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## NIA Project Close Down Report Document

### Date of Submission

Jan 2026

### Project Reference Number

NIA2\_NESO097

## Project Progress

### Project Title

Assessment of Alternative Approaches to setting NTCs

### Project Reference Number

NIA2\_NESO097

### Funding Licensee(s)

NESO - National Energy System Operator

### Project Start Date

January 2025

### Project Duration

0 years and 6 months

### Nominated Project Contact(s)

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## Scope

The scope of the research project comprises of four stages and includes key areas of focus:

### Scope item 1 – Summary of current arrangements

- A summary of the drivers of need for NTCs.
- Description of the frameworks NESO currently uses to set NTCs (based on NESO's NTC Calculation Policy) and compensate interconnectors (based on NESO's Methodology for Commercial Arrangements relating to Interconnector Capacity).
- Outline of the benefits and drawbacks of the current approach.
- An inception report to NESO summarising the analysis.

### Scope item 2 – Assessment of a potential NTC market

- Outline of the theoretical benefits of an NTC market, as a result of potential competition between interconnectors to meet NESO's needs.
- Assessment of the feasibility of an NTC market, including consideration of the extent to which NESO's requirements are locational.
- A high-level design for a potential NTC market.
- A quantitative cost benefit analysis of an NTC market, leveraging historical NTC usage data (to identify the periods in which NTCs have typically been required) and the outputs of FTI's dispatch model (for example, future power prices and interconnector flows), by analysing a counterfactual 'status quo' scenario and an NTC market scenario.
- A presentation to NESO summarising analysis.

### Scope item 3 – Possible alternatives to NTCs (expanding trades market)

- Exploration of the potential to systematically extend the use to of trades, from interconnectors to a greater number of generators (and, in turn, energy traders). This could increase the potential benefits, by further increasing competition and liquidity.
- A cost benefit analysis of a Trades market.
- An interim report to NESO summarising analysis.

### Scope item 4 – Recommendations

- Development of recommendations for options to reduce reliance on the use of NTCs
- A final report to NESO that sets out our methodology, results and recommendations (summarising Scope Items 1 to 3).
- A cost-benefit analysis of an NTC market would compare the costs paid by consumers for expected future NTC adjustments: (i) under the current status quo arrangements to those (ii) under an NTC market in which NESO is assumed to be able to restrict the interconnector(s) facing the lowest price differential, and therefore incurring the lowest cost.

## Objectives

The objective of this project is to:

- Assess the feasibility of a market-based mechanism for setting NTC restrictions. The project will first analyse the current NTC arrangements in GB, then will create a high-level design option for a NTC market and a cost benefit analysis.
- Assess and provide alternative options to reduce reliance on non-market based balancing options (NTCs). The project will include a quantitative assessment of the costs and benefits of an alternative approach to NTCs.

## Success Criteria

The project's success will be measured by its ability to achieve the objectives, through:

- An assessment of the feasibility of an NTC market supported by qualitative and quantitative analysis, cost benefit analysis and a high-level design option.
- A proposal of an alternative option(s) to NTCs supported by qualitative and quantitative analysis, and cost benefit analysis.
- A recommendation of which of the following is the most suitable option: current NTC arrangements, an NTC market or an alternative to NTCs, supported by evidence.

## 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 Assessment of Alternative Approaches to setting NTCs, NIA2\_NESO097 (“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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**Background information:** The electricity system has significantly evolved over the past ten years, with increasing amounts of renewable generation on the network, and a reduction in the amount of synchronous generation. This is leading to increased frequency volatility and more frequent, and larger, thermal and margin constraints. Actions taken by NESO to manage these constraints to maintain system security are increasing in both volume of actions and costs to consumers. This topic is being widely discussed given an expected increase in the number of interconnectors connecting to the grid and the need to manage constraints which is one of the main challenges being considered in REMA. Constraints will become even more exacerbated due to the location of the connection points for new interconnectors (mainly southeast England) and their large MW capacity.

