Annex 2 to the Algorithm methodology:

Common set of requirements for the continuous trading matching algorithm

1 Requirements on functionalities and performance

1.1 General requirements

	Initial Requirements	Future Requirements	TSO	NEMO
a) The continuous trading matching algorithm shall support the continuous matching of orders as well as the continuous allocation of intraday cross-zonal capacity.	X		X	X
b) The continuous trading matching algorithm shall ensure equal treatment of orders coming from all NEMOs and from requests for explicit capacity allocation.	X			X
c) For each bidding zone, the continuous trading matching algorithm shall be able to:				
(i) support at least the order types included in the ID products;	X			X
(ii) support non-standard products (all products besides quarter hourly, half hourly and hourly) to the extent this is technically feasible and approved by the competent regulatory authorities;		X	X	X
(iii) facilitate different market time units (MTUs) which shall be configurable in each bidding zone;	X		X	X
(iv) facilitate configurations with more than one NEMO for a given bidding zone or a scheduling area in accordance to the multiple NEMO arrangement as referred to in Article 57 of the CACM regulation;	X		X	X
(v) support multiple scheduling areas within a bidding zone as requested by TSOs;	X		X	
(vi) allocate cross-zonal capacities on a bidding zone border with multiple TSOs on one or both sides of the concerned bidding zone border.	X		X	X
d) Intraday cross-zonal gate opening and intraday cross-zonal gate closure times (IDCZGT) shall be configurable for each bidding zone border.	X		X	X
e) The continuous trading matching algorithm shall aim to ensure that economic surplus is maximised, where applicable.	X		X	X
f) The continuous trading matching algorithm shall support one or multiple bidding zones within a country and shall be scalable to cover all bidding zones eligible for participating in SIDC.	X		X	X
g) The continuous trading matching algorithm shall be able to provide the net positions of bidding zones and scheduled exchanges between bidding zones.	X		X	

h) For each bidding zone the result from application of the continuous trading matching algorithm shall be for each MTU calculate one net position and, where applicable, net positions for each scheduling area and each NEMO trading hub.

i) The continuous trading matching algorithm must ensure the respect of the proprietary rights and the anonymity of the data (orders, etc.) and information submitted and accessed by the parties in their use of the system.

j) The integrity of the continuous trading matching algorithm and the data it processes shall be properly secured from unauthorized access.

k) The continuous trading matching algorithm needs to provide all necessary information for the cross-NEMOs settlement and shipping.

l) Problems in one area, on one border or for one NEMO shall not, as far as possible, prevent trading in the other areas, on the other borders or for the other NEMOs.

m) The continuous trading matching algorithm must support, but not be limited to:

   (i) receive the available cross-zonal capacity information in real time;

   (ii) request cross-zonal capacity when pairs of matchable orders are identified.

n) The continuous trading matching algorithm must support transaction cancellation functionalities. The system must be able to initiate the required actions on the capacity allocation side and interaction with the NEMOs:

   (i) In case a cross-border trade is involved in the transaction cancellation, the continuous trading matching algorithm shall request cross-zonal capacity in the opposite direction.

   (ii) The system must support to define a deadline for transaction cancellation.

o) The continuous trading matching algorithm shall match orders according to price, time priority and, for cross-border trades, available cross-zonal capacity and allocation constraints. The configuration of the matching rules must support, but not be limited to the following matching rules:

   (i) Automatic matching process meaning buy and sell orders with crossed prices. The matcher will match the orders at the price of the passive order, i.e. the one already in the order book.

   (ii) When an order is updated or entered, the continuous trading matching algorithm checks if it can be matched.

   (iii) A buy (sell) order can be matched if:

   - there is an order by a trading counterpart with an inferior sell (superior buy) price or equal price;

   - there are several orders on the sell (buy) side fulfilling the first criterion the order with best price is matched first and if

X	X		
X	X	X	
X	X	X	
X		X	
X	X	X	
X	X	X	
X		X	
X		X	

the aggressor order is not fully matched, then the second best price order is matched etc.;

- there are several orders with the same price on the sell (buy) side fulfilling the first criterion, the order with the oldest timestamp is matched first and if the aggressor order is not fully matched, then the second oldest is matched etc.;

- the matching respects the cross-zonal capacity and allocation constraints;

- the matching price is within the harmonised maximum and minimum clearing prices for SIDC.

