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

Jun 2026

Project Reference Number

NIA2_NESO084

Project Progress

Project Title

Alternative approaches to the ORPS methodology

Project Reference Number

NIA2_NESO084

Project Start Date

January 2025

Project Duration

0 years and 6 months

Nominated Project Contact(s)

Jeremy Taylor

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.

Objectives

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

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.

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 Alternative approaches to the ORPS methodology, NIA2_NESO084 (“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).

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Performance Compared to the Original Project Aims

The project aimed to understand the costs incurred by ORPS providers through extensive industry engagement and options analysis. This then formed the basis for the development of a methodology that is transparent, fair, cost-reflective and enduring. The project delivered its intended purpose by developing a methodology which is directly and proportionately linked to the costs associated with the delivery of mandatory reactive power, with clear justifications for the approach to extrapolating the cost. The approach was based

on data developed by DESNZ which is within the public domain, thereby ensuring transparency. There were no material deviations from the original intent.

The project achieved its aims of developing a recommended methodology which seeks to compensate providers fairly and proportionally for their provision of mandatory reactive power.

Performance Compared to the Original Project Objectives

Objective 1: Review and analyse the merits and drawbacks of the existing ORPS methodology
Status: Met
Delivery Outcome: A work package report was delivered outlining the merits and drawbacks of the existing ORPS methodology. This was necessary before proceeding with stakeholder engagement and option analysis & development.

Evidence: A study was performed, based on publicly available data, data provided by NESO, and workshops between DNV and NESO. A report was compiled which gave an overview of the ORPS mechanism in the context of long-term planning, through to despatch and settlement; reactive power market design; eligibility; and commercial parameters. Also included was an explanation of key parameters of the formulae, strengths and weaknesses of the methodology, and an initial set of evaluation criteria against which to assess the suitability of different methodologies.

Objective 2: Research different regimes commonly adopted by other relevant international Transmission System Operators (TSOs)
Status: Met
Delivery Outcome: A work package report was delivered which outlined the variety of approaches adopted worldwide to compensating mandatory reactive power. This formed a basis of the design features to be considered for a new methodology.

Evidence: Five TSOs (or comparable organisations) around the world were engaged with to learn from their reactive power compensation mechanisms. The engagement consisted of each TSO completing a questionnaire with a one-hour follow-up call with the project team. This engagement did not allow for a detailed assessment of each mechanism, instead allowing for useful lessons to be learned. The mechanisms in use varied across jurisdictions and include ‘no compensation’, fixed tariff and market-based mechanisms, with some jurisdictions using an approach that blends several mechanisms.

Objective 3: Identify the technical capability, preference, and concerns of ORPS service providers.
Status: Met
Delivery Outcome: Work package was delivered with no changes.
Evidence: The project’s engagement with providers involved one-to-one engagement with 8 parties, operating a range of 11 technologies. Additional stakeholders were also engaged in a collective stakeholder workshop after the 1:1 engagement sessions. As a result of this work there were a range of strengths identified with the current compensation mechanism. In addition, various design features (from TSO interviews) were discussed to understand providers’ attitudes towards these areas and to understand whether these features were felt to address them.

Objective 4: Generate feasible options based on industry feedback. Model, evaluate and prioritise the shortlisted options and understand the impact on balancing services model.
Status: Met
Delivery Outcome: Two reports were produced, one which outlined the design features and options for a new methodology, with a detailed qualitative analysis on their appropriateness vs the project criteria. A second report was produced which showed the modelling forecast results of the two most appropriate options against the ORPS baseline, out to 2030.

Evidence
Drawing on lessons from earlier work packages, the project team developed ten options based on key mechanism design features. These were initially assessed qualitatively to indicate their relative suitability. While inherently subjective, this provided a useful baseline, supported by multiple engagements between DNV and NESO to strengthen the selection process.

