

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 2024

Project Reference Number

NIA2_NGESO044

Project Progress

Project Title

Dispatch Optimiser Transformation (DOT)

Project Reference Number

NIA2_NGESO044

Project Start Date

July 2023

Project Duration

0 years and 6 months

Nominated Project Contact(s)

Shaun Clohessy

Scope

The project will last approximately six months with one project partner. IBM working alongside the ESO and Industry SMEs will develop the detailed data model report, gap analysis report, the iterative plan and architectural views.

Objectives

The objectives are as follows:

- Utilising reports from the original ADO project and SME input to define clearly what ADO will build and how.
- Identify gaps in the planned infrastructure and suggest specific projects to address gaps.
- Identify wider factors or risks that could impact the delivery of the ADO vision and define mitigating actions.
- Develop an agile delivery plan that can be integrated with BAU and existing business plans.

Success Criteria

The following will be considered when assessing whether the project is successful:

- The Data Model report will be produced defining the type, source and quality of data required to be able to run the models.
- The gap analysis will identify the gaps in capability and provide sufficient detail to initiate activity to address missing capabilities.
- The iterative plan will be utilised as a blueprint for the ADO programme.
- Stakeholders across the ESO will have awareness of the approach to deliver ADO and be engaged in the project.
- The project delivers against objectives, timescales and budgets as defined in the proposal

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 Dispatch Optimiser Transformation (DOT), NIA2_NGESO044 ("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).

The Report provided is for information only and viewers of the Report should not place any reliance on any of the contents of this Report including (without limitation) any data, recommendations or conclusions and should take all appropriate steps to verify this information before acting upon it and rely on their own information. None of the Publishers nor its affiliated companies make any representations nor give any warranties or undertakings in relation to the content of the Report in relation to the quality, accuracy, completeness or fitness for purpose of such content. To the fullest extent permitted by law, the Publishers shall not be liable howsoever arising (including negligence) in respect of or in relation to any reliance on information contained in the Report

Copyright © National Grid Electricity System Operator 2024

Project Overview

The project is a continuation of the Advanced Dispatch Optimisation (NIA2_NGESO013) project previously completed by Google Tapestry, where Tapestry created a strategic vision with the goal of designing an efficient dispatch process that is fit for purpose for the energy system of the future. Tapestry introduced several concepts to achieve the desired outcome, including:

- Automated insights through adaptive machine-learning input data models
- Probabilistic trajectories of various system states
- A series of look-ahead time-coupled security-constrained economic dispatch optimisation engines creating a system operating plan (SOP), instructions and reserves
- Enhanced or automated operator decision support
- Automated performance monitoring

The Dispatch Optimiser Transformation (DOT) Project aimed to meticulously explore the effective and efficient implementation of the vision outlined in the Tapestry report.

The project involved the identification of future capabilities necessary for realising the envisioned objectives and a comprehensive analysis of the current state of these capabilities. Once the to-be and the as-is were articulated, a gap analysis was conducted to ascertain the steps required for transitioning National Grid ESO from its current state to the desired future state. This analysis was presented as work packages and a roadmap for clarity and actionable guidance.

Additionally, the project delved deeply into the input data models, comprehensively assessing required input and output data for each model as well as data quality and data availability.

In the course of the DOT project, an architectural framework was proposed to support the realisation of the objectives described above. This report summarises the key insights derived from each of these activities, which collectively constitute the final deliverables of the project.

Project Plan and Activities

The project delivered the objectives on time, met the original success criteria and was held within the budget of £700,000.

A comprehensive Input Data Model report has been produced. Analysis of the as-is system, including committed business plan development, and the to-be system and organisational requirements have been carried out and detailed in the Gap Analysis Report. A Capability Framework was developed to support development of the Roadmap. The Roadmap details the next steps and specific projects to be initiated along with a high-level cost estimate and a suggested supplier list.

Stakeholders across the ESO have been engaged, are aware of the approach being taken to deliver the ADO solution and have contributed to the deliverables in the work packages.

In addition to interpreting the Tapestry end vision and breaking this down into meaningful work packages the project team have also evolved the End Vision to include the following:

- Forecasting of storage assets
- Forecasting of aggregated assets
- Differentiation of transmission constraint types including inertia
- Cross-cutting scenario capability

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

Changes to Scope and Approach

Due to stakeholder availability the timing of some of the work needed to be replanned to accommodate shift patterns.

Prior to commencing the project, the team identified a risk that in some circumstances the data required may not be available or if it is available, it may not contain all the expected fields. This risk materialised on a small number of occasions, e.g., evidence of legacy data. As a mitigating action the project team interviewed SMEs knowledgeable of the areas to confirm the data features.

