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_NGESO083

Project Progress

Project Title

Construction Planning Assumptions Methodology Review

Project Reference Number

NIA2_NGESO083

Project Start Date

March 2024

Project Duration

1 year and 4 months

Nominated Project Contact(s)

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Scope

This project aims to review the current CPA process and propose updates to properly support the connections of emerging technologies associated with a net-zero carbon transition. Accordingly, the scope of the work includes:

-A high-level review of the overall CPA process including pre CPA assumptions (e.g., sent and in-flight offers, attrition assumptions, queue position, etc.) and CPA production (e.g., triggers, option to reuse CPA, local area definition, use of POUYA2, etc.).
-A dedicated review of POUYA2 with particular focus on (i) input data, and collection and processing of outputs, (ii) mathematical models used to assess the connection of different technologies, and (iii) consideration and assessment of uncertainties.
-Proposals to update the CPA process, based on state-of-the-art models, to (i) properly model emerging technologies such as batteries and electrolysers, (ii) capture increasing uncertainty levels associated with the decarbonisation of the energy sector, (iii) automate the connections process, and (iv) address areas of improvement highlighted by ESO and TOs.

The below activities will be carried out to deliver this scope:
Review and benchmarking of POUYA2

-A review of the application of POUYA2 to various connection studies will be performed, placing focus on mathematical formulation, probabilistic modelling assumptions (e.g., assessment of correlation, convergence guarantees, number of samples needed, etc.), input data sources and outputs, and high-level computational performance.
-The source code will be reviewed in dedicated workshops where the NGESO team will present specific parts of the tool. The aims of

the workshops will include i) analysing the structure of the model and identifying the key files and methods with the relevant process to review, ii) exploring the use of data, specifically loading and processing of inputs and production of outputs, and iii) exploring the application of proposed and updated models (e.g., electrolysers and batteries).

Propose models to capture the characteristics of the changing energy landscape.
-Building on inputs from TOs on critical modelling features (existing and required) and academic best practice, options to enhance POUYA2 with dedicated models for emerging low carbon technologies (e.g., battery storage and electrolysers) will be explored.
-Stochastic processes to capture the impacts of uncertainty and express the information in a small subset of scenarios that can be overlayed will be explored. Based on TO feedback, the information should ideally be expressed as a single scenario when possible.
-Simulation of identified uncertainties and probabilistic sampling approaches to demonstrate differences in input data set generation. Note that UOM will not have access to the tool and will not be able to generate different output data sets, only showcase differences in input data).
Review and propose standards for current modelling assumptions and inputs and outputs of the model.

-Review and analysis of output data representation, selecting options which best convey necessary details identified by key stakeholders to enable appropriate decision-making. This activity aims to develop standardised and editable input and output data sets (e.g., in python data frames) to seamlessly populate POUYA2 and facilitate interactions with TOs.
-Review and justify existing modelling assumptions that have been flagged by TOs (e.g., attrition rates) and, when appropriate (e.g., considering POUYA2 compatibility), propose new modelling assumptions, e.g., use of different types of offers (e.g., send and in-flight), dynamic attrition rates that consider timing and other factors (e.g., specific intelligence, historical data, etc.), local area definition (e.g., using recursion theory), etc.

Stakeholder-informed selection of the developed modelling features and procedures.
-Periodically present to, and discuss with, ESO and stakeholders (especially TOs) the findings of the projects and planned next stages.
-Collect stakeholder feedback to inform the different tasks of this project, e.g., list of modelling assumptions to be revised and modified.

Objectives

The aim of the project is to review the current CPA methodology and POUYA2, provide additional justification for key assumptions, and propose new functionalities to meet the changing CPA requirements and enhance the connection application process. Specific objectives and activities of the project include:

- A review and benchmarking of the POUYA2 tool
- Identify and propose models to capture the characteristics of the changing energy landscape.
- Review and propose standards for current modelling assumptions and the inputs and outputs of the model
- Stakeholder-informed selection of the developed modelling features and procedures.

Success Criteria

The success of the project will be determined by its ability to assess the suitability of the current CPA process, and proposed relevant updates, to address connection needs to support the net-zero carbon transition. Accordingly, the project success will be measured in terms of its ability to meet the following objectives:

- Review the current CPA methodology and identify potential gaps and improvements, including consideration for stochastic characteristics of technology operation and scenarios.
- Review the key modelling assumptions and current use of POUYA2 in the context of CPA.
- Identify the suitability to model key emerging technologies (e.g., storage, electrolysers, etc.) and, when appropriate, propose suitable modelling updates.
- Analyse the current process to provide inputs to and extract outputs from POUYA2, and propose options to automate the process.