The most feasible options were identified as either a single unit rate or multiple unit rates, with the latter scoring more highly. To align the proposed rates with providers’ Operation and Maintenance (O&M) costs and the Connection and Use of System Code (CUSC) charging principles, DNV proposed using variable O&M costs from the DESNZ LCOE report. A single rate for all technologies was not sufficiently cost-reflective and risked under- or over-compensating providers, so it was not recommended for quantitative modelling. Instead, two alternative multi-rate options were taken forward for Plexos modelling against the current ORPS methodology as a baseline: one unit rate per technology type, and two grouped rates - one for synchronous generation and one for non-synchronous generation, based on weighted average variable O&M costs.

Plexos results:

- Prediction of future reactive power demand profile for the year to come (up to 2030) based on active projection (FES data – peak data) and DNV prediction based on historical data (to derive data for each settlement period)
- The predicted volume of reactive power broadly aligned with FES forecast (which are for peak active power values and does not include reactive power value per settlement period)
- Actual reactive power dispatch per technologies (volume) is used for predicting the payments of all three mechanisms (like for like volume comparison)
- Dispatch of technology is based on share constraints and order of merit, although this differs from existing practices it is the most practical way to predict future volume
- Based on the predicted volumes, the lowest cost scheme was the Multiple Rate (per technology), but both schemes are close in their reductions (around 75% to 80% on the predicted existing ORPS payments)

Objective 5: Deliver a final report and recommendation via industry webinar

Status: Met

Delivery Outcome: The recommendation was based on qualitative analysis, with modelling used to illustrate the outcome. The ORPS project recommended replacing the existing pricing methodology through a code modification with a multi-rate approach, using one rate per technology type. The methodology uses a unit's power factor range to derive a £/MVARh rate from variable O&M and fuel costs in DESNZ's LCOE data (expressed in £/MWh), aligning with the CUSC payment principles. The recommendation was presented to industry in a webinar, and feedback was used to refine the design for the final project report. Key areas of feedback during the webinar were:

- Power factor requirements vary by technology, location, project size, and Grid Code compliance route (ECC or CC).
- LCOE inputs can be refined further, and NESO is progressing this with DESNZ. Any changes will be taken forward through the Business-as-Usual code modification process. Zero MW technologies, including synchronous condensers and compensators, remain outside the revised ORPS and require further analysis.
- Dispatch remains out of scope. Compensation is driven by the unit rate (£/MVArh) and metered volume (MVArh), while this project focused solely on revised ORPS unit rates.

Evidence: A presentation and recommendation of the findings (nominated methodology) was played by DNV. The webinar was then held jointly by DNV/NESO which delivered to industry the recommended new methodology, the summary and Q&A documents are available on the NESO page. The webinar actively engaged with various stakeholders, including industry trade bodies, ensuring due diligence and the gathering of as much feedback as possible.

Performance Compared to the Original Success Criteria

Success Criterion 1: Summary of the current ORPS methodology, its key strengths and weaknesses, and the criteria and constraints for assessing alternative approaches **(achieved)**

Result: A report summarising ORPS across planning, dispatch, settlement, market design, eligibility, and commercial parameters, and set out the formula inputs, main strengths and weaknesses, and initial evaluation criteria.

Supporting Evidence: Work Package (WP) 1 report (not published)

Success Criterion 2: Summary of engagement with selected TSOs, the regimes they use, and the relative merits of each approach with respect to GB **(achieved)**

Result: The report summarised engagement with five TSOs (Australia, Belgium, Texas, France, Sweden). It highlighted three key findings: no-compensation models are established but could be contentious in GB; compensated models are usually technology-agnostic and designed to balance incentives, cost recovery, and oversight; and penalty regimes vary, but usually apply only after agreed tolerance thresholds are exceeded.

Supporting Evidence: WP2 report (not published)

Success Criterion 3: Summary of technology capabilities, generation mix, stakeholder engagement, provider views, and the evidence used to decide which proposals should be taken forward **(achieved)**

Result: The report summarised one-to-one engagement with eight parties across 11 technologies and feedback from the industry webinar. Stakeholders valued the current method's simplicity, single tariff, indexation, and cost recovery, but raised concerns about transparency, high cost, exclusion of asynchronous technologies, and limited forecasting visibility. Three high-level models were tested, with very limited support for a no-compensation approach.

