

# Methodology for GB Commercial Arrangements relating to Interconnector Capacity Calculation

June 2023

## 1. Purpose

This document outlines the GB methodology for commercial arrangements for payments relating to interconnector (IC) capacity restrictions resulting from NTC restrictions set by National Grid Electricity System Operator (ESO). The commercial arrangements in this document should be applied to:

- All interconnector projects (existing and future) that are connected to the GB transmission system.
- Capacity calculations made both before and after the Firmness Deadline.

This methodology should be applied in full to ensure consistency of NTC arrangements across all interconnectors.

A number of capitalised terms are defined in section 5 of this document.

## 2. Overview of Net Transfer Capacity (NTC)

### What is an NTC?

NTC or Net Transfer Capacity 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, which is based on the following inputs, is the lowest of any of these inputs and is calculated independently for each flow direction and MTU:

- Firstly, the asset rating, condition and any relevant outages on the interconnector as determined by the interconnector owner i.e., the interconnector capability;
- Secondly, any restriction to the interconnector's capacity (NTC restriction) submitted by the System Operators (SOs) at each end of the interconnector, i.e. ESO or the Connected System Operator, based on the SO's respective system conditions and possible security limitations required in order to maintain secure system operation (system security).

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 can be classified into four capacity types; 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.

#### **How does ESO submit an NTC restriction?**

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. Commercial Principles**

Where NTC restrictions submitted by ESO result in interconnector capacity being restricted, ESO will make compensation payments for the NTC restriction. In certain circumstances, e.g., where the NTC restrictions result in additional income for the interconnector owner, the compensation payment will be from the interconnector owner to ESO as per item (C) below. The GB commercial arrangements for payments relating to NTC restrictions by ESO comply with the following principles:

- (A) This methodology covers the commercial arrangements between the interconnector owner and ESO. It does not deal with the terms either between the interconnector owner and the holders of transmission capacity through the interconnector capacity auction processes or the Connected SO.
- (B) To ensure cost neutrality, payments to an interconnector owner for reduction to:
  - Allocated capacity should reflect the cost to the interconnector of remunerating transmission capacity holders as set out in the relevant interconnector's Access Rules.
  - Unallocated capacity should reflect the likely cost to the interconnector with the NTC restriction applied, compared to a scenario where the NTC restriction had not been applied.
- (C) Any payments should recognise that an interconnector owner may generate additional income through a reduction in capacity (e.g., as capacity becomes scarce this may increase the price of capacity and congestion income may increase). Payments should also take into account instances where an interconnector owner receives congestion income. This may result in an interconnector owner paying, rather than receiving payments.
- (D) Any payment must only cover the volume of reduced interconnector capacity resulting from ESO's NTC restriction. No payment will be due if the capacity reduction is the result of any other factor, e.g. reduced interconnector capability or NTC restrictions by the Connected SO (unless concurrent in which case see point F). In the case of loss of access resulting from the interconnector's assets (such as a trip by the interconnector), there will be no further compensation to the interconnector owner via this mechanism.
- (E) Ex-ante capacity reductions resulting from planned maintenance or works on the NETS shall not result in any compensation between the ESO and the interconnector owner if the Bilateral Connection Agreement (BCA) for that interconnector describes a reduction of the Transmission Entry Capacity (TEC) for that specific planned outage condition.

