

NIA Project Close Down Report Document

Date of Submission

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Project Reference Number

NIA2_NGESO0013

Project Progress

Project Title

Advanced Dispatch Optimisation

Project Reference Number

NIA2_NGESO0013

Funding Licensee(s)

NG ESO - National Grid ESO

Project Start Date

November 2021

Project Duration

0 years and 9 months

Nominated Project Contact(s)

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Scope

This study will evaluate the inputs and elements necessary to inform the optimization algorithms, and the approach to optimization, with a report that will set out the development pathway for this tool.

The Report will address the following:

- recommendations for the approach to purpose driven modelling
- contemplation of use-case specific technology recommendation including simulation and modelling recommendations
- contemplation of inputs and approaches to data gaps
- contemplation of optimization approaches

Objectives

Objective 1: to understand what could be possible with existing, or new data and optimisation techniques to improve the way actions are taken in the Balancing Mechanism, through development of new tools.

Objective 2: have a clear view of what other work and research has been developed in similar use cases and other sectors (e.g. Digital Twins), which would establish a best practice approach to optimisation the BM for the GB energy system, and help quantify the benefits which could be delivered for end consumers.

Objective 3: use the understanding developed in this study to set out the next steps, and a roadmap for how innovative new tools

would be delivered for the ENCC in future.

Success Criteria

The project will be a success if the following can be achieved:

- Understanding that we could create a more comprehensive optimisation process which includes extraneous variables and be 'future ready' to adapt to a rapidly changing energy landscape.
- Insights and learning into of the tools currently available (or being researched) and the data or processes which will be required to achieve an advanced dispatch optimiser for the balancing mechanism.
- Better understanding of the benefits that would be provided by such a tool, for wider system efficiency, reliability, decarbonisation, cost reduction, increased competition etc.
- Clear understanding of the next steps to develop and deliver this tool into the ENCC and what additional data or expertise will be required to do so.

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

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Project Activities

The project objectives were pursued via three work packages, two of which were progressed in parallel in accordance with the overall project plan. Each of the objectives has now been completed and details of how these have been completed have been set out below. The deliverables associated with these objectives can be accessed on the [Smarter Networks Portal](#).

WP1 – Understanding Current ESO Control Room Tools and Processes, and Capturing Future Requirements

Initial research was undertaken in early 2022 when ~30 ESO Subject Matter Experts (SMEs) were interviewed and a series of virtual and in-person workshops were held. The purpose of the interviews and workshops was to gain an understanding of the activities carried out by the various roles within the Control Room whilst also understanding the source data required, current outputs generated and optimisation and visualization tools utilised. In addition, requirements were elicited for a future state Control Room tool which would be capable of adaptation to meet the needs of a changing energy landscape, providing more certainty for grid operators in forecasting power systems conditions as more distributed intermittent renewable resources, many with integrated storage, continue to be connected to the grid and more distributed technologies such as smart controls and Electric Vehicle (EV) charging continue to alter customer behavior.

WP2 – Research Best Practices Globally and Advanced Technologies

The purpose of this work package was to conduct, and report on, a benchmarking analysis of best existing practices for power grid operators around the world, including the processes and tools utilized to perform short-term resource scheduling and dispatch operations. This activity included a desktop review of existing practices as well as selected interviews with grid operators in Asia-Pacific, Europe, South America, and North America. The benchmarking analysis provides a general overview of practices and evaluates which practices seem to have the most promise as an initial starting point to manage increasing operational uncertainties as the industry moves through the energy transition. The analysis also includes commentary to assist in the understanding of what state-of-the-art technology exists (or will be available) that could be beneficial to the NGESO's Virtual Energy System program, of which the Advanced Dispatch Optimiser is a use case.

WP3 – Develop a Roadmap Report for how Innovative New Tools Would be Delivered for the ENCC in Future

Following the ESO SME interviews, workshops and the benchmarking analysis exercise, a Roadmap Report was produced which provides a high-level vision and approach to transforming dispatch optimization tools and processes through the development of an Advanced Dispatch Optimiser system utilizing newly created digital models for the entire security-constrained dispatch problem.

The report includes the following:

- A conceptual overview of suggested dispatch systems approach.
- A breakdown of the primary system components required for the Advanced Dispatch Optimiser system.
- A consideration of the data requirements needed to be able to run the system and create the required scenarios for operator review.
- A Roadmap detailing the approach and methodologies to be used to ensure 'future proofing' as well as realizing value at the earliest opportunity.
- A view on how the introduction of the Advanced Dispatch Optimiser system would change the roles and processes of the ESO Control Room operators.
- Details of the constraints and challenges, some of which are unique to the UK energy system and high-level approaches to begin addressing them.

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

Initial plans included an analysis of System Operation Real Time (SORT) data, to obtain a complete picture of data associated with dispatch operations. However, upon initial inspection it was determined the data was insufficient to provide the required insight. Therefore, as an alternative, qualitative analysis was carried out through interviews with key ESO SMEs, to understand how improvements could be made to dispatch related data.

Following production of the Advanced Dispatch Optimiser Roadmap Report and Benchmarking Report, it was determined the Benchmarking Report should become an Annex to the Roadmap Report and a Summary slide deck of the Roadmap Report was produced.

Lessons Learnt for Future Projects

- Currently there appear to be insufficient incentives for all resources to provide accurate data and operational forecasts to system operators. The market rules and regulatory requirements should be reviewed to ensure all resources are incented to provide accurate information and forecasts.
- The UK grid system is somewhat unique in that it does not use Automatic Generation Control (AGC) to keep frequency within established bandwidth.
- In the current UK Market, rules require NGESO to provide closed dispatch instructions (closed BOAs) for generators and pay them extra to alter their schedule, appears inconsistent with the need to value flexibility and develop nimble and accurate real-time dispatch instructions. Therefore, a review of these market rules with consideration of the incentives for flexibility is recommended.

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

Three reports were delivered in the course of the project:

- ADO Roadmap Report
- ADO Benchmarking Report Annex
- ADO Summary slide pack

The reports summarise research findings and synthesise strategic recommendations covering:

- global best practice for dispatch tools and processes
- a proposed architecture for an integrated dispatch optimization tool
- a proposed roadmap to develop and implement the tool in an agile manner
- high-level challenges to be considered which may impact the utility of the tools

Data Access

Details on how network or consumption data arising in the course of a NIC or NIA funded project can be requested by interested parties, and the terms on which such data will be made available by National Grid can be found in our publicly available "Data sharing policy related to NIC/NIA projects" and www.nationalgrideso.com/innovation. National Grid Electricity System Operator already publishes much of the data arising from our NIC/NIA projects at www.smartnetworks.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

All project reports have been published on the [Smarter Networks Portal](#) including:

- ADO Roadmap Report
- ADO Benchmarking Report Annex
- ADO Summary slide pack

Planned Implementation

The project findings were presented to the ESO Executive team and feedback on the vision and implementation approach was sought. Approval to proceed with the intention to develop an Advance Dispatch Optimiser tool was obtained.

The next steps will be to perform a detailed gap analysis against existing activities and develop a forward program of work to deliver the ADO tools:

- understand in detail what dispatch capability (tools and processes) are currently in place or in progress
- identify which ADO requirements can be met by existing business plan activities
- identify which ADO requirements cannot be met by existing business plan activities, and what innovation activated can be used to fill any gaps found
- develop a program plan to detail end-to-end delivery of the ADO tools, taking into account existing business plan activities and an agile development approach
- identify funding routes for development of innovative aspects not currently in the business plan

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 license 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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Not applicable