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.

NIA Project Registration and PEA Document

Date of Submission

Oct 2022

Project Reference Number

NIA2_NGESO012

Project Registration

Project Title

COMMANDER – Coordinated Operational Methodology for Managing and Accessing Network Distributed Energy Resources

Project Reference Number

NIA2_NGESO012

Project Licensee(s)

National Grid Electricity System Operator

Project Start

October 2022

Project Duration

1 year and 4 months

Nominated Project Contact(s)

Matthew Rivett (ESO), Stuart Fowler (WPD)

Project Budget

£500,000.00

Summary

The end consumer, Distribution Network Operators (DNOs) and Distributed Energy Resources (DERs) are becoming active participants in providing increasing levels of flexibility to the Great Britain (GB) electricity system but there is uncertainty in relation to the roles and responsibilities of the ESO and DSOs in this new smart energy world. This project aims to address those gaps and has the potential to deliver whole systems benefits by creating new flexibility market opportunities for potential service providers.

Deliverables of the project will include reports on national and international trends, a techno-economic feasibility assessment of the developed ESO/DSO coordination schemes at operational timescales, an impact assessment of the ESO/DSO coordination schemes and a roadmap for the physical deployment of the preferred ESO/DSO coordination scheme.

Nominated Contact Email Address(es)

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Problem Being Solved

The three challenges of decarbonisation, decentralisation and digitisation are changing the energy system. The end consumer, Distribution Network Operators (DNOs) and Distributed Energy Resources (DERs) are becoming active participants in providing increasing levels of flexibility to the Great Britain (GB) electricity system. This has, therefore, the potential to deliver whole system benefits by creating new flexibility market opportunities for potential service providers. These markets will enable flexibility services to compete alongside traditional investment options for all relevant network reinforcements or upgrades of significant value and to make the most cost-effective investment decisions in the future. As both the Electricity System Operator (ESO) and the DNOs (hereafter referred to as Distribution System Operators (DSOs) to reflect their more active operational role) are seeking additional sources of flexibility, there is uncertainty in relation to the roles and responsibilities of the ESO and DSOs in this new smart energy world. As services from DERs are increasingly used to tackle both network management and energy balancing issues, there is a need to ensure they can provide multiple services to several entities, such as the ESO, the DSOs and Suppliers, in techno-economic efficient and secure manner.

In this context, to ensure DERs can provide flexibility services to multiple entities, efficient coordination between the ESO and DSO is critically important when accessing DERs for flexibility service provision. Therefore, there is a need to:

- Identify and define alternative ESO/DSO coordination schemes for accessing and managing DERs with respect to their qualification, procurement, dispatch and settlement. In particular, the roles and responsibilities of the key actors involved, their interfaces across different timescales and information exchanges as well as key market arrangements to facilitate the process;
- Quantify and assess the techno-economic feasibility of alternative ESO/DSO coordination schemes for accessing and managing DERs for service provision at operational timescales; and
- Develop an engineering-based roadmap and recommendations for the practical implementation of the preferred ESO/DSO coordination scheme.

The ESO/DSO coordination schemes will have a focus on maximising the use of flexibility provided by DERs with respect to enabling them to participate equally alongside other flexibility and balancing service providers, including conventional and renewable transmission connected assets as well as interconnectors.

Enabling efficient access to DERs through streamlined ESO/DSO coordination will deliver; opportunities for customers to realise value from services and new technology; more sustainable energy markets and networks; reduced costs to customers (e.g., network balancing and investment); enhanced security of supply; and the transition to net zero at the lowest overall cost for customers.

Method(s)

The project brings together an experienced team of subject matter experts from WSP and Imperial College London, with significant expertise in power network utilities, transition to DSO, whole electricity system planning and operation, techno-economic modelling of whole electricity system and future electricity markets. They will deliver in close collaboration to ensure that learning outcomes are translatable into Business as Usual (BaU) practices in the ESO business and can be replicable and scalable across the GB DNOs. The project will be structured in the following five distinct work streams (WS), each of which has specific objectives.