Lessons Learnt for Future Projects

This was an ambitious project that sought to understand the multitude of Control Room systems and the data inputs and outputs involved. Utilising an agile approach and understanding that not necessarily all the data that was requested would be available, or available in a format that was easily ingestible within the project's timescales, was beneficial in ensuring the project were pragmatic in what level of granularity could be achieved when producing the Data Model report especially with regard to legacy system data. Having a technical delivery partner who is experienced in Control Room operations, systems and processes meant the project could call on their knowledge and experience as well as the ESO SMEs and deliver more efficiently than a partner with little or no Control Room knowledge.

The project team gained valuable insight by spending time in the Control Room as well as holding in person meetings with SMEs at key points in the project to elicit requirements or review outputs.

The process for ensuring the IBM team were set up with all the relevant access to ESO systems and software took far longer than anyone anticipated.

Dissemination

The project featured in a presentation on the Virtual Energy System at the Energy Innovation Summit in November 2023 and can be found via the following link:

EIS presentation

ADO was also mentioned in an article in Utility Week 'We're only just getting started with AI' by Dan Clarke, Head of Innovation, Energy Networks Association – Published 20th May 2024

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 has delivered all its original objectives as well as evolving the solution End Vision.

Capability Framework – The capability framework that was developed as part of the DOT project aimed to break down the vision defined by Google Tapestry into distinct (to-be) capabilities. These direct and value-adding capabilities (L0) were then broken down into enabling capabilities (L1), which in sum provide the means to the L0 capability.

Gap Analysis Report - The comprehensive gap analysis report provides an in-depth explanation of the capabilities and the associated value that each of these capabilities may offer.

Google Tapestry created a strategic vision to design an efficient dispatch process that is fit for purpose for the energy system of the future. Tapestry introduced several concepts to achieve the desired outcome, including:

- Automated insights through adaptive machine-learning input data models.
- Probabilistic trajectories of various system states.
- A series of look-ahead time-coupled security-constrained economic dispatch optimisation engines create a system operating plan (SOP), instructions and reserves.
- Enhanced or automated operator decision support.
- Automated performance monitoring.

The DOT Project, following the Google Tapestry study, aimed to meticulously explore the effective and efficient implementation of the recommendations outlined in the Tapestry report. The project involved a comprehensive analysis of the current dispatch process and the identification of future capabilities necessary for realising the envisioned objectives. After the identification of prospective or future

capabilities, a thorough gap analysis was undertaken to assess the disparity between the current "as-is" state and the envisioned "to-be" state to devise a path for their realization.

Work Package Report – Closing the gaps identified in the gap analysis section will necessitate the initiation of a series of strategic initiatives. The total scope of work has been systematically broken down into a series of workstreams and modular work packages.

The work package report provides a comprehensive overview of the work packages, including their detailed descriptions, the duration of each initiative, the dependencies involved, and the corresponding effort needed for successful completion.

The work packages have been categorized as follows:

- Regulatory Framework Agreement and/or Stakeholder engagement
- Value and/or feasibility analysis
- Design
- Agile Development
- Research

Roadmap Report – The Roadmap has been designed to orchestrate the essential initiatives (work packages) that are required to be delivered as part of a comprehensive strategy to address the gaps identified in the gap analysis. The roadmap presents a visual representation of the proposed timelines, detailing the sequence of work packages, their associated dependencies, and scheduled milestones.

Input Data Model Report – Within the Data model report deliverable, the focus is on the Adaptive Input Data Models – exploring current and planned capabilities, the required final capability, as well as the associated gaps and next steps. The model groups discussed are:

- Adaptive Generation Models2
 - Thermal
 - Renewable
 - Grid scale duration limited assets, such as batteries and pumped storage
[added following Google X clarification and not explicitly referenced within the Tapestry report]
- Adaptive Transmission Model
- Adaptive Interconnector Models
- Adaptive Distributed Energy Resources (DER) Models
- Adaptive Net Demand Models
 - Demand Forecast and Consumer Behaviour
 - Embedded DER

Architectural View – To ensure a technically sound roadmap the project created a high-level view of a potential logical architecture for the Advanced Dispatch Optimization (ADO) system. The project created four key architectural artefacts:

A System Context Diagram: This provides an overview of the ADO system and its relationship to other systems and components.
Architectural Principles: They outline the guiding principles and constraints that have shaped the architecture of the ADO system.
Architectural Decisions: To capture the key decisions made during the design process, including the rationale behind each decision.
A Component Model: This diagram provides a detailed view of the components that make up the ADO system, including their relationships and interactions.

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 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.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 released on to the Smarter Networks Portal:

Planned Implementation

Next steps for the project are as follows:

- Decide on approach to progress the ADO programme of work considering results of this project, e.g., priority order of work packages for development, funding options, potential timelines, potential project partners etc
- Obtain ESO executive approval to proceed with ADO programme
- Secure finances from selected funding options
- ADO programme set up

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.

Standards Documents