Supporting Evidence: WP3 report (not published)

Success Criterion 4: Summary of the Plexos modelling for shortlisted options, sandbox models, assumptions, outputs, exclusions, and forecast cost impact versus the current rate **(achieved)**

Result: Two multi-rate options were modelled: one rate by technology group (synchronous and non-synchronous) and one rate by technology. The modelling used a simplified single-node network to illustrate the proposed payment methods and excluded regional voltage constraints, cross-border effects, future network developments, embedded generation impacts, and reactive compensation from transmission asset owners. Both options materially reduced forecast ORPS payments, with the technology-specific approach delivering the lowest cost and reductions of around 75% to 80% versus the current baseline.

Supporting Evidence: WP4 report and modelling results (not published)

Success Criterion 5: Presentation of the recommended methodology, summary of findings, use of stakeholder feedback, and implementation risk assessment **(achieved)**

Result: A report and presentation on the recommended methodology. Potential opportunities and assumptions around the baseline LCOE data were highlighted with key risks identified. Initial mitigations were identified, including targeted webinar engagement with providers to test support and refine the approach.

Supporting Evidence: WP5 report (not published)

Success Criterion 6: Support for an industry webinar on the recommended methodology, designed to gather stakeholder feedback to be used in a fair and balanced manner **(achieved)**

Result: Industry feedback focused on power factor treatment in the conversion method, opportunities to refine LCOE data, and dispatch arrangements outside project scope.

Supporting Evidence: Webinar summary and Q&A documents

Success Criterion 7: Refinement of the final methodology to reflect industry feedback in a fair and balanced way **(achieved)**

Result/Supporting Evidence: Final report completed and published on the NESO and ENA pages. Report covers clear recommendation on design and next steps through the code modification process and liaising with DESNZ for opportunities to refine the LCOE data.

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

There were no required modifications to the planned approach.

Lessons Learnt for Future Projects

Key lessons learned were:

- Reinforcement of the importance of early and frequent industry engagement.
- Ensuring all parties have a clear definition and understanding of the project requirements. As time was spent evaluating market-driven solutions, which were not aligned with the scope of a cost-reflective compensatory payment.
- An innovative and flexible methodology developed which more accurately reflects the CUSC charging principles and provider cost of provision, ensuring value for the consumer while NESO maintain a safe and stable network.
- The development of a future proofed methodology, i.e. one that incorporates new technologies, new research, and will continue to reflect the energy landscape as it continues to evolve.

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 indicated the following findings:

1. The strengths and weaknesses of the existing regime
2. The varying approaches adopted by other TSOs to compensating mandatory reactive power provision and their appropriateness to the GB system.
3. Service providers' views on the present methodology, and what a future methodology could/should look like.
4. The synthesis of options for possible regimes for compensating mandatory reactive power, and each one's appropriateness in

relation to the project criteria and GB network.
5. Projected reduction in ORPS spend for the two most appropriate regimes identified.
6. Recommendation of the most appropriate new methodology, with implementation risks.
7. Key feedback from industry on the proposed methodology.
8. A final methodology to be proposed for incorporation into the CUSC

There is a now a recognition that the current methodology is no longer appropriate. A CUSC modification (CMP457) has been raised, which is an expression of intent by proposing to implement the new methodology. The change process is required to be followed due to regulatory obligations. At the time of writing this report, the modification is at medium status and will progress to workgroups once its status has been classified at high. Additionally, regular dialogue has started between NESO and DESNZ regarding enduring improvements to the LCOE data. All NESO teams have been identified which utilise the LCOE data to ensure continued dialogue and alignment with its use and improvement.

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 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

The intellectual property which was generated as a result of the project is the recommended new methodology for compensating providers of mandatory reactive power. This methodology is outlined in the project's final report which can be found on both the Smarter Networks portal and NESO project page.