- (F) A reduction of capacity can only be paid once; should NTC restrictions by the two SOs result in an equal capacity reduction, in order to avoid duplication of compensation, the GB commercial arrangements shall cover half of the shared NTC restriction. Any additional capacity reduction beyond the shared NTC restriction, will be wholly picked up by the respective SO. For example, if ESO's NTC restriction reduces capacity by 100MW and the Connected SO's NTC restriction reduces capacity by 125MW, the GB commercial arrangements shall be applicable to 50MW only (half of the shared amount). Whereas, if ESO's NTC restriction reduces capacity by 125MW and the Connected SO's NTC restriction reduces capacity by 100MW, the GB commercial arrangement shall be applicable to 75MW (half of the shared amount plus all of the remaining unshared amount, i.e.  $(100/2)+25$ ).
- (G) All parties (the interconnector owner, ESO and the Connected SO) will be responsible for ensuring that the working mechanism for calculating capacity ahead of allocation at the relevant timeframes is carried out as agreed. This can be achieved via any agreed party (or a third party) fulfilling the calculating party role.
- (H) This methodology will be implemented via the necessary interconnector agreement changes to reflect the NTC calculation process in the operating protocols and relevant settlement agreements.

## 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. 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;
2. 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.

3. ESO will seek to move the allocated flow to within securable limits via trading or other SO-SO trades;
4. ID NTC restrictions will be submitted:
  - a. In case of further ID (re)nominations;
  - b. In case ESO needs to secure market traded or SO-SO traded actions (securing against failed trades for any reason).
5. Where multiple ICs jointly contribute/exacerbate a particular constraint, the total NTC restriction will be spread across the multiple ICs, as far as is practicable.
  - This requires a complex consideration of many elements, such as respective effectiveness of each IC to reduce a constraint and what initial nominations already exist.
6. ESO will submit a NTC restriction that allows maximum interconnector capacity, but which is consistent with secure system operation (system security);

7. Any DA NTC restriction which restricts the nominated Long-Term capacity should only be considered by the Calculating Party from the level of the nominated Long-Term capacity.

## 5. GB Commercial Arrangements Methodology

### Applicable Terminology

#### *Nominated*

Capacity that has been sold by an interconnector in an auction at any timescales and declared in the latest Interconnector Schedule/Reference Programme (and Final Physical Notification in GB Balancing Mechanism). This is firm capacity. N.B. – All LT Nominated capacity sold in Long-term auctions must be nominated prior to the DA auction in order to be firm.

#### *Allocated*

Capacity that has been sold to market participants through auctions in any timescale and not yet lapsed, or capacity that that has been implicitly allocated as a result of an implicitly coupled auction (and therefore scheduled a flow). Different for long-term and Day-ahead/Intraday:

- Long-term (LT) – Capacity that has been reserved to market participants through the LT auctions but has not been nominated.
- Day-ahead (DA)/Intraday (ID) – Same as Nominated above or capacity that that has been implicitly allocated as a result of an implicitly coupled DA/ID auction and therefore declared in the latest Interconnector Schedule/Reference Programme (and Final Physical Notification in GB Balancing Mechanism).

#### *Unallocated*

For DA capacity calculation, unallocated capacity is capacity that has not been sold within the interconnector's previous long-term auctions. For ID capacity calculation, unallocated capacity is capacity that remains unutilised (either not allocated, or not nominated for physical flow) following a Day-ahead explicit auction or Day-ahead implicit allocation process, that the interconnector proposes to make available for Intraday allocation. Different for LT, DA & ID:

- LT – Capacity that has not been sold i.e. not Nominated nor Allocated. Ahead of the first LT auction, no capacity has been Nominated or Allocated.
- DA – Capacity that has not been sold within the interconnector's LT auctions (excluding LT Allocated capacity which is classed as unallocated in DA unless nominated).
- ID – Capacity that remains unsold (neither allocated, nor nominated) following the Day-ahead or previous Intraday auction.

#### *Implicit*

Implicit allocation is in accordance with the market coupling mechanisms at Day-ahead and/or Intraday timeframes where capacity is not bought directly but is implicitly bought with the energy product and therefore the flow is directly allocated (& nominated).

#### *Explicit*

Explicit allocation is where capacity rights are bought directly by parties and is then nominated afterwards to produce a flow (but nomination is not mandatory).

### *Firmness Deadline*

The point in time after which cross-zonal capacity becomes firm for each interconnector, in accordance with their respective Access Rules i.e., the time at which the latest Interconnector Schedule/Reference Programme (and the associated FPN is submitted).

