

NIA Project Close Down Report Document

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NIA2_NGESO038

Project Progress

Project Title

Whole Energy System Network Planning Review

Project Reference Number

NIA2_NGESO038

Project Start Date

March 2023

Project Duration

0 years and 6 months

Nominated Project Contact(s)

Robert Gibson

Scope

The purpose of this project is to understand what the different options are for undertaking whole energy system planning across multiple energy vectors, as well as to establish the principles of whole energy network planning.

Activities will include:

Research and analysis: Undertaking desk-based research seeking international evidence in regulation, project innovation, and academia as the basis for research into the best practice on whole energy system analysis and design – informing draft use cases and an initial set of principles for whole energy system planning.

Stakeholder Workshops: Engagement with a range of sector representatives to test and enhance use cases. Exploring the synergies that can be obtained in the cross-sector management and delivery of energy projects, to enable the energy transition efficiently and economically.

Analysis and Reporting: Updated use cases and identification of trade-offs in the decision-making process and a refined principles for the analysis. Also, to include gap analysis in current evidence base for optimisation across vectors and technologies, and recommendations for ESO to close gaps going forward and position the FSO role for maximum impact and efficiency. Delivery in the form of report.

Objectives

The primary objective of this project is to gain an understanding on the options available for undertaking whole energy analysis. This is supported by:

1. Delivery of results from desktop research into what is already done
2. Stakeholder engagement effectively undertaken throughout the project
3. Delivery of findings through a cohesive, publicly shareable, report

Success Criteria

This project will be successful if there is an established understanding of what options there are for undertaking network analysis across multiple energy vectors. This understanding should be built on a foundation of research and engaging relevant stakeholders.

This will take the form of feasibility study report that contains an overview of best practice on whole energy system analysis and design with:

- Use cases for typical whole systems optimisation problems;
- Proposed principles for whole energy system coordination/optimisation by the FSO;
- Defined gaps in evidence for the full spectrum of technologies/solutions to be considered;
- Recommendations regarding future projects to expand the evidence base for whole energy system coordination.

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

National Grid Electricity System Operator (“NGESO”) has endeavoured to prepare the published report (“Report”) in respect of Whole Energy System Network Planning Review, NIA2_NGESO038 (“Project”) in a manner which is, as far as possible, objective, using information collected and compiled by NG 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 NG and the Project partners).

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Project Overview

The purpose of this project was to understand what the different options are for undertaking whole energy system planning across multiple energy vectors, as well as to establish the principles of whole energy network planning. This project sought to build this understanding through research and analysis of existing best practice, tested through stakeholder engagement, delivering an actionable set of use cases and principles for the ESO to evolve into the FSO.

Project Plan

The project has been delivered through a multiphase approach:

Phase 1: Desk-based study focusing on whole energy system analysis. The outcome from this phase was the creation of draft use cases of typical whole energy system optimisation problems that the FSO will need to solve. This provided an initial view of the principles of whole energy system coordination, which were tested with stakeholders, that would maximise synergies across vectors and deliver the most efficient and economic outcome for UK plc.

Phase 2: Stakeholder engagement in order for the project to receive feedback on the draft use cases and principles as well as to collect cross-industry perspectives of the opportunities and challenges associated with whole energy system analysis.

Phase 3: Finalisation of the use cases and principles, according to stakeholders’ feedback. In addition, phase 3 defined gaps in evidence for the full spectrum of technologies/solutions to be considered; recommendations regarding future projects to expand the evidence base for whole energy system coordination.

Project Plan & Project Activities

The project was planned to be completed by July 2023. The completion of each phase reflects one milestone for the project:

- Phase 1 milestone: Completion of draft use cases and principles
- Phase 2 milestone: ENA workshop
- Phase 3 milestone: Final Report

In phase 1, following a series of workshops between the ESO and DNV and desk-based research, the draft use cases and principles

were developed for undertaking whole energy network planning. These were reviewed and updated throughout the following milestones to ensure completeness and accuracy of information. In addition, the draft approach to the principles was analysed.

The main outputs of these workshops were:

- Draft use cases that reflect the key whole energy system co-optimisation problems that the ESO is already considering
- Draft approach of the principles that should be further tested with ESO stakeholders

Phase 2 followed by carrying out stakeholder engagement sessions: the first session with Ofgem and the Department for Energy Security and Net Zero (DESNZ), the second session with National Gas Transmission (NGT) and finally, the third with multiple ENA members. The feedback and comments from these sessions have been very insightful and have therefore been incorporated into the updated use cases and principles; this feedback confirmed that key stakeholders are aligned when considering the whole energy system optimisation problems.