WS1. DEVELOPMENT OF ESO/DSO COORDINATION SCHEMES

This WS will undertake research, analysis and stakeholder engagement of alternative ESO/DSO coordination schemes for accessing and managing DERs with respect to their qualification, procurement, dispatch and settlement. The key objectives of this WS are:

- Research and analysis of national and international trends on ESO/DSO coordination schemes, assess their relevance and applicability to the GB electricity system and extract appropriate lessons learned.
- Conduct stakeholder engagement activities within the ESO to take stock of different perspectives, objectives, aspirations and boundaries around potential future ESO/DSO coordination schemes in GB.
- Develop different ESO/DSO coordination schemes for accessing and managing DERs (limited to a maximum of two) on a high-level basis covering key aspects such as getting connected and commercial arrangements, system coordination and operation, and network design and development. It includes identifying and defining the roles and responsibilities of the key actors involved, such as suppliers, aggregators, DER providers, prosumers, local energy systems, etc., their interfaces and information exchanges.

Deliverables

- Report on national and international trends on ESO/DSO coordination schemes
- Report on the developed ESO/DSO coordination schemes

WS2. TECHNO-ECONOMIC FEASIBILITY ASSESSMENT OF ESO/DSO COORDINATION SCHEMES AT OPERATIONAL TIMESCALES

This WS will perform techno-economic modelling of the whole electricity system to quantify and assess the techno-economic feasibility of the alternative ESO/DSO coordination schemes for accessing and managing DERs for service provision at operational timescales. The key objectives of this WS are:

- Enhance the current whole electricity system model to represent the developed ESO/DSO coordination schemes at operational timescales (both pre and post event). The model is based on a Security Constrained Optimal Power Flow and looks to minimise the costs of balancing the transmission and distribution systems, jointly or sequentially, considering dynamic operational constraints of conventional generating plans, renewable energy resources, transmission and distribution connected flexible energy resources, network outages, interconnection, etc.
- Define whole electricity system use cases against which to assess the coordination schemes. These will consider geographic locations of the networks, specific types of flexibility services, different technology types of flexibility services, etc.
- Map the use cases on to the model developed to quantify and assess the costs and benefits associated with operational

performance of the different ESO/DSO coordination schemes.

- The model will quantify and assess the technical costs and benefits different ESO/DSO coordination schemes against the costs incurred from running the whole electricity system.

Deliverables

- Report on the techno-economic feasibility assessment of the developed ESO/DSO coordination schemes at operational timescales.

WS3. IMPACT ASSESSMENT OF THE ESO/DSO COORDINATION SCHEMES

This WS will undertake an impact assessment of the ESO/DSO coordination schemes. The impact assessment will combine a quantitative assessment of relative costs and benefits of the schemes with a qualitative assessment across a wide-ranging criterion that will be informed by stakeholder feedback within the ESO. It will provide in-depth insights on the strengths and weaknesses of the different schemes. The key objectives of this WS are:

- Enhance the current whole electricity system model to represent the developed ESO/DSO coordination schemes at planning timescales. For each scheme, the optimisation-based model will balance the costs of investing in generation, transmission and distribution infrastructures and the costs running the whole system against the benefits brought by flexibility service provision from transmission and distribution connected flexibility resources.
- Quantitative assessment (i.e., economic case criterion) of the relative costs and benefits for the impact assessment. Application of the model to quantify and assess the different ESO/DSO coordination schemes against the costs incurred from investing in traditional electricity infrastructure and balancing the whole electricity system and the benefits brought by flexibility energy resources.
- Develop a wide-ranging criterion to underpin the qualitative assessment of the overall impact assessment. The criteria may cover the strategic case, commercial case, financial case, etc. including aspects such as customer experience, market viability sustainability, environmental sustainability, regulatory frameworks, industry structure and organisation. Conduct stakeholder engagement activities within the ESO to support with scoring across the criteria.
- Combine the quantitative and qualitative assessments to form the overall impact assessment. Select the preferred ESO/DSO coordination scheme for roadmap development.

Deliverables

- Report on the impact assessment of the ESO/DSO coordination schemes.