### *Curtailment*

When an NTC restriction results in allocated and/or nominated capacity being restricted in the final round of market activity (this is usually the ID phase), which therefore means curtailing the final nominated flow. This should only occur in a 'force majeure' or emergency situation as usually ESO would counter-trade in order to move the scheduled flow below the level of any required NTC restriction.

## **GB Commercial Methodology**

Tables 1, 2 & 3 illustrate the GB commercial arrangements for each capacity regime on each bidding zone border and where different categories of capacity restriction occur.

These tables represent the different coupling arrangements that exist (or will exist) across GB borders, and therefore each table references the relevant mechanism for clarity. The principles of the commercial methodology are consistent across the different coupling arrangements. This document will be updated when these arrangements change over time or as new ICs connect.

For a more in-depth explanation of the settlement methods in each box (labelled 1, 2, 3, 4a, 4b), please see Appendix 1.

*Table 1: GB Commercial Arrangements matrix for explicit DA, and explicit ID*

*For example, IFA, BritNed, NEMO, IFA2, ElecLink and Viking Link*

Timing of NTC & type of capacity affected	Restricted capacity that is allocated (but only unnominated Long Term*)	Unallocated capacity restricted
Capacity management feeds into Day-ahead auctions  (i.e. before FD)	(1) See relevant Access Rules	(4a) Net capacity revenue loss/gain calculated from unrestricted marginal price  (4b) For OMW auctions; use the lower of the median or mean marginal price relating to the specific hour and direction for each of the previous 31 days.**
Capacity management feeds into Intraday auctions  (i.e. after FD, before ID auction opening)	(3) Net imbalance charge from both markets	(4a) Net capacity revenue loss/gain calculated from unrestricted marginal price  (4b) For OMW auctions; use the lower of the median or mean marginal price relating to the specific hour and direction for each of the previous 31 days.**

\*Any Long Term capacity that is nominated is considered firm and will not be restricted – as per Principle of Use 7.

**\*\* Where 31 days of data are not available the number of days data that is available will be utilised. However in the event that this is 0, then agreement will be reached with the affected Interconnector to utilise a number of days in the future.**

**Table 2: GB Commercial Arrangements matrix for implicit ID**

*For example, Moyle, EWIC and Greenlink*

Timing of NTC & type of capacity affected	Allocated capacity restricted	Unallocated capacity restricted
Capacity management feeds into Day-ahead auctions  (i.e. before FD)	N/A	N/A
Capacity management feeds into Intraday auctions  (i.e. after FD, before ID auction opening)	(3) Net imbalance charge from both markets	(2) Where practicable, the difference in congestion rent from a re-run of the coupling algorithm without restriction OR, the loss adjusted, market spread

**Table 3: GB Commercial Arrangements matrix for implicit DA.**

*For example, NSL*

Timing of NTC & type of capacity affected	Allocated capacity restricted	Unallocated capacity restricted
Capacity management feeds into Day-ahead auctions  (i.e. before FD)	N/A	(2) Where practicable, the difference in congestion rent from a re-run of the coupling algorithm without restriction OR, the loss adjusted, market spread
Capacity management feeds into Intraday auctions  (i.e. after FD, before ID auction opening)	N/A	N/A

## 6. Future Developments

- **ITL Transition:** Once this methodology has been approved, any existing interconnector agreements which use ITLs will be changed to be consistent with this methodology. The summarised differences between ITLs and NTCs are: a NTC restriction has the ability to curtail allocated and nominated capacities as described previously in this methodology, whereas ITLs can only limit the unallocated capacity; and, there is no compensation associated with ITLs.
- **Trade and Co-operation Agreement Transition (TCA):** NTC restrictions shall be used in parallel to the development of the Capacity Calculation arrangements envisaged within the TCA. This document shall be revisited, if needed, following the finalisation of the Day-ahead and Intraday Capacity Calculation technical procedure(s).
- **Loose Volume Coupling:** As part of the TCA a new Day-ahead auction is being developed. It is expected that this will result in a form of implicit coupling being implemented. As described above, for implicit auctions the best approach is to re-run the new algorithm, with and without NTC limits to determine if the interconnectors gain or lose congestion income.

