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 Close Down Report Document

Date of Submission

Jul 2025

Project Reference Number

NIA2_NGESO091

Project Progress

Project Title

Quantitative assessment of self and central scheduling

Project Reference Number

NIA2_NGESO091

Funding Licensee(s)

NESO - National Energy System Operator

Project Start Date

July 2024

Project Duration

0 years and 10 months

Nominated Project Contact(s)

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Scope

Core 1 – Qualitative overview of scheduling approaches:
To provide a conceptual understanding of the differences between self-scheduling and central scheduling.
This includes the pros and cons of the two regimes, interactions with zonal pricing, and numerical examples of each approach
Core 2 – Quantitative estimate of the impact of central vs self-scheduling under national wholesale pricing:
Total consumer costs including: wholesale costs and CfD payments under both scheduling approaches; BM costs to resolve thermal constraints under self-scheduling; compensation payments and BM costs to solve energy imbalances under central scheduling
Forecasted DA wholesale electricity prices
Total system costs
Total volumes activated in the BM and revenues, by technology and year
Direction and volume of IC flows
A key insight from this assessment will be the relative quantum of the BM costs under self-scheduling and the (much lower) BM costs under central scheduling, and how this difference compares to the compensation payments required under central scheduling.
Core 3 – Development of an appropriate (self-scheduling) counterfactual for the analysis: status quo BM with appropriate augmentations:
Key outputs would be the same as in Core 2 above with a focus on constraint costs and redispatching volumes and revenue, by technology and year.
Core 4 – National vs zonal:
Compare the key modelling outputs (listed in Core 2 above) to evaluate how a zonal design changes the merits of central vs self-scheduling. Note that under zonal pricing also inter-zonal congestion rent is created that can be redistributed to consumers. In addition, for the zonal model setups, to comment on:

Differences in zonal wholesale price patterns
BM volumes by zone
Utilisation of inter-zonal (within GB) transmission capacity and the impact on wholesale costs and inter-zonal congestion rent
The potential impact of uncertainty in inter-zonal transmission capacity that can be made available in the wholesale market under self-scheduling, relative to central, on the quantum (qualitative only).
Optional 1 – national vs zonal sensitivity
Key outputs the same as Core 2 and Core 4
Does the case for central scheduling vary depending on the number of zones?
To what extent does self-scheduling become less/more attractive option with a lower number of zones?
Optional 2 – cross-border transmission sensitivity
Key outputs would be the same as in Core 2 with an additional analysis of congestion rent earned by ICs under the four different model setups (N1C, Z1C, N3C and Z3C).
Optional 3 – impact of strengthened balancing incentives
The outcome of this analysis will be a mapping of BM costs on the proportions of the hourly nodal real-time energy imbalances resolved by market participants vs those resolved by ESO. This mapping will give an indication of the extent to which the reforms to balancing incentives (represented by the magnitudes of imbalances) can impact overall BM costs.

Objectives

The overall objective of this project is to
Quantitatively and qualitatively evaluate the impacts of self vs central scheduling on consumer costs; and
Establish how potential changes to the design of the Balancing Mechanism (BM) and/or the potential introduction of zonal wholesale electricity pricing impact this evaluation

Success Criteria

This project should enable robust understanding of potential consumer and system benefits and trade-offs from significant reform in REMA (self vs central scheduling) and in turn, support key decision making within the REMA programme. This involves the delivery of:

- A qualitative assessment of central vs self-scheduling approaches with the relative pros and cons
- A robust quantitative assessment of central vs self-scheduling and the estimated consumer and system benefits
- The development of a robust counterfactual to understand the impacts on the quantitative evaluation above
- A robust quantitative assessment of the impact of zonal wholesale pricing on scheduling approaches (under both a low zone scenario and a high zone scenario)
- A robust quantitative assessment of the impact of cross-border transmission scheduling on the benefits case for central scheduling

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 Quantitative assessment of self and central scheduling, NIA2_NESO091 (“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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This project is part of REMA. The Review of Electricity Market Arrangements (REMA) is a comprehensive initiative by the UK Department for Energy Security and Net Zero (DESNZ) aimed at transforming the UK's electricity market to support a decarbonised, cost-effective, and secure power system by 2035

The project was delivered across two workstreams: ‘Core’ and ‘Optional’, the Core workstream focused on the delivery of the main project objectives, and the Optional workstream was devised to test the robustness of the results to certain input assumptions and/or alternative policy intervention.

