

GB NTC Calculation Policy

Relating to Interconnector Capacity Calculation

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Version History

<u>Document Version</u>	<u>Date Issued</u>	<u>Brief Description of Changes</u>
1.0	5 th April 2024	First version

1. Purpose

This document outlines the policy for the operational calculation of interconnector capacity restrictions set by National Grid Electricity System Operator (ESO). These interconnector capacity restrictions are achieved through Net Transfer Capacity (NTC) processes in coordination with external interconnector parties and other System Operators interconnected to GB. The policy set out by this document applies to:

- All interconnector projects (existing and future) that are connected to the GB transmission system;
- All timescales, i.e. capacity calculations made both before and after the Firmness Deadline.

This policy is applied in full to ensure consistency of NTC usage across all interconnectors.

2. Overview of Net Transfer Capacity (NTC)

Net Transfer Capacity or NTC is a value used by System Operators (SOs) in order to set the maximum capacity that an interconnector can import and/or export to that SO's grid for a given Market Time Unit (MTU). The NTC process is a method of calculating the resulting maximum import and export capacities that an interconnector can release to the market (Final NTC). The Final NTC, based on the following inputs, is the lowest of any of these inputs and is calculated independently for each flow direction and MTU:

- The asset rating, condition and any relevant outages on the interconnector, i.e. the interconnector capability. This is determined by the interconnector owner/operator;
- Any restriction to the interconnector's capacity (NTC restriction) based on each SO's respective system conditions and potential security limitations required in order to maintain secure system operation (System Security). This is determined and submitted independently by the SOs at each end of the interconnector, i.e. ESO or the Connected SO.

Final NTC Calculation processes are carried out at Day-ahead (DA) and Intraday (ID) timeframes during which the interconnector owner can update its capability declaration and the connected SOs can submit or update their NTC restrictions where operationally required, ahead of the capacity allocation auctions. If ESO has a requirement to restrict an interconnector's capacity and therefore submits an NTC restriction, the resulting effect on the interconnector's capacity depends on the type of capacity affected listed as follows: unallocated capacity, allocated capacity, nominated capacity and curtailed capacity.

NB; some interconnectors currently use Intraday Trading/Transfer Limits (ITLs) rather than NTCs. ITLs were the initial method to manage interconnector capacity and are subtly different to NTCs. ITLs only limit unallocated capacity and only feed into ID auctions. They cannot restrict other forms of capacity and cannot be used at the DA timeframes. Also, there is no compensation associated with the use of ITLs. ESO is working with the interconnector owners and Connected SOs still utilising ITLs to transition to the use of NTCs.

The processes relating to the submission of SOs' NTC restrictions and the calculation and application of Final NTCs, at each timeframe, for each interconnector are trilaterally agreed with both the interconnector owner and Connected SOs.

3. Background information

System Security is the reason for any actions taken in order to comply with the Security and Quality of Supply Standard (SQSS) as is required by the ESO's Transmission License. At a high level, the areas of the SQSS applicable to ESO's use of NTC can be split into 3 main areas: Network Constraints – Transmission & Energy (localised Voltage, localised Thermal, localised Stability, national Inertia), Largest System Loss relating to Frequency Management (Largest System Loss, both Generation and Demand, Rate of Change of Frequency and Response) and Margin Extremes (risk of System Warnings related to GB system margin issues).

ESO will only apply NTC restrictions where necessary to ensure System Security, in line with ESO's Security and Quality of Supply Standards (SQSS) including sections 2.5, 2.6, 2.9, 2.10 and 5.1 to 5.4, and in accordance with the Grid Code regarding System Warnings, including sections OC6.5.1, OC7.4.8 and BC1.5.4(c) to BC1.5.4(j), therefore preventing a change of System State and associated use of Emergency Actions.

4. Principles of use

This section provides an understanding of the principles of when and how NTC restrictions are applied by ESO. NTC restrictions are used as a last resort action to ensure secure system operation.

1. ESO will only apply an NTC restriction if required to maintain secure system operation (System Security).
2. The decision to calculate and possibly apply NTC restrictions will be based on:
 - a. the best forecast of system conditions at the time;
 - b. the best view of credible alternative actions that are likely to be available;
3. ESO will not submit DA NTC restrictions on a given IC where ID options are available. This means either:
 - An established explicit ID market, where the throughput of energy volumes in the connecting market meets or exceeds that requested by ESO; or
 - Some other form of ID service provided by either the IC, connecting SO or another third party with reasonable availability and firmness.

The exception to this is where a new ID market or service is formed, confidence and/or liquidity, i.e. is ESO able to secure the required volumes in the new market or service, would need to be built up before solely relying on this option in lieu of submitting DA NTC limits.

4. ESO will seek to move the allocated flow to within securable limits via trading or other SO-SO trades;
5. ID NTC restrictions will be applied to ensure System Security is maintained following:

- a. further ID (re)nominations;
 - b. market trading or SO-SO trading actions (securing against failed trades for any reason).
6. Where multiple ICs jointly contribute/exacerbate a particular constraint, the total NTC restriction will be spread across the multiple ICs equitably, as far as is practicable.
- This requires a complex consideration of many elements, such as NTC submission deadlines for each IC, number of active network constraints, respective effectiveness of each IC to reduce each individual network constraint and what initial nominations already exist.