WS4. ROADMAP FOR THE PHYSICAL DEPLOYMENT OF THE ESO/DSO COORDINATION SCHEME

This WS will develop an engineering-based roadmap and recommendations for the practical implementation of the preferred ESO/DSO coordination scheme. The key objectives of this WS are:

- Identify and define the key activities and initiatives, covering technical, commercial and regulatory aspects, that need to happen to enable the physical deployment of the schemes. Carry out stakeholder engagement activities to feedback on the roadmap activities. Organise the activities on a priority list according to their alignment to the ESO strategic objectives and value delivered.
- Time-sequence the activities onto the roadmap itself. The sequence will reflect the established priorities and will be modified, as appropriate, to account for dependencies. There will also be a high-level assessment of the ability of the ESO to manage the implied rate of change. Develop a set of management KPIs track the delivery of the roadmap.
- To assess the roadmap in terms of its impact across operational areas of the ESO business. The assessment will identify areas of high, medium and low change across the business across different time periods and will describe key changes.

Deliverables

- Report on the roadmap for the physical deployment of the preferred ESO/DSO coordination scheme.

WS5. BROADER APPLICATION OF FINDINGS, REPORTING AND KNOWLEDGE DISSEMINATION

This WS will complete all project reporting and knowledge dissemination required as part of Network Innovation Allowance (NIA). The key objectives of this WS are:

- Deliver the monthly project management related reports such as the project risk register, actions log, lessons learned log, key output milestones report, IPR register, project monthly report etc.
- Deliver the annual project report and the project close down report.
- Deliver knowledge dissemination webinars and workshops to industry stakeholder, etc.

Deliverables

- Annual project report.
- Project close down report.
- Knowledge dissemination event (workshop or seminar with key stakeholders).

In line with the ENA's ENIP document, the risk rating is scored Low.

TRL Steps = 1 (2 TRL steps)
Cost = 1 (£450k)
Suppliers = 1 (1 supplier)
Data Assumptions = 2
Total = 5 (Low)

Scope

To ensure DERs can provide flexibility services to multiple entities, efficient coordination between the ESO and DSOs is critically important when accessing DERs for flexibility service provision. At present there is a lot of uncertainty in relation to the roles and responsibilities of the ESO and DSO's in this new smart energy world.

This project seeks to build on the work of the Open Networks and the Regional Development programmes by researching the current international trends in this area and defining a roadmap for the practical implementation of the schemes across GB. With WPD as a project partner, it will give greater insight into the challenges from both a system operator and DNO perspective.

The ESO/DSO coordination schemes will have a focus on maximising the use of flexibility provided by DERs with respect to enabling them to participate equally alongside other flexibility and balancing service providers, including conventional and renewable transmission connected assets as well as interconnectors.

Enabling efficient access to DERs through streamlined ESO/DSO coordination will deliver:

- Opportunities for customers to realise value from services and new technology
- More sustainable energy markets and networks
- Reduced costs to consumers through more optimised use of services
- Enhanced security of supply
- Transition to net zero at the lowest overall cost for customers

Objective(s)

The project aims to:

- Identify and define alternative ESO/DSO coordination schemes for accessing and managing DERs with respect to their qualification, procurement, dispatch, and settlement. In particular, the roles and responsibilities of the key actors involved, their interfaces across different timescales and information exchanges as well as key market arrangements to facilitate the process;
- Quantify and assess the techno-economic feasibility of alternative ESO/DSO coordination schemes for accessing and managing DERs for service provision at operational timescales; and
- Develop an engineering-based roadmap and recommendations for the practical implementation of the preferred ESO/DSO coordination scheme.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

The ESO does not have a direct connection to consumers, and therefore is unable to differentiate the impact on consumers and those in vulnerable situations.

This project has been assessed as having a neutral impact on customers in vulnerable situations because it is a transmission project. Benefits to all consumers are detailed below.

Success Criteria

The project will be classed as successful if the following criteria is met:

- There is a greater understanding of the latest national and international trends on ESO/DSO coordination schemes and how they could potentially be applicable to the GB system.
- There is a detailed techno-economic feasibility and analysis of each ESO/DSO coordination scheme.
- There is a developed roadmap which outlines the physical deployment of the preferred ESO/DSO coordination schemes.

- To operationalise the findings from this project, further functional workstreams will have been identified, which encapsulates all of the technological, commercial, regulatory and operational change required at granular organisational level.

Project Partners and External Funding

National Grid Electricity System Operator (ESO) & Western Power Distribution (WPD) will be jointly funding the project. WSP will be carrying out the work, no external funding required.

Potential for New Learning

This project will define a roadmap for the future of the ESO/DSO coordination schemes. At present there is much uncertainty around the future roles of the ESO and DNO's and this project will help to bridge the gaps in knowledge and highlight areas for further exploration.

