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_NESO097

Project Registration

Project Title

Assessment of Alternative Approaches to setting NTCs

Project Reference Number

NIA2_NESO097

Project Licensee(s)

National Energy System Operator

Project Start

January 2025

Project Duration

0 years and 6 months

Nominated Project Contact(s)

Racheal Idowu

Project Budget

£260,000.00

Summary

NESO is considering alternative arrangements to effectively manage constraints and interconnector flows. This project will consider the current NTC arrangements, assess the feasibility of an NTC market and explore the potential to systematically extend the use of trades, from interconnectors to a greater number of generators.

The project findings could offer NESO a route to procure NTCs through a competitive market and provide insights into potential efficiencies and cost savings compared to the current arrangements.

Nominated Contact Email Address(es)

Innovation@neso.energy

Problem Being Solved

Background

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.

Current Challenges

While the use of NTCs provides NESO a last resort option to manage network constraints, largest loss relating to frequency management and margin extremes by limiting the capacity of and therefore flow across the interconnectors, the current arrangements can result in an inefficient outcome if there are significant differences in expected price differentials between GB and the countries connected via the interconnectors.

Under the current arrangements:

o Where multiple ICs jointly contribute to a particular constraint, NESO is obligated to 'spread' any NTC restrictions between different interconnectors as far as is practicable; and

o NESO compensates interconnectors (signed up to IC Commercial Compensation Methodology) to ensure that interconnectors are kept "whole" and will not lose out (or profit) because of an NTC restriction by NESO.

o Some interconnectors use Intraday Trading Limit (ITL) instead of NTC to perform the restrictions. ITLs were the initial method and are different to NTCs – ITLs can only limit unallocated capacity in intraday auctions. There is no compensation associated with the use of ITLs.

It is important for NESO to explore market-based alternatives to the current NTC arrangements and understand whether these alternatives will be:

1. beneficial for system operation,
2. more efficient and cost-effective
3. enabling NESO to maximise interconnector capacity whilst ensuring security of supply

Method(s)

This project will be led by FTI Consulting with input from NESO and wider stakeholders. The methods used to deliver this project will include qualitative and quantitative analysis and cost benefit analysis.

Analysis will be conducted across the below scope items:

1. Summary of current arrangements

This section will:

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

2. Assessment of a potential NTC market

This section will:

- Propose 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.
- Set out theoretical benefits and drawbacks of an NTC market.
- 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. This would rely 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.
- Calculate expected future costs of NTC restrictions.

3. Possible alternatives to NTC

This section will:

- Assess expanding the market for GTMA Electricity Trades.
- Produce a cost benefit analysis of a trades market. This would rely on a combination of data on historical NTC adjustments and the outputs of FTI's dispatch model

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

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

TRL Steps = 1

Cost = £260,000)

Suppliers = 1 (1 Supplier)

Data Assumptions = 2

Total = 4 Low

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.

Objective(s)

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.

Consumer Vulnerability Impact Assessment (RIIO-2 Projects Only)

N/A

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.

Project Partners and External Funding

Project partner: FTI Consulting, no external funding contribution.

Potential for New Learning

· Net Transfer Capacity or Intraday Trading Limits are currently the only actions a System Operator can use to guarantee an interconnector's flow will not breach System Security. Evidence backed analysis of potential alternatives to NTCs will provide NESO with insight into existing or new tools that could reduce reliance on restricting interconnector capacity using NTCs.

· An assessment into the feasibility of an NTC market will be undertaken for the first time. The analysis and high-level design will provide NESO with insight into geographic areas where an NTC market may be beneficial, potentially efficiencies and cost savings compared to current arrangements, and the mechanism by which a NTC market would be facilitated. i.e. auction process.

· The findings could provide NESO teams with greater insight on potential alternative options to manage constraints, a standardised way to manage interconnector flows, forecast costs for NTC restrictions, and increase competition while ensuring system security. They may also influence how our Control Room operators manage and calculate the flow restrictions in the most efficient way.

· Key findings will be shared with industry and connected TSOs.

· Potential benefits and drawbacks of introducing an NTC market supported by qualitative and quantitative analysis.

· A cost benefit assessment of current arrangements compared to an NTC market or an alternative. The outcome of this will feed into NESO's C1 derogation process for NTCs.

· Additionally, the findings of this project will be shared with several NESO cross-border workstreams e.g., REMA, market coupling and the development of Offshore Hybrid Assets market arrangements.

Scale of Project

The project will span 6 months with FTI consulting delivering the work.