5. Factors Considered when Calculating NTCs

This section provides a more detailed explanation of the factors considered by ESO when calculating NTCs. The following is split into the 3 main areas of system security as previously detailed in section 3 of this policy; Network Constraints, Largest System Loss & Margin Extremes. If more than one of these areas apply at any one time, the resulting NTC will be the lowest, i.e. most restrictive, value.

i) Network Constraints

1. Does the interconnector have an effect on one or more network constraints?
 - Effectiveness must be more than the 5% threshold aligned with the EU TSOs as per article 15(5) of CSAM. This is further explained in Section 6, point 1.
2. For that constraint, are there any alternative actions, whilst considering future running of the system, available to manage the constraint before taking action on the interconnector? E.g.:
 - Any possible system topology changes to achieve the highest constraint limit possible;
 - Additional generation available to synchronise/de-synchronise whilst maintaining the ability to securely operate the current and future system (excluding inflexible units e.g. nuclear).
3. If the interconnector has no Explicit Intraday (ID) market or the Explicit ID market does not provide sufficient liquidity or certainty (e.g. the further ahead of real-time the auction is, the less certainty it provides as system conditions could change), the NTC requires a safety margin in case one of the alternative actions is no longer available in real-time therefore ensuring real-time System Security can be maintained, e.g.:
 - For a constraint restricting the export from an area of the GB network, has an additional generator changed its Physical Notification (PN) to now be generating and is either inflexible and/or ESO is unable to instruct it off in the Balancing Mechanism?
 - For a constraint restricting the import into an area of the GB network, has a generator that should have been generating made itself unavailable to generate in the Balancing Mechanism?

4. Following the steps above, is an NTC restriction still required on the interconnector in order to ensure system security relating to the constraint can be maintained?
5. Are there multiple interconnectors between which the NTC should be shared, considering the:
 - Effectiveness of each interconnector on the constraint;
 - Capability (MPTC) of each interconnector, i.e. share is proportional;
 - An interconnector's Nominated capacity at the time of calculating the NTC?

The resulting value is the NTC value that will be set to ensure GB System Security relating to Network Constraints.

ii) Largest System Loss (*incl. RoCoF & Response*)

Based on forecast inertia levels derived from the latest available generation and demand forecasts:

1. For the Largest (System) Loss, both generation (Low Frequency) and demand (High Frequency), how much Response (e.g. FFR, DR, DM, DC, etc.) is required to secure that loss?
2. Is that level of Response achievable and justifiable whilst still meeting demand and any constraint boundaries?
3. If not, what Largest Loss can be secured with the maximum justifiably achievable response level?

The resulting value is the NTC value that will be set to ensure GB System Security relating to the Largest System Loss.

iii) Margin Extremes (*Risk of System Warnings*)

1. Is an Electricity Margin Notice (EMN) and/or a High Risk of Demand Reduction (HRDR) warning likely to be required (using the most up-to-date forecasts) or has such a warning already been triggered or issued?
2. What is the possibility of interconnectors re-nominating sufficient volumes such that the GB system is at risk of an EMN and/or a HRDR System Warning being triggered?
 - If likely, set NTC values to the limit at which HRDR would be triggered.
3. The above relates to Positive/Upward Margin. This equally applies to Negative/Downward Margin with the system warning being an NRAPM (Negative Reserve Active Power Margin).

The resulting value is the NTC value that will be set to ensure GB System Security relating to Margin Extremes.

The resulting NTC values will be the lowest of these three calculations to ensure System Security can be maintained at all times. The reason for restriction in associated transparency publications will be the reason for the most onerous restriction, i.e. the reason for the lowest NTC value.

6. Relevant Information

1. Using a quantitative approach, the influence of an interconnector on a Critical Network Element (CNE) determines whether the interconnector has an impact on that boundary. A CNE is a network element (line, cable, transformer etc.) that limits the amount of power that can be exchanged (following a network contingency) out of or into a group (network constraint group). Changing the flow on an interconnector within the constraint group is considered to affect the CNE if the change in flow on the CNE exceeds 5% of the change in flow on the Interconnector (i.e. a change of 100MW on the Interconnector affects the CNE by 5MW or above). This threshold comes directly from the Methodology for Coordinating Operational Security Analysis (CSAM) – https://acer.europa.eu/sites/default/files/documents/Individual%20Decisions_annex/Annex%20I%20-%20ACER%20Decision%20on%20CSAM.pdf, and has been adopted in the Ireland-UK and Channel regional CSAMs.
2. GB Frequency Response services – <https://www.nationalgrideso.com/industry-information/balancing-services/frequency-response-services>
3. Operational Transparency data showing NTC restrictions by ESO – <https://www.nationalgrideso.com/search-data?f%5B0%5D=organization%3A23171>
4. Definition of System States as per EU Commission Regulation 2017/1485 – <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R1485>
5. Use of Emergency Actions in GB – <https://www.nationalgrideso.com/document/277221/download> & [OTF 08.03.23 \(brightcove.net\)](https://www.brightcove.net/otf/08.03.23)
6. The Methodology for GB Commercial Arrangements relating to Interconnector Capacity Calculation – <https://www.nationalgrideso.com/document/203726/download>