## 7. Settlement

Payments between the interconnectors and ESO will only commence when there is an agreed bilateral agreement for this between the interconnector and ESO, that is in line with the arrangements and principles within this document. The detail of the settlement and payment arrangements shall also be outlined in each party's bilateral agreements.

To support the invoicing arrangements, ESO will collect the available data required to support the settlement of the commercial arrangements outlined in this document. Should the data not be able to be retrieved, interconnectors are requested to provide the data.

Please refer to Appendix 1 for details of settlement.

## 8. Implementation Method

Tripartite discussions between the interconnector, ESO and the Connected SO shall be needed to include the relevant NTC processes in the trilateral Operating Protocol (OP).

In addition, the applicable interconnector specific settlement agreements shall be updated accordingly to align the processes outlined in the Operating Protocol.

## Appendix 1 – Settlement

### The Calculation Process

Considering the number of variables involved between interconnectors, auction regimes and various scenarios, calculating any settlement becomes complex. Below, ESO outlines the process that will be undertaken to run this calculation. **For the avoidance of doubt, the formula set out below is illustrative and generalised for all interconnectors. The final formula will be set out and agreed in the trilateral interconnector settlement agreements.** Where necessary, sign convention may be reversed to indicate credit or debit payment direction.

Where restricted volumes are concerned, losses will be accounted for as appropriate according to each interconnector's Access Rules.

#### A. "Build the Picture"

Before calculating any settlement data, we must build the picture of the volume of each type of capacity restricted at each horizon. This uses the **Auction Data, Interconnector Nominated Flow** and **Outages / Commercial Availability** sources detailed above.

With this data, we know the volume of unallocated and allocated capacity restricted through NTC restrictions at both the DA and ID stages, for each settlement period.

#### Data Sources Required

##### ESO and Connected SO NTC restriction data

The first step is to ascertain what NTC restrictions have been submitted by both system operators. This data is provided either by the Final NTC Calculating party or by the interconnector owner (as detailed in the individual interconnector Operating Protocol and settlement agreement).

##### Outages/Commercial Availability

To know how much capacity was restricted through NTC restrictions, ESO cannot assume the interconnector could have been available to run at maximum import/export – ESO must account for this by considering the commercial availability/capability of the interconnector at the time of auction. ESO's initial approach has been to utilise Elexon's BM Reports/REMIT data, filtered as appropriate, to determine the maximum capability for the interconnector for each auction. For some interconnectors, this information is provided by the Final NTC Calculating party or by the interconnector owner.

- <https://www.bmreports.com/bmrs/?q=remit> provides a user interface for exporting data as needed. Elexon also has an API feature which can be used to fetch this data.

##### Interconnector Nominated Flow

In order to distinguish what capacity was allocated, unallocated, nominated and unnominated across DA and ID timescales, the Total Nominated Flow is needed.

For DA Auctions:

- The nominated capacity is the sum of nominations made separately across import and export. This value can either be provided directly, or derived from the auction specifications (offered capacity) and the commercial availability/capability of the interconnector.
- The allocated but unnominated capacity can then either be calculated as the difference between the two values above or fetched by assessing the volume of capacity sold across all Long Term auctions.



For Intraday auctions, similarly to DA, the exact source of this data may vary across interconnectors. As an example, NemoLink's nominations at Long Term, Day-ahead and Intraday are available on ENTSO-E's transparency platform - <https://transparency.entsoe.eu/transmission-domain/r2/totalCapacityNominated/show>.