Technology Readiness at Start

TRL1 Basic Principles

Technology Readiness at End

TRL2 Invention and Research

Geographical Area

The project will cover the GB network, including interconnectors between the synchronous area of Great Britain (GB) and other countries.

Revenue Allowed for the RIIO Settlement

None

Indicative Total NIA Project Expenditure

£260,000

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:

Interconnectors allow Great Britain and neighbouring markets to benefit from different supply mixes, generation patterns and demand patterns. They provide access to a broader pool of generation assets, reducing the need for domestic fossil-fuel-based backup capacity in alignment with the CP30 ambition.

Interconnector flows can present a risk of a large system infeed or outfeed loss to the GB system. NESO uses NTC and ITL restrictions to restrict interconnector capacity in order to ensure system security. As more interconnectors are built, there is a possibility of increased constraints on the system which could result in an increased need to ensure system security using NTC restrictions. This project seeks to explore alternatives to NTCs that would ensure system security while maximising energy efficiency.

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

This is a research project so not applicable.

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

This research project will assess the feasibility of an NTC market for GB connected interconnectors with connected countries.

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

The project will span six months and involve both qualitative and quantitative analysis, including a cost-benefit analysis. The project will consider the costs of potential markets it explores, such as producing a cost-benefit analysis of an NTC market, calculating expected future costs of NTC restrictions, assessing the feasibility and potential cost savings of a market-based solution, and exploring the potential to extend the use of trades from interconnectors to more generators.

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

NESO is required to provide evidence on where it is developing alternatives to reduce reliance on non-market based balancing options. The recommendations and findings of this project will provide NESO and with a feasibility assessment of a market-based NTC approach and also alternative option(s) that could reduce reliance on NTCs.

The outcomes of this project will be shared across the industry. Project on Operation of Interconnectors' analysed options which could maximise the benefits of cross-border interconnectors under current national pricing arrangements. An NTC market-based approach was suggested as a way could provide a valid option for enabling increased interconnector participation in constraint management.

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.

This is the first and currently the only project assessing the feasibility of an NTC market. There is no duplication.

The outcome of the project will feed into relevant projects on interconnector operations, cross-border markets and REMA.

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

- There is currently no market-based tool to manage the maximum capacity that an interconnector can import and/or export to that SO's grid for a given Market Time Unit (MTU). The possibility of the creation of an NTC market would be the first of its kind in GB and the world.
- If an NTC market is proven to be feasible, it could lead to the creation of a new market structure which has not been tried before. An NTC market would likely take the form of an auction run by NESO before the interconnectors hold their explicit capacity auction processes. FTI expect the auctions to primarily occur across ID timeframes, in line with NESO's current approach to NTCs where capacity is only restricted at DA if suitable ID options are not available.
- 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.
- This project has 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.

Relevant Foreground IPR

A final report summarising the findings throughout the project and detailing the proposed next steps will be shared on the Smarter Networks Portal.

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 Energy System Operator 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.neso.energy/about/innovation

3. Via our managed mailbox innovation@nationalenergyso.com

Details on the terms on which such data will be made available by National Energy System Operator can be found on our website: Data Sharing Approach | National Energy System Operator.

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

As part of the C1 (formerly C28) derogation process, NESO has held internal workshops to discuss potential alternatives to NTCs, noting that there are no current alternatives that give NESO's control room the same ability to manage GB system security breaches resulting from interconnector flows in the same way as NTCs and ITLs.

Due to the this, NESO took an action to explore internal innovation funding to assess the feasibility of an NTC market due to the complexity and the novelty of this project. An assessment into the feasibility of an NTC market has never been conducted before. In particular, high-level design options, auction process for interconnectors, analysis of interconnectors by location and a cost-benefit analysis.

Given NESO's requirement to maintain system security under Security and Quality of Supply Standards, there is no guarantee that the solutions identified from the analysis would be applicable.

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

NESO has an obligation under the Security and Quality of Supply Standards to maintain system security. The management of interconnectors is key in managing system security, given the large import and export capability of interconnectors, the resulting implications on GB transmission network flows and the GB system impact of an unplanned interconnector loss. A capacity management process is required to ensure continued secure GB system operation. The process by which this is currently achieved is the application of a Net Transfer Capacity.

The application of NTCs is a firm option for managing system security as a last resort when necessary.

The innovation project into the feasibility of an NTC market and alternative options to NTCs will provide in-depth analysis of the current

process, high-level design options, costs, benefits, and stakeholder impacts.

As NESO's C1 derogation for NTCs is set to expire in September 2026, it's important this evidence backed research is conducted to fulfil our regulatory obligations.

This project has been approved by a senior member of staff

- [x] Yes