## Aim

NTC restrictions are currently the only tool NESO can guarantee an interconnector's flow will not risk a breach of Grid System Security. A like for like alternative to NTCs (that meets system security) has not been developed, the project findings will provide insights into potential alternatives including a market-based option.

## Performance Compared to the Original Project Aims, Objectives and Success Criteria

### Objective

The objective of this project was to assess the feasibility of a market-based mechanism for setting NTC restrictions. The project analysed the current NTC arrangements in GB, to create a high-level design option for an NTC market and a cost benefit analysis. The project has met its original objectives and success criteria by delivering an evidence-based assessment of the feasibility of an NTC market, evaluating alternative options to NTCs through qualitative and quantitative analysis and cost-benefit analysis, and providing a clear, supported recommendation on the most suitable approach

### Method

This project has included input from the Industry, in particular, interconnectors.

The methods used to deliver this project included qualitative and quantitative analysis and cost benefit analysis.

The analysis was conducted across the below scope items:

1. Summary of current arrangements This section explains the need for NTCs and how it differs from other interconnector-related tools. It sets out the frameworks that determine how NESO utilises NTCs, and may include analysis of historical data on NTC usage. This could include both analysis at an aggregate level, annual level, and at a more granular issue-specific level (e.g., actions to mitigate a specific thermal constraint). This scope also sets out the benefits and drawbacks of NTCs.

2. Assessment of a potential NTC market This section proposed a high-level design of an NTC market considering the auction/bidding process, geographical location of interconnectors, the role of NESO and interconnectors, and fallback mechanisms. Also, safeguards against gaming, for example, a market that is designed in such a way that it would not be possible for interconnector(s) to influence power prices and its own rents were considered. The section set out theoretical benefits and drawbacks of an NTC market and produce a cost benefit analysis of an NTC market comparing the costs paid by NESO for expected future NTC adjustments: (i) under the current NTC arrangements to those (ii) under an NTC market, in which NESO is assumed to be able to restrict the interconnector(s) facing the lowest price differential, and therefore incurring the lowest cost. To do this, the section relied on a combination of data on historical NTC adjustments and the outputs of FTI's dispatch model, which includes forecasts of future power prices, generator outputs, and interconnector flows. Finally, this section calculated the expected future costs of NTC restrictions.

3. Possible alternatives to NTC This section assessed expanding the market for Grid Trade Master Agreement Electricity Trades. The section aimed to produce a cost benefit analysis of a trades market. To do this the section relied on a combination of data on historical NTC adjustments and the outputs of FTI's dispatch model.

FTI Consulting will provide a report upon completion of each scope item. Also, FTI delivered a final report to NESO that sets out the methodology, results and recommendations.

Outcome – conclusion from the report.

**Key finding 1:** NESO's existing NTC tool is effective in supporting system security, providing functionality that is not available to NESO via other options, but risks exposing GB consumers to higher than necessary costs and is not transparent

**Key finding 2:** Implementing an NTC market could, in theory, reduce costs to GB consumers while still maintaining system security by focusing restrictions on the lowest cost ICs to restrict. Potential benefits will increase when the variance across different connected European market prices is high.

**Key finding 3:** An NTC market is likely not suitable for GB ICs outside of the South East due to a lack of competition in those areas. As such, the status quo cannot be – in the short to medium term - fully replaced by an NTC market, necessitating future derogations from Ofgem.

**Key finding 4:** Whether the potential benefits of an NTC market can be realised in practice is uncertain, in part due to the risk of participants having significant market power or engaging in strategic bidding, even within the South East. Given the likely complexity associated with implementing an NTC market, the overall case for doing so therefore appears modest, particularly in the short term.

**Key finding 5:** Enhancing NESO's trading operations would be in keeping with NESO's recent direction of travel and could help to reduce the reliance on non-market NTC restrictions but would bring significant additional complexity and does not remove the need for NTC restrictions as a tool for managing the system.