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

The project has made good progress towards achieving its aims and objectives. Key achievements include:
Development of Improved Methodology: The project successfully developed a new methodology for modelling Electrolyser and Interconnector (IC) for Construction Planning Assumptions (CPA). This methodology has been tested, demonstrating its effectiveness in enhancing flexibility.

Stakeholder Feedback: Feedback from stakeholders has been positive. The new methodology of modeling has added the feature to reflect the industrial behaviors in the proposed models.
Milestone Achievement: The project has met its milestones within the timeline and budget, while prioritising some tasks with higher priority. This includes the completion of key tasks such as methodology development and testing.
Demonstrable Improvements: The implementation of the new methodology has led to demonstrable improvements in the modelling, eventually contributing to the accuracy and reliability of CPAs. This has been tested through various case studies.
Overall, the project has performed well compared to its original aims, objectives, and success criteria; and it is in line with the target for connection reform. The successful development of the improved methodology, positive stakeholder feedback, and achievement of project milestones are clear indicators of the project's success. The implementation of the improved model in POUYA is ongoing.

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

During the course of the project, several modifications were required to adapt to evolving circumstances and feedback:
Economic Dispatch Focus: Initially, the project included uncertainty work, but it was decided to focus on modelling improvement on economic dispatch side due to its urgent priority. This shift ensured that the primary objectives were met without compromising the project's integrity. The decision was influenced by the need to address immediate challenges in economic dispatch, which were deemed more critical than the uncertainty aspects.

Timeline Adjustments: The detailed tasks and their timelines were revised to align with the connection reform scheduled for August 2025. This included coordination with the University of Manchester and the formulation of electrolyser and interconnector models. The adjustments ensured that project milestones were met in a timely manner, facilitating smooth integration with the broader connection of reform initiatives.

Inputs and Outputs Automation Removal: The inputs and outputs, along with related automation, were removed from the planned approach. This decision was made because the Scotland COAT team is working closely with TOs on these aspects, and they are not needed with the evolving circumstances. This allowed the team to focus on more critical tasks and leverage the expertise of TOs for handling inputs and outputs.

Lessons Learnt for Future Projects

Flexibility in Planning: Being flexible and open to modifying the planned approach based on real-time feedback and evolving project needs is essential. This adaptability can lead to more efficient and effective project execution. The project demonstrated this through the various adjustments made to the timeline, focus areas, and task details.

Prioritisation of Tasks: Prioritising tasks based on their impact and urgency ensures that critical objectives are met without compromising the overall project goals. The project team effectively prioritised tasks such as economic dispatch analysis and electrolyser/IC modelling to ensure timely completion of key deliverables.

Code Sharing Constraints: There were challenges related to code sharing due to security requirements in the contract. Understanding and addressing security and compliance requirements early in the project can prevent delays and facilitate smoother collaboration. Engaging with relevant teams to navigate these constraints and facilitate data sharing is important.

Documentation and User Stories: The importance of detailed documentation and clear user stories was highlighted. Ensuring that all technical changes are well-documented and communicated can prevent misunderstandings and streamline the development process. The project involved creating detailed technical documents and user stories to capture requirements and guide implementation.

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

The innovative project undertaken by the University of Manchester yielded several promising outcomes:
Innovative solutions: The project introduced innovative solutions for model formulation, contributing to the overall advancement and flexibility of CPA methodology.
IC modelling improvement: the project proposes the formulations of ICs modelling to resolve the issue of ICs being very sensitive to price assumptions.
Electrolyser modelling improvement: The project developed a methodology to process aggregated electrolysis demand information and produce demand profiles, with components of constant hourly electrical demand and a variable (price-based) electrical demand. These data will be passed to POUYA for Economic Dispatch. This would provide a robust framework for handling electrolyser demand and integrating it into broader energy models.
Economic Dispatch Analysis: The project successfully focused on the economic dispatch side, providing valuable insights and

analysis results for the Economic dispatch in CPA, e.g., the correlation between ICs and electrical demand, renewable generation and non-renewable generation; the impact of generator removal before and after POUYA running. This focus allowed the team to address critical challenges in economic dispatch and deliver actionable insights.

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

Report of model improvement for electrolysers and interconnectors
Proposed changes to the model of electrolysers and interconnectors in the modelling tool