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

Jan 2025

Project Reference Number

NIA2_NESO084

Project Registration

Project Title

Alternative approaches to the ORPS methodology

Project Reference Number

NIA2_NESO084

Project Licensee(s)

National Energy System Operator

Project Start

January 2025

Project Duration

0 years and 6 months

Nominated Project Contact(s)

Jeremy Taylor

Project Budget

£200,000.00

Summary

Transmission connected generators are required to provide Obligatory Reactive Power Service (ORPS) as an Ancillary Service to help maintain a reliable electricity system. The Connection and Use of System Code (CUSC) contains the methodology which calculates the default payment rate for ORPS providers. It remains unchanged since 2007 and is based on the Retail Price Index (RPI) and wholesale power prices, being designed to compensate providers for the costs of providing ORPS. The project's aim is to re-design the methodology into an enduring solution, so that it compensates ORPS providers in a manner which is fair and reflective of the costs they incur due to the significant changes to the energy landscape and move to net zero.

Nominated Contact Email Address(es)

box.so.innovation@nationalgrid.com

Problem Being Solved

Licensed transmission connected generators are required as per Grid Code CC.6.3.2 to generate or absorb reactive power within certain parameters, determined by technology, size and location. To assist with voltage support, NESO is able to access this reactive power as an ancillary service, though Mandatory Service Agreements with generators. For providing this mandatory service, providers are remunerated through the OPRS default payment mechanism, as outlined in the CUSC schedule 3, part 1, appendix 1.

Generating or absorbing reactive power requires a generator to either reduce active power (MW) generation to increase its reactive power generation or burn more fuel (coal, gas, biomass etc) to increase reactive power and maintain active power. There are fixed,

variable and opportunity costs incurred by providers for generating or absorbing reactive power. The default payment mechanism in the CUSC, which was designed to compensate generators for the provision of reactive power, was first developed in the 1990's, with its most recent update in 2007. The methodology is based solely on Retail Price Index (RPI) and wholesale power prices and no longer reflects the generation mix and commercial characteristics of the industry. The spike in wholesale gas prices from October 2021 caused the default payment rate to rise from ~£3/MVArh, to £17/MVArh in October 2022. This led to an increase in annual mandatory reactive power costs: £70m in 20/21, £190m in 21/22, £353m in 22/23 and £187m in 23/24.

Due to the significant increase in providers of reactive power from non-coal/non-gas fuel types who are less exposed to volatility in wholesale gas prices, the current methodology is viewed as not fit for purpose as it could potentially led to unfair compensations for non-coal/gas units.
Additionally, demands for absorption of reactive power are increasing, and set to continue increasing, due to spillage from the DNOs. This will increase the amount of overall spending on reactive power.

A new methodology which is transparent, fair, cost-effective, and enduring is required. This will require extensive industry engagement to understand the costs incurred by providers, so that a new methodology is fair.

Method(s)

Along the NetZero policy and the decarbonisation journey of the GB electricity system, thermal generators will be replaced by other types of generation, such as battery, onshore/offshore wind, solar, hydropower, biomass and other emerging technologies, to mitigate carbon emissions and achieve a net zero electricity system.

The project aims to propose new compensation regimes that can delink or partially delink from the gas generation dominated wholesale price, and link to elements that can better reflect factors such as technical limitations, daily operations, cost structure and investment considerations of the non-thermal generators.

Any proposed changes to the ORPS compensation methodology will have widespread industry impact, therefore the project will not only be reviewing and analysing the existing regime but are also conducting extensive industry engagement in the form of interviews with providers of differing technologies and a wider industry workshop. This will help to understand providers' challenges and costs. The project will also extract the merits and drawbacks of the compensation regimes in other relevant overseas markets who are undertaking similar energy transitions.

Based on the pros and cons of different compensation principles of these overseas markets, and mixing with the GB context, the project will generate a few feasible options and convert them into a quantitative model for impact simulation and analysis on different type of generation technologies with NESO's historical data and the selected Future Energy Scenarios. 1-2 shortlisted options will then be further fine-tuned and converted into a detailed compensation methodology / formula.