**Key finding 6:** In recent years, NESO has improved the transparency of its use of NTC restrictions and the efficiency of its trading operations. However, recognising the concerns raised by ICs, FTI agree that there is likely scope for further improvements. FTI's quantitative assessment of i) a formal NTC market; and ii) expanding NESO's existing Trades function identified relatively modest benefits and material risks. As a result, a continuation of incremental reforms to the existing arrangements appears to be – for the time being - a more appropriate way forward compared to a more fundamental re-design of the NTC tool.

Direct performance against objectives:

An assessment of the feasibility of an NTC market supported by qualitative and quantitative analysis, cost benefit analysis and a high-level design option

The report reaches a firm conclusion to not recommend implementing a NTC market due to:

- a lack of competition within markets giving individual participants significant power
- a lack of substitutability between interconnectors to meet constraints in practice.
- benefits of a market (before costs) being worth between €1.3 to €2.9m per year, so a very limited overall possible benefit once costs accounted for.
- derogations ultimately still required as an NTC market could not replace the status quo arrangements entirely due to interconnectors not being located in a position to participate in a market.

A proposal of an alternative option(s) to NTCs supported by qualitative and quantitative analysis, and cost benefit analysis

The report assesses the benefits and drawbacks of the status quo and possibility of alternatives to an NTC market, with a focus on trades. There is a potential for cost savings to GB consumers which is greater than the cost saving of an NTC market, due to a wider pool of assets and increased competition and substitutability. The drawbacks of this option include:

- Not being able to replace NTC restrictions in all circumstances.
- Greater implementation and operation complexity.

A recommendation of which of the following is the most suitable option: current NTC arrangements, an NTC market or an alternative to NTCs, supported by evidence

The sixth key finding is clear as to the recommended course of action and why

In recent years, NESO has improved the transparency of its use of NTC restrictions and the efficiency of its trading operations. However, recognising the concerns raised by ICs, we agree that there is likely scope for further improvements. FTI quantitative assessment of i) a formal NTC market; and ii) expanding NESO's existing Trades function identified relatively modest benefits and material risks. As a result, a continuation of incremental reforms to the existing arrangements appears to be – for the time being - a more appropriate way forward compared to a more fundamental re-design of the NTC restriction tool.

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

There have been no required modifications to the planned approach.

## **Lessons Learnt for Future Projects**

### **The key lessons learned from work package 1:**

- Following Ofgem's recent Window 3 decision, IC capacity in the southeast could increase to 13 GW by 2032, potentially driving greater volumes of network constraints and resulting NESO actions.
- In practice, the cost of making a given IC whole (consistent with the overarching objective of the NTC Commercial Arrangements policy) will, at times, vary by IC. Broadly, ICs that are connected to markets with smaller differentials between the GB whole price and the connected market wholesale price will be cheaper to make whole, and vice versa. Additionally, the non-market nature of the current tool means there is no potential for competitive pressures between ICs to drive down compensation payable by NESO, although compensation is typically based on market prices (for example, the results of subsequent capacity auction results). Taken together, these issues mean that the current NTC design risks imposing higher than necessary costs on GB consumers.
- Investment decisions are unlikely to be materially impacted by NTC usage under the status quo (at least as long as the nature and frequency of NTC usage remains broadly in line with recent historical trends).

### **The key lessons learned from work package 2**

- Expected £1.1m of savings with an NTC market compared to the current status quo arrangements.

- Growing complexity of managing GB system constraints (due to, for example, regional imbalances between supply and demand, growing interconnector capacity, increased intermittency from growing renewables capacity) is likely to change the size of average NTC restrictions.
- Gross cost savings of a competitive market for NTC restrictions is driven by differences in GB-EU price differentials across connected countries.
- An NTC Market necessarily allocates a greater proportion of restriction onto one or two interconnectors, over others. In approving an NTC market, Ofgem and NESO would signal a willingness for reduced utilisation of some cables over others.
- Interconnectors facing the greatest volume of restrictions may, at best, reflect this inconvenience in their bids. However, they may also interpret high restriction levels as reflective of their significant value to the system and therefore, increase bids above cost-effective levels.