In case of partial matching of an order, the non-matched part remains in the book (except otherwise specified by the order type) as an order with the quantity equal to the non-matched quantity - the price of the remaining part of order is the one entered initially by the trader except otherwise specified by the order type.

p) The orders are all centralised in a consolidated order book that is used to generate the local views, considering the relevant cross-zonal capacity and allocation constraints

q) All incoming orders and explicit capacity requests are queued in the same queue. The continuous trading matching algorithm shall guarantee a first come first serve principle. Only one matching and/or cross-zonal capacity allocation event can occur at the same time.

r) The continuous trading matching algorithm supports increase and decrease of capacity. When the capacity available increases due to netting, capacity publication or update, it may lead to a crossed order book. The continuous trading matching algorithm must include a mechanism to solve this situation (pair matching or auction).

s) The continuous trading matching algorithm must calculate local views of order books based on available orders and capacities. The configuration of the local views must support, but not be limited to the following rules:

(i) The local view of a bidding zone corresponds to the orders that the market participants of the bidding zone can trade

(ii) The available capacity corresponds to the maximum flow between two bidding zones (unless flow-based cross-border capacity mechanisms are defined and implemented) taking all allocation constraints into consideration.

(iii) For building the same local view, the same capacity can only be considered once.

(iv) Construction of the local view must take into account the harmonised maximum and minimum clearing prices for SIDC.

t) The continuous trading matching algorithm must prevent that NEMOs have the information to calculate the local view based on the order books from other NEMOs and capacities.

u) Capacity and order book updates are used to create updated local views. Local view updates are continuously broadcasted to the connected NEMOs in a non-discriminatory manner. | X | | X | X

v) The continuous trading matching algorithm must allow, as part of SIDC, to cross-match the different order types of the ID products within one and between multiple bidding zones, respecting the capacity and order restrictions. | X | | | X

1.2 Qualitative requirements with precision and price ranges

a) The continuous trading matching algorithm shall provide all market participants non-discriminatory access to cross-zonal capacity in accordance with Article 3(j) of the CACM Regulation. | X | | X | X

b) The continuous trading matching algorithm shall aim to ensure that in case there are matching opportunities the matching shall always take place taking into account the IDCZGT. | X | | ▾ | X

c) The continuous trading matching algorithm shall be able to reproduce the same results with the same input data coming in exactly identical sequence and timing. | X | | X | X

d) The continuous trading matching algorithm shall support 23, 24 or 25 hours for a trading day. | X | | X | X

e) The continuous trading matching algorithm shall support automatically the leap years, i.e. 366 days in a year. | X | | X | X

f) The matching process of the continuous trading matching algorithm, including prices and allocated capacities resulting from this calculation process, has to be transparent, auditable, and explainable. This requirement applies also to all the deterministic rules and applied continuous trading matching algorithm heuristics, if any, and occurrence rate of these rules and heuristics. | X | | X | X

g) The continuous trading matching algorithm shall be well structured and well documented. A description of the continuous trading matching algorithm should be made publicly available, and should be kept up to date. The documentation shall be written in English. | X | | X | X

h) The continuous trading matching algorithm shall support negative prices as well as prices with different price boundaries. | X | | ▾ | X

i) The continuous trading matching algorithm shall be able to deliver prices and volumes according to bidding zone or/and scheduling area specific ticks and, in case rounding is required, rounding rules. | X | | X | X

1.3 Other functionalities related to cross-zonal capacity allocation

a) The continuous trading matching algorithm shall be able to match both implicit (NEMOs) and explicit capacity allocation requests. | X | | X | X

b) The continuous trading matching algorithm shall be able to calculate for each MTU the scheduled exchanges between bidding zones. | X | | X | X

c) The continuous trading matching algorithm shall be able to calculate for each MTU the scheduled exchanges between scheduling areas. | X | | X |

d) Once allocated by the continuous trading matching algorithm, the capacity is firm (cannot be changed by TSOs). | X | | | X

e) Cross-zonal capacity shall be allocated to either energy transactions or explicit requests, at zero price for market participants.

f) All incoming orders and explicit capacity requests are treated in a non- discriminatory fashion (e.g. single queue). The system must implement the first come first serve principle. Only one matching event can be executed at the same time.

g) The continuous trading matching algorithm shall allow for non-zero pricing of intraday capacity in accordance with Article 55 of the CACM Regulation, where the pricing intraday cross-zonal capacity shall reflect market congestion and shall be based on actual orders and a proposal for methodology shall be developed by all TSOs.

h) For the execution of complementary regional auctions, it shall be possible to stop continuous trading within and between relevant bidding zones for a limited period of time before the intraday cross-zonal gate closure time, which shall not exceed the minimum time required to hold the auction and in any case 10 minutes.

i) Once one or more pan-European auctions are combined with continuous trading, the continuous trading matching algorithm shall include the necessary mechanisms for:

  (i) allowing the operational integration with the auctions taking into account the intraday cross-zonal gate opening and closure times.