Based on the quantitative simulation and the projected implementation challenges, the project will score and rank the compensation methodologies, generate a report, and make a recommendation to the NESO. They will support on the presentation and engagement with key industry stakeholders through a consultation paper, seminar, workshop, etc, as identified applicable for NESO.

Finally, the project will also support on the revision or modification of the selected methodology after the stakeholder engagement stage.

In line with the ENA's ENIP document, the risk rating is scored:
TRL Steps = 2
Cost = £200,000)
Suppliers = 1 (1 Supplier)
Data Assumptions = 2
Total = 5 Low

Scope

This project aims to challenge the methodology and limitations of the existing ORPS model, re-designing it so that it fairly and transparently compensates parties for the provision of mandatory reactive power. Its scope is limited to the commercial element of the formula, as outlined in the CUSC schedule 3, part 1, appendix 1, and is highlighted in bold below:

BPU = (46,270,000 * Im * X * Y) / 42,054,693

Key benefits could be:
That reactive power providers are compensated fairly and appropriately, reflecting the present, and future, energy landscapes.
A transparent and justifiable methodology.
Reduced ORPS rates (not linked to unrelated fuel types).
A potential reduction in balancing costs.

Objective(s)

The key objectives are to:
Review and analyse the merits and drawbacks of the existing ORPS methodology.
Research different regimes commonly adopted by other relevant international TSOs.
Identify the technical capability, preference, and concerns of ORPS service providers.
Generate feasible options based on industry feedback. Model, evaluate and prioritise the shortlisted options and understand the impact on balancing services model.
Deliver a final report and recommendation via industry webinar

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

This project has been assessed as having a neutral impact on customers in vulnerable situations.

Success Criteria

The key success criteria are:

- Delivery of a report summarising: A list of merits and drawbacks associated with the current ORPS methodology, and evaluation criteria and a keynote of the procedure and limitations of changes or introduction of new methodology.
- A report summarising:
Engagement with TSOs and the regimes adopted by the selected TSOs, including a high-level assessment of the different adopted approaches.
The core principles analysed with their pros and cons on cost impact, fairness, transparency, implementation challenges, robustness to the market conditions, and market arrangements with respect to GB
- A report summarising:
The capability curves of different generation technologies
An estimated portfolio of generation mix, nominal capacity, and the active / reactive power ratio
The engagement with the various SP and the collective webinar; demonstrating engagement across a varied mix of technology types across a variety of companies in the industry to avoid any bias towards any one technology, individual or group of individuals. Ensure inclusion of investment companies as well as service providers.
The findings on the technical capabilities of different technology types, preferences, concerns by different technology types and respondent; how they provide reactive power and what it means for them as a service provider; fuel cost, maintenance costs, etc. Covering why the proposals to be developed are the ones to be taken forward.
- A report summarising:
The Plexos model adopted for the shortlisted options; detailing draft and final specifications for the sandbox models; associated Input DataFiles; solutions for all sandbox models; related post-processing materials; a summary of the review process which covers elements which haven't been considered; a forecasted reactive cost based on the recommended option compared with the current rate.
- A presentation and recommendation of the findings (nominated methodology)
To include a summary of all findings, referring to the appendices, which is a collation of all prior reports, ensuring feedback from stakeholders is used in a fair and balanced manner.
The implementation risk assessment.
- Support for NESO in the presentation of an online seminar which delivers to industry the recommended new methodology. The engagement must actively engage with various stakeholders, including industry trade bodies, ensuring due diligence and the gathering of as much feedback as possible. Feedback from stakeholders should be used in a fair and balanced manner.
- Fine-tuning of the final proposed methodology, incorporating industry feedback into the final report, ensuring feedback is actioned and used in a fair and balanced manner.
- If a re-designed methodology is required this will be handed over to the relevant NESO team for implementation.

Project Partners and External Funding

Project Partner is DNV, No external funding.

Potential for New Learning

A comprehensive and up-to-date view of the challenges and costs that generators face when providing mandatory reactive power services will be helpful for any pre-tender strategy work that takes place in developing future reactive power services and markets. The anonymised reports and data that are shared on the NESO website and Smarter Networks portal will help other generators understand their own costs and challenges, when looking to connect to the grid and provided mandatory services.