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 report indicated findings which have been summarised below:

1. NTCs are required to manage system security - NESO's existing NTC tool is effective for system security and offers unique functionality, but it may lead to higher costs for GB consumers and lacks and the NTC setting process lacks transparency
2. Introducing an NTC market could theoretically lower consumer costs while maintaining system security, especially when price differences across European markets are significant. An NTC market could provide some cost savings of between EUR 0.46m to EUR4.8M per year, which are related to the cost differentials in the connected countries. However, critically, the benefits calculated come with a number of related assumptions. If these assumptions are not realised, then the benefits will decrease. An NTC market is likely only viable for interconnectors (ICs) in the Southeast of GB due to limited competition elsewhere, meaning the current system will still be needed in the short to medium term. Realising the benefits of an NTC market is uncertain due to risks like market power concentration and strategic bidding. The complexity of implementation makes the case for change relatively weak in the near term.
3. Improving NESO's trading operations aligns with its current strategic direction and could reduce reliance on non-market NTC restrictions, though it would add complexity and not eliminate the need for restrictions.
4. While NESO has made progress in transparency and trading efficiency, further improvements are possible. A full redesign of the NTC tool is not justified currently; gradual enhancements are the preferred path forward.
5. All Interconnectors would have to transition from ITLs to NTCs for any form of market to be considered operationally viable.

## 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](http://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 published on the Smart Networks portal at the completion of the project

FTI Net Transfer Capacity Final Report consisting of:

- Review of existing arrangements
- Review of the benefits of a potential NTC market
- Review of alternative mechanisms to reduce reliance on non-market NTC restriction.

## Planned Implementation

Once published we will:

- Engage with Industry (using JESG forum as the location for a webinar) and gather feedback.
- Use the report, outcomes of engagement and other work related to NTC (such as the recent industry call for input relating to the NTC compensation methodology) to assess NESO's position on the feasibility of market-based arrangements for applying NTC restrictions. This is likely to be considered as part of NESO's review of Ofgem's C28 Derogation (expiring September 2026) that allows NESO to procure use of NTC as a non-frequency balancing service following non-market based procedures.
- Continue to consider market-based solutions for NTCs.

## Net Benefit Statement

Whilst it is not possible to give a quantifiable benefit statement, this project has given NESO focussed outcomes to work from and with industry colleagues on the report also provides evidence to industry of exploration into market-based arrangements for capacity management by NESO. The report delivered gives an independent, objective overview to this area.

The original rationale for an innovation project was Standard Licence Condition C28 which requires NESO to procure balancing services using market-based procedures. NTC is not procured through market-based procedures and therefore requires a derogation from this requirement – set to expire on 30/09/26.

The Innovation project was required was to:

- Identify and assess feasible market-based alternative for NTC including CBA, market design, and tech/system requirements, and impact assessment.
- Explore alternative solutions to NTCs including CBA, impact assessment, etc.

The basis of this report, considering that all NTCs transition to ITLs, gives an overview of what such an interconnector market would look like on that basis, giving Ofgem information to consider if they were minded to incentivise transitioning.

It is also a strong reference point for future innovation or derogations on NTC arrangements more broadly. The report and its conclusions will be important for NESO's review of the C28 derogation which expires in September 2026:

- The third outcome in particular, noting that in the short to medium term, that a NTC market outside of South East England is not possible, gives a possible direction to proceed regarding the specific issue of NESO using NTC via non-market based routes
- This report demonstrates that exhaustive consideration has been given to operating a NTC market and the conditions for which it may be possible will be kept as a point of reference. This is key for NESO demonstrating to Ofgem that it has considered this option and its benefits.

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The report gives direction on where NTC operation could be made more efficient, delivering greater outcomes for consumers.

Taken together, the outcomes of the project deliver net benefits by providing NESO and Ofgem with a robust, independent evidence base on the feasibility, costs, risks and limitations of alternative approaches to NTC arrangements. This reduces uncertainty, supports evidence-based regulatory and operational decision-making, helps avoid the cost and risk of implementing unsuitable market mechanisms, and provides a strong reference point for future derogation decisions and innovation activity.

## Other Comments

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## Standards Documents