The Core workstream was delivered in the form of a final report.

Core 1: Qualitative overview of scheduling approaches

- A sufficient qualitative overview was provided of different scheduling approaches, with reference to how these approaches are applied across jurisdictions.

Core 2: Quantitative estimate of the impact of central vs self-scheduling under national pricing

- A robust evaluation of central scheduling against self-scheduling using economic modelling was provided, detailing the breakdown in consumer costs between thermal constraints, forecast errors, and other consumer cost impacts. A breakdown of constraint costs and volume by technology type is also provided.

Core 3: Development of an appropriate self-scheduling counterfactual

- A counterfactual scenario was developed, the "Augmented BM", which proxied the impact on balancing costs from potential policy reforms to the BM (Balancing Mechanism). The three augmentations were i) Reduced offer uplift, ii) improved battery utilisation, iii) Wider access to the BM.
- The modelled counterfactual provided clear understanding of the benefits of incremental balancing reforms, relative to more wide-reaching reforms, such as central scheduling and/or zonal pricing

Core 4: National vs zonal under self- and central scheduling

- A robust evaluation of the impact of zonal pricing on the merits of self- and central scheduling was provided, including change in total consumer costs and the composition of consumer costs.

The Core workstream final report delivered on the project aims and objectives.

The Optional workstream was delivered in two phases, with two separate final reports.

Strengthened balancing incentives: Impact of NIV (Net Imbalance Volume) chasing

- A qualitative overview of balancing arrangements was provided and the role of NIV chasing. In particular, the impact NIV chasing can have on consumer costs, depending on the presence of network constraints.
- A novel methodology was developed in order to test the impact of NIV chasing in GB on balancing costs.
- The evaluation provided an estimate of the impact of NIV chasing at different levels of NIV chasing on the system, and therefore the potential savings of policy reforms which seek to reduce NIV chasing

Updated generation and transmission background

- A re-examination of the case for central scheduling against self-scheduling, under FES24, CP30, and Beyond 2030 generation and network plans was provided.
- A subset of market designs tested in the Core workstreams were evaluated i) National pricing with self-scheduling, ii) National pricing with central scheduling, and iii) Zonal pricing with self-scheduling

The Optional workstream final report delivered on the aims and objectives.

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

Once the project partners were agreed on the modelling methodology and assumptions, a Request for Input to industry stakeholders was published to provide written feedback on the proposed modelling approach. The purpose was to give industry the opportunity to directly shape the input assumptions to the model and to ensure the modelling exercise was robust and transparent.

Based on industry feedback, the planned approach to the 'Optional' workstreams was reconsidered. Originally the following sensitivities were identified:

Optional 1 – national vs zonal sensitivity

- Key outputs the same as Core 2 and Core 4
- Does the case for central scheduling vary depending on the number of zones?
- To what extent does self-scheduling become less/more attractive option with a lower number of zones?

Optional 2 – cross-border transmission sensitivity

- Key outputs would be the same as in Core 2 with an additional analysis of congestion rent earned by ICs under the four different model setups (N1C, Z1C, N3C and Z3C).

Optional 3 – impact of strengthened balancing incentives

- The outcome of this analysis will be a mapping of BM costs on the proportions of the hourly nodal real-time energy imbalances resolved by market participants vs those resolved by ESO.
- This mapping will give an indication of the extent to which the reforms to balancing incentives (represented by the magnitudes of imbalances) can impact overall BM costs.

The primary concern within the feedback was the choice of generation and transmission background, as it risked overstating the level of network constraints and redispatch required and could therefore overestimate the benefits of introducing central dispatch and/or zonal pricing.

