoption of renewables.
Sustainability: The platform indirectly supports societal shifts towards sustainable energy and the achievement of net-zero carbon

targets.

Financial Implications:

Cost Reduction: With connection delays at offshore wind farms currently presenting a significant cost up to 15 billion GBP (for the offshore wind project alone) according to Ofgem. This platform's streamlining capabilities could do its part in reducing these expenditures.

Performance and Efficiency Savings:

Time Efficiency: The Grid Connection simulation tool is expected to markedly enhance network planning and connection times, remove going back and forth between NESO and the OEM with trial and error, surpassing current Business as Usual scenarios.

Non-financial Benefits:

Collaboration and Confidentiality: The platform promotes a secure, collaborative environment for confidential data analysis, without compromising data integrity.

Support for UK's Energy Goals: Directly aids the UK in meeting its ambitious zero-carbon operation and 50 GW offshore wind targets by 2030.

By enabling the NESO, plant owners, consultants, Ofgem, academics, and the broader society to partake in this innovative approach, the Grid Connection Simulation Tool underscores the UK's commitment to leading in the renewable energy sector. The collaboration and information-sharing facilitated by the platform enhance decision-making processes, transcend organisational boundaries, and ensure superior outcomes for network operators, OEMs, the economy, and the environment, contributing to a resilient and sustainable energy infrastructure.

Objectives

- The establishment of a cloud based PSCAD simulation tool that would result in significant time savings for planning and operational studies due to parallel simulation capabilities.
- A dedicated hardware setup for the PSCAD platform, either in-house or at a third-party data center, that will minimize data exchange latency and thus not impact the overall simulation speed.
- Granting third-party users access to the simulation tool will encourage collaborative development without compromising NESO's proprietary data and model integrity.
- Implementing a proof of concept on a smaller region of the NG PSCAD model will effectively demonstrate the scalability of the platform for full NG system simulations.
- The development of specialized tools to automate tasks such as the extraction of specific network regions and the provision of approved signals will improve the efficiency of granting third-party access, thereby reducing the lead time for connection studies.

Success Criteria

- Evaluate the reduction in time and complexity for new grid connections, comparing times from application to connection before and after implementation.
- Assess protection of proprietary models and sensitive data based on stakeholder feedback on security and confidentiality.
- Measure improved collaboration between grid operators, renewable energy providers and / or other customers connecting to the network and other stakeholders through surveys and user feedback.
- Analyse the solution's adaptability to changing grid conditions and the integration of various renewable energy sources, using usage statistics and the platform's ability to handle diverse requests.
- Evaluate the project's impact on grid stability and renewable energy integration through technical performance metrics, including grid disturbances and renewable capacity connected.
- Assess cost savings for grid operators, energy providers, and potentially consumers by comparing the grid connection process efficiency and the necessity of NDAs and model validations before and after project implementa

Performance Compared to the Original Project Aims, Objectives and Success Criteria

(Standard NESO Text – do not amend)

National Energy System Operator ("NESO") has endeavoured to prepare the published report ("Report") in respect of Grid Connection Simulator tool NIA2_NESO095 ("Project") in a manner which is, as far as possible, objective, using information collected and compiled by NESO and its Project partners ("Publishers"). Any intellectual property rights developed in the course of the Project and used in the Report shall be owned by the Publishers (as agreed between NESO and the Project partners).

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Project Summary:

The NIA Project aims to develop a tool known as the Grid Connection Simulation Tool. This secure platform allows plant owners and consultants to connect their models and perform Electromagnetic Transient (EMT) studies using the National Grid's wider-area EMT model, without accessing or having visibility of confidential network and OEM data.
The project is being delivered through following Work packages:
WP1 – PSCAD Cloud Infrastructure Assessment
WP2 – Determination of Hardware and Software Needs
WP3 – Security & Collaboration Framework
WP4 – Proof of Concept Development.
WP5 - User Accessibility
WP6 - Automation Tool Development
WP7 - Scaling the Proof of Concept to Full System Application
WP8 - Comprehensive Testing and Validation
WP9 - Knowledge Transfer and System Handover

Project Progress:

This project was kicked off in Jan 2025 and currently, the partner, MHI is working on WP1, WP2 and WP3 simultaneously and planning to submit the reports on May 2025.
WP1:
In this task, MHI and NESO collaborated to explore suitable hardware options for the PSCAD simulation environment. Given the complexity and size of the GB system model, which will operate on multiple cores using PSCAD's 'Parallel Network Interface', the focus was on ensuring efficient simulation times for practical application. Additionally, MHI and NESO discussed options for low data exchange latency, which may influence the choice of platforms or necessitate special agreements with providers such as Azure. This task involved both MHI and NESO IT teams to address security requirements and concerns.

MHI is currently preparing a Technical Note document for this task, which will include the following key points:
Options for the PSCAD Cloud infrastructure setup
The feasibility of cloud platforms versus physical server locations
Hardware specifications for current and future NG PSCAD models
Additional hardware for communication between machines
Software and compiler requirements
Hardware and IT security concerns and protocols

WP2:
In this task, MHI reviewed the detailed hardware and software specifications required to support NESO's projected use of the PSCAD platform. MHI is in the process of preparing a Technical Note document for this task, which will include the following key points:

The number of processors required for the initial setup
Details of PSCAD licensing, including associated costs
Additional hardware considerations for the system
Options for Fortran compiler licensing and costs

WP3:
In this task, the MHI and NESO IT teams discussed the security infrastructure for the platform. The NESO IT team provided an overview of the security measures currently in place for EMT Azure. Both teams have agreed upon and finalised the security setup. MHI is currently preparing a Technical Note document that will provide a comprehensive outline of the IT security protocols and partnership framework, ensuring that all discussions are meticulously documented and decisions are clearly communicated.

Required Modifications to the Planned Approach During the Course of the Project

No Modifications to the Planned Approach.

Lessons Learnt for Future Projects

The project has yielded the following key lessons thus far:

The importance of early engagement with NESO DD&T to ensure alignment with NESO's requirements regarding hardware, software, and security protocols and frameworks for cloud solutions.
Identification of suitable hardware and software options and specifications for the PSCAD simulation environment to effectively support this platform.
The necessity of implementing security protocols and frameworks for the deployment of this tool.

Note: The following sections are only required for those projects which have been completed since 1st April 2013, or since the previous Project Progress information was reported.

The Outcomes of the Project

To date, the NESO and MHI teams have engaged in biweekly collaborations to discuss WP1, WP2, and WP3. These discussions have resulted in the following outcomes:

Development of hardware and software requirements for the tool.
Establishment of security protocols and frameworks for the tool's deployment.

MHI is planning to submit the final reports on these working packages by May 2025

Data Access

Details on how network or consumption data arising in the course of NIA funded projects can be requested by interested parties, and the terms on which such data will be made available by NESO can be found in our publicly available “Data sharing policy related to NIA projects (and formerly NIC)” and Innovation | National Energy System Operator.

National Energy System Operator already publishes much of the data arising from our NIA projects at www.smarternetworks.org. You may wish to check this website before making an application under this policy, in case the data which you are seeking has already been published.

Foreground IPR

No Foreground IPR as of now.