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

Jul 2025

Project Reference Number

NIA2_NGESO068

Project Progress

Project Title

Market Signals for the Electrification of Heating

Project Reference Number

NIA2_NGESO068

Funding Licensee(s)

NESO - National Energy System Operator

Project Start Date

March 2024

Project Duration

1 year and 3 months

Nominated Project Contact(s)

innovation@nes

Scope

The project scope focuses on electric home heating including heat pumps, storage heaters, direct electrical heating and thermal storage including hot water and phase change materials. Domestic consumers are the focus for the project, and a number of home heating archetypes and profiles will be developed. The project does not include networked home heating solutions such as district heating solutions.

The project takes a whole electricity system approach to understanding costs and benefits from electrified heating, and for market signals. The project will however focus on market signals that the ESO have direct influence over and look to understand these in the context of other market signals and options to accelerate electrification of heating and flexible operation.
The project will only focus on home heating and will not focus in detail on other electrification or flexibility technologies or consumer segments. Whilst the project scenarios will have a long-term outlook, the market signals and options for interventions will focus on the medium term, up to 2030.

Objectives

The key objectives are to:

1. Understand electric heating uptake scenarios
2. Understand status quo, including counterfactual and identifying costs of “doing nothing”
3. Identify gaps, enablers and blockers for electric heating in the GB market
4. Identify what signals would be more effective with consumers
5. Design a trial of market interventions

Success Criteria

The key success criteria are:

- The delivery of an “actionable” list of recommended market interventions that can positively influence heating electrification and flexibility provision from heating.
- The design of an implementable trial.
- Increased learning and understanding of heating pathways and flexibility potential for home heating across the ESO.

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

National Energy System Operator (“NESO”) has endeavoured to prepare the published report (“Report”) in respect of Market Signals for the Electrification of Heating, NIA2_NESO068(“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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1. Understand electric heating uptake scenarios

All areas of this work package were completed. A focus on heat pump technology was agreed with NESO, to maintain alignment with current government policy and FES projections. Residential heat pump deployment, and the mechanisms required to operate in a flexible manner to support NESO market operations were emphasised. The benefits of including heat networks and direct electric heating and heat storage were acknowledged, but agreed to be largely out of scope for the detailed analysis.
Common building types were researched, and reviewed and an agreed set of architype buildings developed in conjunction with NESO, for subsequent building heat demand modelling. Agreeing the characteristics of the building architypes required some compromises between the NESO previously constructed architypes and Ofgem’s architypes, where a combination of occupant’s profiles and building characteristics were
required.
The IES modelling was undertaken to establish indicative peak demands and annual profiles for subsequent
Analysis.

2. Understand status quo, including counterfactual and identifying costs of “doing nothing”

An assessment of network reinforcements and associated costs resulting from electrification of heat were undertaken, including for transmission at boundaries and distribution. Identifying transmission related reinforcement costs were based on data available from NESO and constrained to specific examples of priority transmission boundaries. A comprehensive assessment of all related transmission reinforcement costs will be extremely complex and beyond the scope of this study. Cornwall Insight developed a bespoke BM modelling tool, which was utilized to focus on the reduction of demand peak forecasts and growth in flexible heat consumption, and the cost benefits of specific Balancing Mechanism service lines were assessed from 2025 to 2030, which aligned with the government’s CP30 objectives. This was supported by Cornwall Insight’s proprietary CM tool, which was used to evaluate the impact of greater flexible heat capacity on security of supply provisions.

3. Identify gaps, enablers and blockers for electric heating in the GB market

In collaboration with NESO, desk-based research reviewed NESO’s flexibility requirements in the horizon 2024 to 2030, considering data from FES, demand forecast trends and flexibility requirements. Learnings from other work packages were used to establish demand projections for peak winter conditions to 2030, and also to 2050. An optioneering exercise was undertaken to identify potential market interventions which are within the scope of NESO’s role and responsibilities to implement. This identified options from both a market and a technical barrier perspective. Outline economic analysis and cost benefits analysis was undertaken to establish indicative impacts of electrified heat, and potential benefits of flexible operation of electrified heat – with a key focus on up to 2030.

4. Identify what signals would be more effective with consumers

A combination of webinars, workshops, and targeted interviews with industry stakeholders has been undertaken. The balance of workshops and interviews was reviewed during the project, with an increased focus on targeted interviews being adopted. During the course of the project, a new government was elected which developed the Clean Power 2030 policy objective. This influenced various

areas of the project's focus. ESO also evolved into NESO, taking on additional responsibilities. Stakeholder feedback was used to help align the project focus areas with the rapidly changing political, market and technical developments which may impact the electrification of heat, and its flexibility to support NESO's balancing requirements.