  (ii) allowing the incorporation of the auctions' results to the continuous trading, in terms of cross-zonal capacity.

1.4 Performance

a) The continuous trading matching algorithm shall produce and log performance indicators with minimum level of those indicators in order to monitor its performance. This shall include, among others, the report on the number of and the frequency of unmatched feasible trades and their volumes, the statistics related to the usage of different products with regard to their impact on continuous trading matching algorithm performance and in relation to particular products. These measurements should include for every bidding zone the number and volume of bids per product and the number and volume of accepted bids per product.

b) All TSOs and NEMOs shall develop performance indicators in order to monitor the performance of the continuous trading matching algorithm.

2 Requirements related to cross-zonal capacities

2.1 The continuous trading matching algorithm shall be able for each MTU to:

a) allow TSOs to set constant cross-zonal capacity and allocation constraints for each bidding zone border in case coordinated net transmission capacity is applied. This cross-zonal capacity value may also be a very high value;

b) constrain scheduled exchanges to the respective cross-zonal capacity value for each bidding zone border for each cross-zonal

flow directions, in case the coordinated net transmission capacity approach is applied;

c) where applicable, allow setting a default value for cross-zonal capacity for each bidding zone border and for each direction in case coordinated net transmission capacity approach is applied;

d) constrain, where appropriate, an aggregated set of cross-zonal interconnectors with one global cross-zonal transmission capacity limit (cumulative net transmission capacity), i.e. a general boundary constraint. This constraint shall be applicable also to a predefined set of bidding zone borders in order to limit for example the net position of a bidding zone(s);

e) allow the processing of flow-based parameters, if provided at the defined MTU, when allocating cross-zonal capacities for each bidding zone border;

f) allow definition and application of the following flow-based parameters for each network element of a given bidding zone for flow-based approach:

   (i) power transfer distribution factor (PTDF) as defined in Regulation (EU) 543/2013; and

   (ii) available margin on critical network element as refered to in Regulation (EU) 543/2013;

g) ensure that the PTDF matrix multiplied by the net position is less than or equal to the available margin for each critical network element;

h) allow the reception of the flow-based parameters as:

   (i) "zero balanced" meaning that the available margin on critical network elements applies from zero exchanges and that pre-existing exchanges are transmitted aside; or

   (ii) "not zero balanced" meaning that the available margin on critical network elements applies from pre-existing exchanges;

i) allow the coexistence of both flow-based and coordinated net transmission capacity approaches within the coupled regions, i.e. hybrid coupling;

j) allow the use of virtual bidding zones to model how the critical network elements of a CCR applying the flow-based approach are impacted by cross-zonal exchanges on HVDC interconnectors within a CCR or by cross-zonal exchanges on bidding zone borders outside the CRR that are applying the coordinated net transmission capacity approach;

k) facilitate change of cross-zonal capacity values or flow-based parameters, which among other things might be a consequence of netting, capacity publication or update of capacity value or flow-based parameter. In such a case, if a crossed order book is produced, the continuous trading matching algorithm shall match the relevant orders with the aim of maximizing economic surplus.

l) allow configuring the moment when the cross-zonal capacity update is applied or becomes effective;

m) enable to halt/unhalt one bidding zone, one border, one instrument, <u>and</u> one NEMO. In case of halting of one bidding zone, one instrument and one NEMO, all the relevant orders will be halted or inactivated. — X | | X | X

n) handle situations for relevant bidding zone borders where the calculated cross-zonal capacity value applying coordinated net transmission capacity approach is less than the current level of exchange so that no more capacity is allocated in the direction of this exchange until level of exchange is below the calculated cross zonal capacity value; and — X | | X

o) handle situations for relevant bidding zone borders where for continuous intraday trading applying flow-based approach an initial market clearing point is outside flow-based domain by allowing only trades moving the clearing point towards the flow-based domain. — | X | X