Planned Implementation

The proposed methodology is one for multiple rates, with a single rate per technology type, using DESNZ's LCOE data to extrapolate a £/MVArh rate from £/MWh costs for variable O&M and fuel costs. This process sets the initial unit rate of each technology. This approach differs from the existing ORPS payment mechanism, which is a single rate which is technology agnostic.

With regard to the LCOE data and assumptions, and the opportunities to refine some of the LCOE data (as highlighted above), continuous engagement with DESNZ, and relevant parties on their processes for updating the LCOE data, is required. This will ensure the LCOE data remains cost reflective.

The final recommendation has been integrated into the CUSC modification process. This process will provide plenty of opportunities to discuss the proposed solution further with industry representatives, refining the proposed new mechanism if required. During this process, the feasibility of implementing the proposed new ORPS payment methodology will be further investigated.

Alongside the new mechanism, review points are built into the design of the proposed methodology, that being the incorporation of refreshed LCOE data from DESNZ. These points will serve as an opportunity to reconsider the impact of the new LCOE data, where the rates can be adjusted accordingly.

Net Benefit Statement

Key Benefits

Benefit 1

A more flexible, transparent and cost-reflective methodology for mandatory reactive power compensation than the current approach.

The proposed design developed by the project and submitted to the code change process for consideration better accommodates emerging technologies, whereas the current methodology was developed around synchronous asset providers and gas price assumptions. It also improves transparency by using a clearer and more explainable methodology, with compensation more closely aligned to the actual cost of provision for different technology types, rather than a model primarily designed for thermal non-renewable generation.

What changed

Once implemented, the new design will more closely align to the actual cost of ORPS provision (i.e. wear and tear & fuel-related

losses by technology/fuel type) as it extrapolates out the cost of reactive power provision from government data (LCOE) which stipulates active power costs by technology. This is markedly different to the present approach which is based on RPI and Power Price Indices which are exposed to market volatility.

Who benefits and how

Consumers - The methodology proposed represents better value as compensation is more closely linked to the actual cost of provision of service, reducing over and under payments. It also results in more stable costs which only rise by Consumer Price Index between iterations of the Levelised Cost Of Electricity updates and has reduced exposure to volatile external market factors.

Industry - a methodology which is fully explainable, with a clear and justifiable logic, and with source data in the public domain. As the source data is produced by DESNZ, there is the opportunity for industry to contribute to future iterations to improve accuracy. As industry adopts new technologies, any not included in the initial code mod will be dealt with via new code mods. This allows the opportunity to revisit and challenge the methodology.

NESO will assist with price forecasting and could change the dispatch of assets due to the control room needing to consider price variation. Also demonstrates NESO's commitment to improving consumer value by embarking on an innovation funded project to bring a key consumer overhead up to date, showing NESO to be trusted experts, demonstrating reliability, impartiality and credibility.

Evidence: Methodology design and supporting analysis, as outlined in the project's Final Report.

Impact: Potential impact on provider costs, through more stable and predictable costs; a more reflective reimbursement for provision of ORPS, significantly reducing over and under payments. Impact on consumer value, by reflecting provision of service, and overall spend. An enduring methodology which only requires code modifications when new technologies are adopted.

Benefit 2: Forecast reduction in ORPS spend

What changed: The project produced a proposed model for ORPS using a PLEXOS simulation out to 2030, that if approved by Ofgem and adopted after consideration in the change process, represents a reduction in ORPS spend of approximately 70%, translating to a consumer saving of approximately £90m per annum.

Who benefits and how: End Consumer - reduction in spend on ORPS which is then recovered through the Balancing Services Use of System.

Evidence

Separate project report detailing a quantitative assessment of the modelling of the new methodology against the present methodology as a baseline. It covered the underlying generation mix, active power demand, and load profiles were based on the Future Energy Scenarios. Forecast of reactive power demand was conducted for each half-hourly interval using a linear regression model. This resulted in forecast of new rates vs present rates out to 2030, total payments by scheme and technology/fuel type, showing consumer savings of approximately £90m per annum.

Impact: A fair renumeration for industry participants providing reactive services that is fit for purpose in the changing energy landscape and will provide savings for the consumer.

Other Comments

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