This project is first of its kind in the UK, bringing together ESO / DSO to coordinate and maximise efficiency of access to DERs to this degree of detail.

Scale of Project

The overall project will last 14 months with ongoing group workshops and one to ones throughout the process.

The deliverables of the project will include reports on national and international trends, a techno-economic feasibility assessment of the developed ESO/DSO coordination schemes at operation timescales, an impact assessment of the ESO/DSO coordination schemes and a roadmap for the physical deployment of the preferred ESO/DSO coordination scheme.

Technology Readiness at Start

TRL3 Proof of Concept

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The project will be based upon the GB ESO area of operations.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£475,000

Project Eligibility Assessment Part 1

There are slightly differing requirements for RIIO-1 and RIIO-2 NIA projects. This is noted in each case, with the requirement numbers listed for both where they differ (shown as RIIO-2 / RIIO-1).

Requirement 1

Facilitate the energy system transition and/or benefit consumers in vulnerable situations (Please complete sections 3.1.1 and 3.1.2 for RIIO-2 projects only)

Please answer **at least one** of the following:

How the Project has the potential to facilitate the energy system transition:

The energy system is rapidly changing with end consumers, DNO's and DERs becoming active participants in providing flexibility across the GB electricity system. This project has the potential to deliver whole systems benefits by creating new flexibility market opportunities for potential service providers.

Enabling efficient access to DERs through streamlined ESO/DSO coordination will deliver:

- Opportunities for customers to realise value from services and new technology
- More sustainable energy markets and networks
- Reduced costs to consumers through more optimised use of services
- Enhanced security of supply
- Transition to net zero at the lowest overall cost for customers

How the Project has potential to benefit consumer in vulnerable situations:

N/A

Requirement 2 / 2b

Has the potential to deliver net benefits to consumers

Project must have the potential to deliver a Solution that delivers a net benefit to consumers of the Gas Transporter and/or Electricity Transmission or Electricity Distribution licensee, as the context requires. This could include delivering a Solution at a lower cost than the most efficient Method currently in use on the GB Gas Transportation System, the Gas Transporter's and/or Electricity Transmission or Electricity Distribution licensee's network, or wider benefits, such as social or environmental.

Please provide an estimate of the saving if the Problem is solved (RIIO-1 projects only)

N/A

Please provide a calculation of the expected benefits the Solution

Not required as research project.

Please provide an estimate of how replicable the Method is across GB

At present there is much uncertainty around the future roles of the ESO and DNO's and this project will help to bridge the gaps in knowledge and highlight areas for further exploration. As the project is the first of its kind within the UK, it is difficult at this stage to quantify how replicable the method will be across GB. However, upon completion of the project we will have cost benefit analysis of the ESO/DSO coordination schemes.

Please provide an outline of the costs of rolling out the Method across GB.

Due to the low TRL levels of the research project, this is not something that we are able to quantify at this stage. However, upon completion of the project we will have a greater understanding of the potential costs that might be involved of rolling out the method across GB.

Requirement 3 / 1

Involve Research, Development or Demonstration

A RIIO-1 NIA Project must have the potential to have a Direct Impact on a Network Licensee's network or the operations of the System Operator and involve the Research, Development, or Demonstration of at least one of the following (please tick which applies):

☐ A specific piece of new (i.e. unproven in GB, or where a method has been trialled outside GB the Network Licensee must justify repeating it as part of a project) equipment (including control and communications system software).

☐ A specific novel arrangement or application of existing licensee equipment (including control and/or communications systems and/or software)

☐ A specific novel operational practice directly related to the operation of the Network Licensees system

☐ A specific novel commercial arrangement

RIIO-2 Projects

☐ A specific piece of new equipment (including monitoring, control and communications systems and software)

☐ A specific piece of new technology (including analysis and modelling systems or software), in relation to which the Method is unproven

☐ A new methodology (including the identification of specific new procedures or techniques used to identify, select, process, and analyse information)

☐ A specific novel arrangement or application of existing gas transportation, electricity transmission or electricity distribution equipment, technology or methodology

☑ A specific novel operational practice directly related to the operation of the GB Gas Transportation System, electricity transmission or electricity distribution

☐ A specific novel commercial arrangement

Specific Requirements 4 / 2a

Please explain how the learning that will be generated could be used by the relevant Network Licensees

This project has the potential to deliver whole systems benefits by creating new flexibility market opportunities for potential service providers. These markets will enable flexibility services to compete alongside traditional investment options for all relevant network reinforcements or upgrades of significant value, and to make the most cost-effective investment decisions in the future.