## **B. Gather Commercial Data**

The next step is to gather **Auction Data**, **Day-ahead Prices** and **Imbalance/System Prices**, for each settlement period. ESO can now calculate the Day-ahead spreads, the net imbalance costs, and recalculate explicit auction clearing prices. These calculations are explained in Step C.

## **C. Apply Settlement Formulae:**

Depending on the interconnector's specific auction profile (see tables 1-3), different calculations apply for different types of capacity restrictions. These calculations are captured by 4 methods, labelled 1-4 in their respective tables.

## (1) Allocated Capacity restricted before FD

See the relevant Access rules for the details of how capacity holders are remunerated. But for illustrative purposes an example calculation for explicit auctions will broadly be as follows:

$$\text{Settlement}_1 = P^{DA}_{CLEAR} \times V^{DA}_{ALLOCATED}$$

**Where:**

$P^{DA}_{CLEAR}$  = Clearing price of the Day-ahead auction, where restricted capacity would have been sold.

$V^{DA}_{ALLOCATED}$  = The Volume of Allocated Capacity restricted through NTC restrictions.

## Data Sources Required

### DA Prices:

The Day-ahead Wholesale Price is needed in each relevant region to calculate the difference between them – the Day-ahead spread. A common data source for all regions should be used for ESO's compensation calculation – ensuring the final settlement figure is fully cost-reflective and fair across parties. For countries neighbouring GB, ENTSO-E serves as a common source for the DA Price. For GB, whilst single Intra-GB coupling is not in place, a volume-weighted average of the two hubs will be used.

- <https://transparency.entsoe.eu/transmission-domain/r2/dayAheadPrices/show> provides the user interface for exporting this data using ENTSO-E's transparency platform. ESO will be using ENTSOE's API to automate the gathering of this data as needed.
- <https://eu.data.energy/#eu> provides EPEX Day-ahead Price and Volume data (as well as some imbalance data covered below). This source requires paid membership.
- [Market data | Nord Pool \(nordpoolgroup.com\)](https://www.nordpoolgroup.com/Market-data) provides historical data on N2EX Day-ahead Prices and Volumes.

## (2) Unallocated Capacity restricted, impacting an implicit auction

Any volume of capacity restricted under these conditions will be paid either according to the net loss/gain in congestion rent as determined by the coupling algorithm (Option 1) or the loss adjusted, scarcity corrected, Day-ahead market spread (Option 2).

Option 1 is the preferred option, but the feasibility of this is yet to be ascertained.

### Option 1:

Here we re-run the implicit market coupling algorithm with the restriction removed. This provides a simulated congestion revenue, which can be calculated using the formula below.

$$\text{Settlement}_{2, OPTION 1} = (((P^{DA}_{GB,RERUN} \times R_{GBP\_EUR}) - P^{DA}_{RE,RERUN}) \times V^{DA}_{RERUN}) -$$
$$(((P^{DA}_{GB,ACT} \times R_{GBP\_EUR}) - P^{DA}_{RE,ACT}) \times V^{DA}_{ACT})$$

**Where:**

$P^{DA}_{GB,ACT}$  = The Coupling Algorithm’s “Live Outcome” DA Price in GB,

$R_{GBP\_EUR}$  = The exchange rate to convert GBP to EUR,

$P^{DA}_{RE,ACT}$  = The Coupling Algorithm’s “Live Outcome” DA Price in the Remote-End region,

$P^{DA}_{GB,RERUN}$  = The Coupling Algorithm’s “Rerun Outcome” DA Price in GB,

$P^{DA}_{RE,RERUN}$  = The Coupling Algorithm’s “Rerun Outcome” DA Price in the Remote-End region,

$V^{DA}_{ACT}$  = The Interconnector Flow determined by the Coupling Algorithm’s “Live Outcome”,

$V^{DA}_{RERUN}$  = The Interconnector Flow determined by the Coupling Algorithm’s “Rerun Outcome”.