Scale of Project

The project will engage with up to 6 globally based TSOs, interview mandatory reactive power providers to cover 11 technology types, host an industry wide workshop and a final online seminar to update industry as to the recommended methodology. The project will take place over a duration of 7 – 8 months.

Technology Readiness at Start

TRL2 Invention and Research

Technology Readiness at End

TRL5 Pilot Scale

Geographical Area

The project will take place in GB

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£200,000

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 provision of reactive power is an essential component in the provision of a secure and stable network for the UK. It is an obligation on participants to provide reactive power when requested by the system operator. The compensation arrangements for the provision of reactive power were developed in the 90's and were based on gas price, RPI and centralised generation. The evolution of the market as we transition to Net Zero has exposed the shortcomings in the present methodology, as it doesn't align to wind, solar and other net zero intermittent generation.

The aim of the project is to review current and anticipated markets for Net Zero generation and develop a revised methodology that aligns to developing technologies and markets. The review will take into consideration renewable technologies to facilitate a whole system approach.
1. Reviewing the ORPS methodology will enable a whole system review
2. By demonstrating a robust methodology at the end of the project this will provide a transparency for participants as part as the new energy transition.
3. Ensure future energy methodology is efficiently designed, fit for purpose and aligned to Net Zero.
4. Facilitate alignment and change to reduce barriers to Net Zero generation as the system moves towards net zero

This project will focus on defining the detailed problem statement on the ORPS methodology is trying to solve, and investigating how should a methodology be developed to deliver that outcome.

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

While the primary driver is network stability and security. The project aims to review compensation to participants provide reactive power, to be more reflective of the net zero marketplace. Any cost savings in the provision of reactive power that will be released by the project will reduce the costs to the consumer.

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)

Not Applicable

Please provide a calculation of the expected benefits the Solution

Not required as this is a research project.

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

Any ORPS methodology will have to be deployed across GB. A key part of these phases will be defining a methodology which can be replicated across GB.

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

Any subsequent changes to the ORPS methodology identified as appropriate by the project and agreed between the system operator and industry will be picked up by NESO's Market Frameworks team and implemented in the relevant industry codes, as appropriate.

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

ORPS is a licence obligation, and the project is looking to develop and understanding of the cost and complexities of proving OPRS using emergent technologies required for Net Zero and ensuring the compensatory arrangements are appropriate and transparent. The learning will be gained via the project undertaking desk research of the markets, considering emerging technologies and using best-in-class benchmarking from other TSOs and electricity markets.

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.

Change proposals to enhanced reactive power services (ERPS) are currently on hold while the ORPS project progresses as it is believed ERPS will no longer be required in future markets providing a suitable ORPS methodology is in place.

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

Not Applicable

Additional Governance And Document Upload

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

Issues with the current methodology have highlighted that it is no longer fit for purpose and the project aims to identify what future Net Zero system requirements are, considering emerging technologies and markets, which are currently unclear.

Relevant Foreground IPR

A final publishable executive summary report.

Data Access Details

A request for information via the Smarter Networks Portal at https://smarter.energynetworks.org, to contact select a project and click 'Contact Lead Network'. NESO already publishes much of the data arising from our innovation projects here so you may wish to check this website before making an application.
Via our Innovation website at https://www.nationalgrideso.com/future-energy/innovation
Via our managed mailbox innovation@nationalenergyso.com
Details on the terms on which such data will be made available by NESO can be found in our publicly available "Data sharing policy relating to NIC/NIA projects" at download.

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

The requirements for compensating obligatory reactive power providers in a Net Zero system remain unclear. It requires research to understand the costs and constraints faced by an emerging Net Zero market, considering experience gained by other TSOs and thorough engagement with industry. This will facilitate the development of a new methodology which is fit for purpose, and future proofed, to support a Net Zero system which is stable, secure, and cost effective.

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

This is not just updating BAU, as the markets involved are evolving all the time. Operationally some participants are deterred from participating in ORPS as the compensation method is not reflective of their costs incurred for providing obligatory reactive power. The needs of emergent technologies (11 currently identified) are not sufficiently understood in order to suggest an update to industry codes.

This project has been approved by a senior member of staff

☑ Yes