The ESO/DSO coordination schemes will have a focus on maximising the use of flexibility provided by DERs with respect to enabling them to participate equally alongside other flexibility and balancing service providers, including conventional and renewable transmission connected assets as well as interconnectors.

Or, please describe what specific challenge identified in the Network Licensee's innovation strategy that is being addressed by the project (RIIO-1 only)

N/A

Is the default IPR position being applied?

☑ Yes

Project Eligibility Assessment Part 2

Not lead to unnecessary duplication

A Project must not lead to unnecessary duplication of any other Project, including but not limited to IFI, LCNF, NIA, NIC or SIF projects already registered, being carried out or completed.

Please demonstrate below that no unnecessary duplication will occur as a result of the Project.

To avoid duplication the proposed project will start with a literature review to understand the latest research of ESO/DSO coordination schemes nationally and internationally. As mentioned, at present there is much uncertainty around the future roles of the ESO and DNO's and this project will help to bridge the gaps in knowledge and highlight areas for further exploration. This project is first of its kind in the UK, bringing together ESO/DSO to coordinate and maximise efficiency of access to DERs to this degree of detail. We envisage that, to operationalise the findings from this project, further functional workstreams will be required, which encapsulates all of the technological, commercial, regulatory and operational change required at granular organisational level.

If applicable, justify why you are undertaking a Project similar to those being carried out by any other Network Licensees.

N/A

Additional Governance And Document Upload

Please identify why the project is innovative and has not been tried before

- This project is first of its kind in the UK, bringing together ESO/DSO to coordinate and maximise efficiency of access to DERs.
- This topic has not currently been explored to this degree of detail and there are no detailed analysis or cost benefit analysis of coordination schemes for ESO/DSO.

Relevant Foreground IPR

The following Foreground IPR will be generated from the project:

- Report on national and international trends on ESO/DSO coordination schemes.
- Report on the developed ESO/DSO coordination schemes.
- Report on the techno-economic feasibility assessment of the developed ESO/DSO coordination schemes at operational timescales.
- Report on the impact assessment of the ESO/DSO coordination schemes.
- Report on the roadmap for the physical deployment of the preferred ESO/DSO coordination scheme.

Data Access Details

Data for this project and all other projects funded under the Network Innovation Allowance (NIA), Network Innovation Competition (NIC) or the new Strategic Innovation Fund (SIF) can be found or requested in a number of ways:

1. A request for information via the Smarter Networks Portal at https://smarter.energynetworks.org, to contact select a project and click 'Contact Lead Network'. National Grid ESO already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.
2. Via our Innovation website at https://www.nationalgrideso.com/future-energy/innovation
3. Via our managed mailbox innovation@nationalgrideso.com

Details on the terms on which such data will be made available by National Grid ESO can be found in our publicly available "Data sharing policy relating to NIC/NIA projects" at https://www.nationalgrideso.com/document/168191/download.

Please identify why the Network Licensees will not fund the project as apart of it's business and usual activities

- Due to the nature of the project and that it is researching potential future impacts to the electricity system based largely on assumptions, this would not fall into current BAU activities as there is a higher level of risk.
- Technological, commercial, regulatory and operational change is potentially required at the DSOs and the ESO in order to facilitate efficient coordination schemes and as such, this cannot easily be done within BAU activities / funding.

Please identify why the project can only be undertaken with the support of the NIA, including reference to the specific risks(e.g. commercial, technical, operational or regulatory) associated with the project

- There is risk in all (technology / commercial/ regulatory / operational) areas as it will plan and map out how the ESO/DSO will work together in these aspects.
- The project requires coordination between stakeholders to resolve conflicts & issues as well as to maintain an overall benefit despite conflicting motives between stakeholders.
- The TRL of the overall framework is relatively low. Therefore, innovation funding is more suitable for exploring the project's potential and increasing the TRL before transferring into BAU activities.

This project has been approved by a senior member of staff

☑ Yes