$$P^{DAGB,LA} R_{GBP\_EUR} P^{DARE,LA} V^{DAUNALLOCATED} F^{CORRECTION}$$

## Option 2:

Should access to the coupling algorithm prove impracticable, we will pursue the following method. The Loss-adjusted spread will be used to approximate a value of the capacity restricted by ESO.

$$\text{Settlement}_{2, OPTION 2} = ((P^{DAGB,LA} \times R_{GBP\_EUR}) - P^{DARE,LA}) \times V^{DAUNALLOCATED}$$

**Where:**

$P^{DA}_{GB,LA}$  = The Loss Adjusted Day-ahead Wholesale Price in GB (weighted between EPEX and NordPool),

$R_{GBP\_EUR}$  = The exchange rate to convert GBP to EUR,

$P^{DA}_{RE,LA}$  = The Loss Adjusted Day-ahead Wholesale Price in the Remote-End region,

$V^{DA}_{UNALLOCATED}$  = The Volume of Unallocated Capacity restricted through NTC restrictions

## Data Sources Required

### DA Prices:

The Day-ahead Wholesale Price is needed in each relevant region to calculate the difference between them – the Day-ahead spread. A common data source for all regions should be used for ESO’s compensation calculation – ensuring the final settlement figure is fully cost-reflective and fair across parties. For countries neighbouring GB, ENTSO-E serves as a common source for the DA Price. For GB, whilst single Intra-GB coupling is not in place, a volume-weighted average of the two hubs will be used.

- <https://transparency.entsoe.eu/transmission-domain/r2/dayAheadPrices/show> provides the user interface for exporting this data using ENTSO-E's transparency platform. ESO will be using ENTSOE's API to automate the gathering of this data as needed.
- <https://eu.data.energy/#eu> provides EPEX Day-ahead Price and Volume data (as well as some imbalance data covered below). This source requires paid membership.
- [Market data | Nord Pool \(nordpoolgroup.com\)](https://www.nordpoolgroup.com) provides historical data on N2EX Day-ahead Prices and Volumes.

### (3) Allocated Capacity restricted after FD

$$\text{Settlement}_3 = (P_{IMB_{GB}} \times V_{ID_{ALLOCATED}} \times S_{GB}) + (P_{IMB_{RE}} \times V_{ID_{ALLOCATED}} \times S_{RE})$$

**Where:**

$P_{IMB_{GB}}$  = The imbalance price in GB,

$P_{IMB_{RE}}$  = The imbalance price in the Remote-End region,

$V_{ID_{ALLOCATED}}$  = The Volume of Allocated Capacity restricted through NTC restrictions,

$S_{GB}$  = A binary value (either -1 or +1) to describe if the GB system was either in surplus or deficit,

$S_{RE}$  = A binary value (either -1 or +1) to describe if the RE system was either in surplus or deficit.

Any volume of capacity restricted under these conditions will be paid such as to hold the relevant interconnector whole on imbalance, netted across both market zones. By doing this, ESO holds the cost/risk for such restrictions.

### Data Sources Required

#### Imbalance/System Prices and Volumes

There is no single source for System Prices across Europe (ENTSO-E is inconsistent in this area). Some sources have been outlined:

- EnAppSys (<https://eu.data.energy/#fr/elec/pricing>) - FR, NO
- TenneT ([https://www.tennet.org/english/operational\\_management/export\\_data.aspx](https://www.tennet.org/english/operational_management/export_data.aspx)) - NL
- Re.alto (<https://portal.realto.io/browse-apis/elia-imbalance-data-be/details>) - BE
- SEM-O (<https://www.sem-o.com/market-data/dynamic-reports/#BM-026>) - ISEM

## (4) Unallocated Capacity restricted, impacting an explicit auction

### a. Unrestricted vs restricted revenues

Restricting the capacity going into an explicit auction introduces scarcity in that auction. To compensate for these restrictions, ESO will look to calculate the unrestricted clearing price – ESO looks at answering the question “without the restriction, what would the auction have cleared at?”