Phase 3 has marked the creation of recommendations regarding future projects to expand the evidence base for whole energy system coordination and performing a gap analysis in evidence for the full spectrum of technologies/solutions to be considered. The principles have been applied to one use case to demonstrate the practicality of the proposed notions.

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

The project was extended by four weeks to allow for further input and collaboration from stakeholders towards the final report; therefore, the project completed in August 2023. This slight delay did not impact the final project costs, nor did it have any implications to the roll out of the project outcome and recommendations.

No changes were required to the approach and methodology agreed at the start of the project.

Lessons Learnt for Future Projects

Through the development of this project, the following lessons learnt have been identified:

- **Literature review evidence:** the literature review on whole energy system optimisation problems is limited, especially with regard to network planning. This learning outcome has been further described in the final report by defining gaps in evidence for the full spectrum of technologies and solutions to be considered. Recommendations have been made for future projects to expand the evidence base for whole energy system coordination.
- **Effectiveness of stakeholder engagement:** input from ESO teams and key stakeholders (Ofgem, DESNZ, NGT) has been effective in validating the approach on developing the use cases and the role of the FSO regarding whole energy system optimisation problems. After every workshop, the delivery team collected the feedback from stakeholders and made the relevant updates to the use cases. Stakeholder feedback has been particularly useful in ensuring that use cases reflect cross-vector challenges and synergies.
- **Cross-vector co-ordination:** gas and electricity networks currently work in silos, focusing on their respective objectives, strategies, and principles. Through this project, we have identified the need for a holistic approach to enable cross-vector alignment, knowledge sharing, and standardised data and processes; this has been detailed in the report's recommendations section where an integrated approach across networks and vectors is proposed.

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

This project has established the foundation of the options available for undertaking whole energy network planning, analysis, and design. This has been achieved through research and engaging relevant key stakeholders, validating the proposals and findings. Therefore, the outcomes of this project are:

- An overview of best practice on whole energy system analysis and design.
- Seven use cases for typical whole systems optimisation problems.
- Proposed principles and criteria for whole energy system coordination/optimisation by the FSO.
- An illustrative application of the proposed principles to use case 1 for tangibility purposes.
- Defined gaps in evidence for the full spectrum of technologies/solutions to be considered.
- Recommendations proposed regarding next steps and future projects to expand the evidence base for whole energy system coordination.

Data Access

The Project outcomes and results contain confidential information and intellectual property rights that cannot be disclosed in this

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Foreground IPR

The final study report contains an overview of the best practices on whole energy system analysis and design, which includes:

- Use cases illustrating typical whole systems optimisation problems.
- Proposed principles for whole energy system coordination/optimisation by the FSO.
- Defined gaps in research for technologies/solutions to be considered.
- Recommendations regarding future projects to expand the evidence base for whole energy system network planning.

Planned Implementation

This project has established a new methodology in the form of principles which set the basis for the whole energy system network planning role. Through ongoing optimisation, new processes will apply to multiple vectors across the energy sector to ensure the successful implementation of a whole energy system approach in network planning.

The report details the recommendations where gaps have been identified for whole energy system optimisation purposes, these focus on several areas such as technology, skills, coordination, tools, and policies. Each area is addressed in detail in the report, with the key outcomes highlighted accordingly.

The next steps are highlighted in the final report, emphasising the need for a targeted approach due to the complexity of the task for the FSO. The priority next steps are:

- Continuation of coordination with key stakeholders (DESNZ, Ofgem, NGT, TOs, etc) in building the capabilities necessary to take on the FSO role.
- Using this project as a basis, develop new processes and solutions to enable whole energy system network planning processes.
- Develop the necessary tools and IT-based solutions for setting out an effective options assessment process.

Net Benefit Statement

The project sets the basis for a whole energy system optimisation process across vectors, supporting FSO's objective to coordinate the gas and electricity network planning roles.

This innovation project's benefits cannot be quantified as the network planning role is a long-term process, which will require detailed tools and systems for an effective implementation and accurate performance measurement. Deploying a whole energy system network design which accounts for all vectors and their respective interactions is a GB first, and possibly the world, adding to the complexity of the task.

This project is the starting point for delivering on the FSO's commitment to adopt a whole energy system view to address operational and planning challenges facing the energy industry. This contributes to the creation of the FSO which has the potential for overall cost reductions of up to £3-4 billion for consumers.

The information provided by this piece of work supports the ESO in shaping the future network planning roles, as it transitions to the independent body of the FSO. By defining the key principles and criteria necessary for carrying out a whole energy system approach, the outcomes of this project provide knowledge and capability benefits that the ESO can build upon.

Through the engagement completed with key stakeholders throughout this project, it was confirmed that this report has outlined the representative challenges through the seven use cases and set out principles which align with the energy vector's objectives and duties.

Other Comments

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Standards Documents

The outcomes from this project have no implication for industry standards.