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

May 2025

Project Reference Number

NIA2_NGESO052

Project Progress

Project Title

Oscillation and regional RoCoF monitoring

Project Reference Number

NIA2_NGESO052

Funding Licensee(s)

NESO - National Energy System Operator

Project Start Date

February 2024

Project Duration

2 years and 1 month

Nominated Project Contact(s)

innovation@nationalgrideso.com

Scope

This project will provide monitoring capabilities, observing two dynamic phenomena in the GB power system – oscillatory behaviour and regional RoCoF trends. It will utilise data from high resolution XMU devices, combined with analytical capabilities to provide insights into the behaviour of the transmission system. It is a desktop study that will use data gathered from the XMU devices and historic events to provide insights into the two dynamic phenomena and will allow us to assess the effectiveness of XMU devices in monitoring system behaviour.
Potential benefits of this project will be determined by the insights gathered, however could include:

- Greater understanding of regional frequency variations, supporting future product developments or operating policies.
- Insights of actual vs. modelled Loss of Mains (LoM) risks could allow the ESO to reduce operational response and reserve holding (reducing consumer cost without increasing risk).
- Development of preventative strategies to mitigate system oscillations.
- WP2 will provide greater understanding of the GB power system and investigations into the root causes of oscillation events. Increased and timely insights will allow the ESO to identify any areas of the system at risk of instability issues, and the root cause of this.

Objectives

The primary objective of this project is to investigate whether the data insights available to the ESO through XMU devices can provide sufficient, detailed insight into how the GB transmission system is operating. It will enhance the situational awareness of the GB power system, complementing the insights that ESO has from existing PMUs.

- Evaluate whether high resolution XMU data can provide new insights into GB system operation that have previously been unavailable to the ESO.
- Assess if the resolution of the results is specific enough to allow the ESO to make changes to operational conditions (if deemed economic and/or relevant).
- Determine if data can be used to enhance the situational awareness currently provided by the SCADA system and PMUs to make more informed decisions to maintain the stability and reliability of the GB power system.

Success Criteria

The success of this project will be determined by its ability to demonstrate the value of data insights provided by XMU technology into how the power system is operating. The project's success will be measured by its ability to achieve the objectives

- Project delivers on time and within specified budget.
- Conclusions can be drawn from the datasets to summarise results and findings.
- Clear understanding around whether resolution of the results is specific enough to allow the ESO to make changes to operational conditions (if deemed economic and/or relevant).
- Data can be used to enhance the situational awareness currently provided by the SCADA system and PMUs to make more informed decisions to maintain the stability and reliability of the GB power system.

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 Oscillation and regional RoCoF monitoring, NIA2_NGESO052 ("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).

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

The project is delivered in two work packages (WPs). Detailed content delivery shall be agreed during project initiation workshops. A final, publishable report will be provided on project conclusion summarising the outputs of the project and learnings gathered from the work. Commercially or operationally sensitive data can be redacted within this report.

WP1: RoCoF events monitoring and reporting service:
Reactive Technologies will analyse local frequency and RoCoF data from large system losses and identify and estimate the occurrence of associated distributed generation RoCoF trips.
The outputs of the WP1 constitutes of:
▪ Historic assessment report. The analysis of the large events occurred in the last 18 months, based on availability of local XMUs, split into 3 month blocks.
▪ Quarterly ongoing reports (for an initial contract period of 24 months).
For each of the qualifying events the outputs will include:
▪ Regional RoCoF characteristics
▪ Quantify general location (distribution network region) and residual size (MW estimate) of RoCoF trips (assumed to be linked to residual un-changed protection systems) in sympathy associated with large RoCoF events on the transmission system
If the analysis highlights the need for additional XMUs, this project will inform the recommendations.

WP2: Oscillation events monitoring and reporting service:
Reactive Technologies will analyse dominant oscillations in each region of the GB system, select events (for the quarterly report) and perform detailed analysis for each event.
The outputs of the WP2 constitutes of:
▪ Quarterly ongoing reports (for an initial contract period of 24 months). Top 40 events will be selected and analysed. Initial split proposed is half the events from Scotland and the other half from the rest of GB but this can be adjusted as required. The first quarterly report will cover the months May, June and July 2024. Subsequent reports will proceed accordingly on a rolling basis. It has been agreed with NG ESO that a historical analysis of oscillation events in Scotland from Jan – Apr 2024 will be included as an addendum

to the first quarterly report.
▪ Specific shorter-term turn around analysis report for oscillation events identified by NG ESO (up to five events per quarter).
For each of the qualifying events the output will include:
▪ Frequency and time domain analysis of the dominant oscillation.

▪ Additional in-depth analysis linking the time of the event to the timing information of grid events shared by NG ESO as explained in Data Requirements.

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

Compared to the original scope of WP2, the analysis of harmonics has been descoped with agreement from both parties, but the analysis of oscillations has been extended by adding the in-depth analysis and increasing the number of events per quarter from 20 to 40.

Lessons Learnt for Future Projects

- Ensure that the scope of the project is relevant to NESO
- Ensure that the proposed methodologies/techniques have been fully developed or proven previously to guarantee the achievement of objectives
- Ensure the availability of the test systems in the required tools and format

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

WP1: 18-month historical report and 3 quarterly reports highlighting the regions where potential DG trips occurred
WP2: 3 quarterly reports analysing the oscillation events occurred in the GB system during the analysed period and 3 short-term turnaround reports providing in-depth analysis of specific oscillation events reported by NESO.

Data Access

Details on hownetwork 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

So far, the following reports have been delivered:

Deliverable 1A & 2A (re-scope and methodologies)

WP1:

- 18-month Historical Assessment Report
- First Quarterly Report
- Second Quarterly Report
- Third Quarterly Report

WP2:

- First Quarterly Report
- Short-term turn-around Analysis Report-Q1
- Second Quarterly Report
- Short-term turn-around Analysis Report-Q2
- Third Quarterly Report

A final, publishable report will be provided on project conclusion summarising the outputs of the project and learnings gathered from the work. Commercially or operationally sensitive data can be redacted within this report.