The amount to be paid for capacity restricted under these conditions will be equal to the difference in the restricted and unrestricted auction revenue. It could be positive or negative – the settlement looks to hold the interconnector financially whole.

$$\text{Settlement}_{4a} = (P_{\text{CLEAR WITH NTC}} \times V_{\text{WITH NTC}}) - (P_{\text{CLEAR WITHOUT NTC}} \times V_{\text{WITHOUT NTC}})$$

**Where:**

$P_{\text{CLEAR WITH NTC}}$  = The Auction Clearing Price, when the NTC restriction is applied,

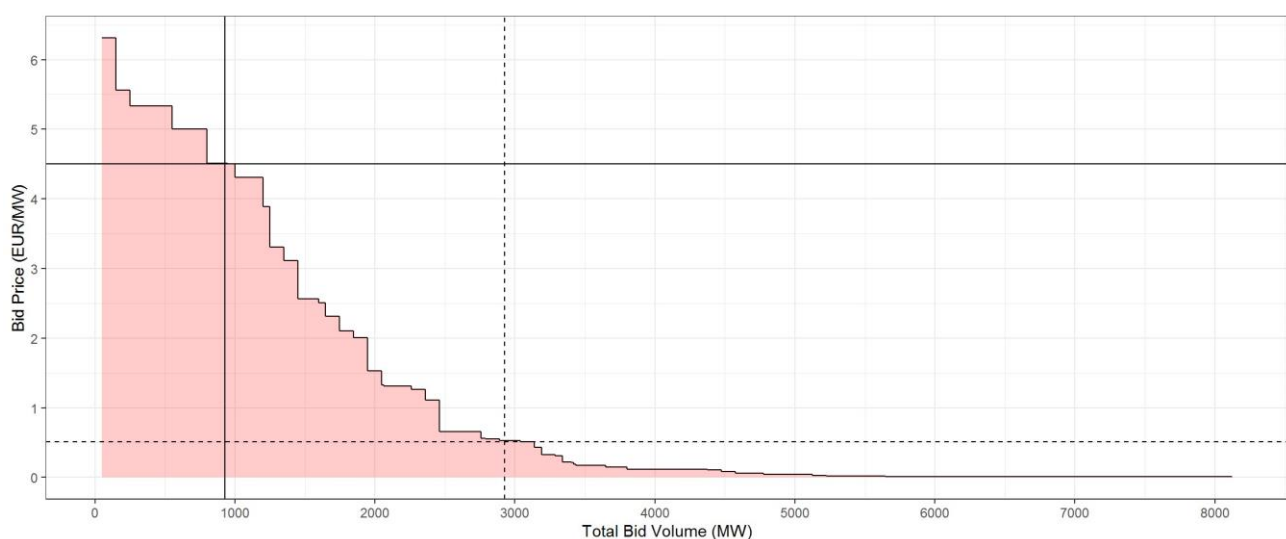
$P_{\text{CLEAR WITHOUT NTC}}$  = The Auction Clearing Price, when the NTC restriction is not applied,

$V_{\text{WITH NTC}}$  = The volume of capacity allocated in the auction with the NTC restriction applied

$V_{\text{WITHOUT NTC}} = V_{\text{WITHOUT NTC}}$  = The volume of capacity that would have been allocated if the NTC restriction had not been applied. This can be calculated as: =MINIMUM((Requested Capacity), (V\_WITH\_NTC+NTC Restriction))

This value is essentially the sum of  $V_{\text{WITH NTC}}$  and the volume of capacity restricted due to the NTC restriction (calculated as part of “Build the Picture”).

To further visualise this, please see the example plot below. This is an explicit auction bid ladder, with intercept lines to highlight volumes and clearing prices both with and without NTC restrictions.