The decision was taken to replace the planned Optional 1 and Optional 2, with a sensitivity that updated the generation and transmission background to the latest generation background (CP30/FES24) and network background (Beyond 2030).

Lessons Learnt for Future Projects

During the scoping phase, a number of potential workstreams were identified, given the wide range of potential market designs (identified in the NESO REMA Dispatch work). A comprehensive approach was undertaken to determine the research questions within each workstream and projected outcomes. Incorporating input from the project partners, NESO, Ofgem and DESNZ, priority workstreams were identified which formed the Core workstreams. These were selected based on their relevance to the REMA Programme, cost and deliverability within REMA timescales. Ensuring the scope was well-defined, and clearly understood by all parties, was critical to project success.

It was recognised that throughout the REMA Programme, input assumptions and methodology for modelling exercises were the subject of considerable debate. We therefore wanted to engage with industry stakeholders at an early stage to gain feedback and challenge on our proposed approach. This was an incredibly valuable exercise, which provided a number of helpful insights on the modelling design and setup and resulted in a change to our planned approach for the sensitivities. We believe this fostered a more robust modelling approach.

The project utilised expertise across a variety of stakeholders, within NESO, the project partners, DESNZ, and Ofgem through an iterative process in which the modelling methodology and results were subject to robust challenge and evaluation.

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 project provided key insights into a range of outcomes:

- Consumer and socioeconomic benefits from self and central scheduling, under both national and zonal pricing. In particular, the key drivers of the benefits case for a move to central scheduling.
- The impact of compensation payments to make participants whole under central scheduling, and the cost of resolving forecast errors.
- The change in redispatch volumes per technology under self- and central scheduling.
The impact on the case for central scheduling from introducing incremental reform to balancing arrangements (e.g. wider BM access, increased competition and liquidity) under national pricing.
- The change in merit for introducing central scheduling or zonal pricing under FES24/CP30 and Beyond 2030, which signifies faster decarbonisation and an increased network build out.
- How NIV chasing impacts balancing costs and whether measures to mitigate it, alongside other balancing reforms, could be an alternative to wholesale reform.

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 reports are expected to be published together on to the Smarter Networks Portal later this year:

- Exploring the economic benefits of co-optimising procurement of energy, response and reserve
- Quantitative assessment of self and central scheduling

Planned Implementation

This assessment has supported the REMA Programme's understanding of scheduling approaches and the key trade-offs between different designs. The results have strengthened the evidence base and inputted into ongoing decision-making processes.

Next steps:

- Continue to use the results for REMA decision-making and provide deeper understanding of reform options under consideration.
- Utilise the findings and data from the project to support wider discussions on market design beyond REMA

Net Benefit Statement

Modelling of REMA reform options has primarily been focused on wholesale design choices, whereas modelling of alternative scheduling approaches has so far been limited, if at all. This project developed a robust methodology, built on previous Innovation projects, to quantitatively evaluate the case for introducing central scheduling against self-scheduling, under both national and zonal pricing. This has enabled a **deeper understanding** of the key trade-offs between alternative designs, and the robustness of these designs under different scenarios, to aid significant decision-making within REMA. In particular, critical assumptions which shape the results were identified and discussed in the GB context. The project also **generated novel insights** into the impact of balancing arrangements on balancing costs, and the potential savings from policy reform. This allowed for a **clearer understanding** of the relative benefits for competing packages of reform under consideration within REMA.

Other Comments

The Project outcomes and results contain confidential information and intellectual property rights that cannot be disclosed in this Report due to their proprietary nature. Should the viewer of this Report ("Viewer") require further details this may be provided on a case by case basis following consultation of all Publishers. In the event such further information is provided each and any Publisher that owns such confidential information or intellectual property rights shall be entitled to request the Viewer enter into terms that govern the sharing of such confidential information and/ or intellectual property rights including where appropriate formal licence terms or confidentiality provisions. Dependent upon the nature of such request the Publishers may be entitled to request a fee from the Viewer in respect of such confidential information or intellectual property rights.

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