5. Design a trial of market interventions

Due to several factors including stakeholder feedback, the volume of heat pump uptake, and the rapidly changing policy landscape, the design of a specific trial was no longer considered to be appropriate by NESO at this stage. As a result of the feedback received from the stakeholder engagement, and the results of the analysis undertaken for the 2025-2030 time period, the focus of this work package was realigned to emphasize the policy and market aspects of flexible operation of electrified heat and to establishing implementation requirements and potential focus areas for future NESO trials. The scope of refinement was undertaken and agreed upon in conjunction with the NESO project team.

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

The overall planned approach was maintained during the course of the project. The increased focus on CP30 resulted in some re-focusing of shorter-term impacts, especially during the earlier work packages. Analysis undertaken, combined with industry stakeholder feedback received during the project, highlighted that longer term implications of electrified heat are highly significant for NESO. Therefore, additional demand analysis to 2050 was undertaken
during Work Package 3 to help quantify the potential longer-term impacts which need to be accounted for in the planning and enabling future NESO services beyond 2030 which are related to the management of electrified heat.

Lessons Learnt for Future Projects

The impact of electrified heat, if aligned to net zero targets and government policy, will impose a substantial demand on the electricity networks and on standby generation necessary for rare, e.g. a severe prolonged winter cold snap, peak demand scenarios. This additional demand will likely have substantially reduced ability to operate in a flexible
manner under an extreme winter cold snap event, without the support of high thermal- performance building stock, and thermal storage. Consideration of different approaches to manage severe winter peaks, for highly electrified heat scenarios will be required. For example, these may include hybrid heating (e.g. Heat Pump and Fueled Boiler) and
thermal networks coupled with long duration thermal storage for 'hard to thermally improve' existing building stock.

Stakeholder feedback supported the promotion of other forms of advanced electric heating, including heat batteries and heat boilers with storage, to provide solutions for buildings which are less suited to heat pumps. Some of the non-heat pump solutions, although being less efficient, do provide increased opportunities for flexible operation including higher speed response rates which may enable extended service offerings for NESO's balancing requirements. Control and metering of flexible assets is being improved through the development of a range of new standards including PAS 1878 and 1879, however there are currently a range of further improvements required to enable flexible heat to participate in new BM service lines which are currently being expanded for access by flexible domestic consumer assets.

When undertaking network reinforcement cost analysis for projects of this nature, detailed and specific data will be helpful to get an accurate forecast of costs, as opposed to using generalised cost assumptions. This includes for substation and conductor reinforcements, and regarding boundary flow estimations and the assumptions on generation and demand under peak conditions related to this data.

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 innovation project explored the impact of electrified residential heat on the electricity networks and the market signals which NESO can use to enable and utilise the development of flexible heat to support network balancing operations whilst delivering whole system cost savings to ultimately benefit end-consumers.

The project covered a range of topic areas including building performance, FES projections, market mechanisms, technical requirements, network reinforcement, and policy. The findings have been brought together to establish key recommendations for future NESO trials and potential areas of focus for Policy and Market development.

Stakeholder input was critical to shaping the case for change and informing decisions on key market design choices. We co-created with industry through industry webinars (available here) and a survey that allowed stakeholders to provide detailed views and feedback to design an effective market.

This project has informed activities and changes NESO can investigate or implement in the short term to enable its markets to be open and accessible to electric home heating, with a view to contributing to the CP30 consumer lead flexible goal of 10 – 12GW across the system by 2030.

The project has also informed further activities NESO needs to undertake to better understand the implications of heat electrification pathways and associated requirements for NESO markets and system operation.

Initial scoping has also been undertaken with the REVEAL team to identify trialing opportunities as part of the REVEAL roadmap, as well as with the Crowdflex team to understand if there are opportunities to collaborate and implement recommendations on any future consumer trials of this nature.

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

The following outcomes have been delivered by this project:
- WP1 Report – Understanding Uptake of Electric Heating Solutions
- WP2 Report - Understand status quo, including counterfactual and identifying costs of "doing nothing"
- WP3 Report - Identify gaps, enablers and blockers for electric heating in the GB market
- WP4 Report - Identify what signals would be more effective with consumers
- WP5 Report – Recommendations including trial options for NESO market interventions

The project will publish an end of project public report on the Smarter Networks Portal.