### b. 0MW auctions

Restrictions on capacity under these conditions may result in 0MW capacity being offered in the auction – in other words, the auction doesn’t take place. ESO will assess the historical clearing prices in both the import and export directions for

the relevant hour of the day. ESO will look at the previous 31 days auction data, and calculate both the median and mean clearing price. The lower of these two prices will be used to compensate restrictions of this type.

$$\text{Settlement}_{4b} = \text{MINIMUM} ( \text{MEAN}(P^{\text{CLEAR}}) , \text{MEDIAN}(P^{\text{CLEAR}}) ) \times V_{\text{WITHOUT NTC}}$$

**Where:**

$P^{\text{CLEAR}}$  = A list of monthly, hourly, directional auction clearing prices,

$V_{\text{WITHOUT NTC}}$  = The volume of capacity that would have been sold, had no NTC restriction been applied.

## Data Sources Required

### DA Prices:

The Day-ahead Wholesale Price is needed in each relevant region to calculate the difference between them – the Day-ahead spread. A common data source for all regions should be used for ESO's compensation calculation – ensuring the final settlement figure is fully cost-reflective and fair across parties. For countries neighbouring GB, ENTSO-E serves as a common source for the DA Price. For GB, whilst single Intra-GB coupling is not in place, a volume-weighted average of the two hubs will be used.

- <https://transparency.entsoe.eu/transmission-domain/r2/dayAheadPrices/show> provides the user interface for exporting this data using ENTSO-E's transparency platform. ESO will be using ENTSOE's API to automate the gathering of this data as needed.
- <https://eu.data.energy/#eu> provides EPEX Day-ahead Price and Volume data (as well as some imbalance data covered below). This source requires paid membership.
- [Market data | Nord Pool \(nordpoolgroup.com\)](#) provides historical data on N2EX Day-ahead Prices and Volumes.

### Explicit Auction and Bid Data:

Auction specifications, bid ladders and results for explicit capacity auctions. The exact source of this data varies across each interconnector, but JAO serves as a publicly available example of the data, covering data for IFA, IFA2 and Nemo.

- <https://www.jao.eu/main> provides a user interface to export data manually from JAO. ESO will be using JAO's new API tool to fetch this data automatically as needed.

## D. Apply Cost-Sharing Principles

Once we have calculated the settlement figures for each box, for each settlement period, we must then consider Principle F – for each settlement period, what proportion of the total settlement figure is ESO responsible for?

In practice this involves repeating the calculations in Step A, but calculating how much capacity was restricted individually by ESO and the Connected SO, rather than just using the lower value.

## Invoicing process

Monthly invoices will be produced by the party who is owed money based on the net value of transactions for the month. The invoice will be sent electronically in PDF format by email. The standard timescales shall be as follows or as otherwise detailed in respective settlement agreements:

- By the 8<sup>th</sup> business day from the 1<sup>st</sup> day of the month, the preliminary statement for the previous month shall be issued by ESO to the interconnector.

For example, by 10<sup>th</sup> June 2020, a preliminary statement will be issued for the NTC transactions which occurred between 1<sup>st</sup> May 2020 to 31<sup>st</sup> May 2020.

- Data shall be reviewed by the two parties between the issue of the preliminary statement and the issue of the invoice.
- By the 18<sup>th</sup> business day from the 1<sup>st</sup> day of the month, an invoice will be issued by the party who is owed money.

For example, by 24<sup>th</sup> June 2020, an invoice will be issued.

- From 6 business days from the issue of the invoice, payment will be made.

For example, the payment outlined on the invoice will be made from 2<sup>nd</sup> July 2020.

## Currency

We will look to settle NTC restrictions in Euros where appropriate. It does not however make sense to convert GB imbalance costs from GBP to Euros for this purpose.

This will mean providing two monthly invoices:

1. Settlement for any incurred GB imbalance from formula 3, in GBP;
2. Settlement for all other compensation formulae, in EUR.