2.2 Multiple flow-based approaches, i.e. plain, intuitive, bilaterally intuitive, may be used for different capacity calculation regions. — | X | X

3 Requirements related to allocation constraints

3.1 The continuous trading matching algorithm shall allow to:

a) constrain the increase/decrease of scheduled exchanges over one direct current (DC) interconnector and/or a combination of DC interconnectors from a MTU to the following MTU or between the last MTU from the day before and the first MTU of the following day. The constraint shall take into account the nominations of long term capacity allocations, i.e. physical transmission rights, and day-ahead scheduled exchanges, where applicable. The constraint shall be handled on a single DC interconnector and multiple DC interconnectors in combination (i.e. ramping); — X | X

b) constrain the increase/decrease of net positions of a single bidding zone from a MTU to the following MTU within a day or between the last MTU from the day before and the first MTU of the following day; and

c) incorporate losses on interconnector(s) between bidding zones during capacity allocation, if requested by the owner(s) of the relevant interconnector after approval by the relevant NRAs

3.2 For the DC interconnectors, the scheduled exchanges shall not be below the minimum stable flow (MSF), other than at zero. The MSF will be given for the DC interconnector, if requested by the owner(s) of the interconnectors after approval by relevant NRAs. The capacity allocation shall take into account the nominations of long term cross-zonal capacity and day ahead cross-zonal capacity, where applicable. The constraints shall be handled on a DC interconnector-by-DC interconnector, multiple DC interconnectors and on a net position (regional) basis. — X | X

3.3 The continuous trading matching algorithm shall allow to set a minimum price difference between adjacent bidding zones when a DC interconnector is used for power exchange. For this requirement, the continuous trading matching algorithm shall model the costs incurred for each MWh passing through a DC interconnector as a "flow tariff". — X | X

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This "flow tariff" shall be treated as a threshold for the price between the bidding zones connected by the DC interconnector. If the price difference between the relevant bidding zones is less than the "flow tariff", the scheduled exchanges will be set to zero. If there is a scheduled exchange, the price difference will equal the "flow tariff", unless there is a congestion. Once the price difference exceeds the "flow tariff", the congestion income becomes positive. This functionality shall be incorporated in the continuous trading matching algorithm if requested by the owner(s) of the interconnector after approval by relevant NRAs.

3.4 The continuous trading matching algorithm shall allow for adverse scheduled exchanges, i.e. scheduled exchanges from higher price bidding zone to lower price bidding zone.

3.5 The continuous trading matching algorithm shall aim to minimize the number of bidding zone borders on the path between the matched orders and allow for route prioritisation by the use of interconnector specific cost coefficients.

4 Requirements on continuous trading matching algorithm output for the delivery of single intraday coupling results

4.1 Regarding the quantities for each MTU the output of the continuous trading matching algorithm shall be:

a) rounded and unrounded net position for each bidding zone, which is defined as the difference between matched supply and demand orders within a bidding zone, where rounding shall follow the rounding rules defined for each bidding zone;

b) where applicable, the rounded and unrounded net position for each NEMO trading hub in bidding zones with several NEMOs shall be provided;

c) the execution status of orders and prices per trade;

d) number and volume of matched block orders for each bidding zone;

4.2 For each relevant MTU, the continuous trading matching algorithm shall provide scheduled exchanges resulting from intraday market coupling in the form of:

a) scheduled exchanges between scheduling areas;

b) scheduled exchanges between bidding zones;

c) scheduled exchanges between NEMO trading hubs;

and pursuant to the Methodology for calculation of scheduled exchanges resulting from market coupling. This is to support the scheduled exchanges calculation and/or multi-NEMO arrangements function.

4.3 Regarding the calculation results, the output of the continuous trading matching algorithm shall be the output necessary for monitoring in accordance with Article 82(2) and (4) of the CACM Regulation.

4.4 The continuous trading matching algorithm shall provide NEMOs and TSOs with information necessary to comply with the monitoring

pursuant to Regulation (EU) 1227/2011 where such information can be obtained only from the continuous trading matching algorithm.

4.5 The continuous trading matching algorithm shall be able to implement a change of bidding zone configurations no later than 4 weeks after a TSO notifies a change subject to the change request procedure.

X		X	X

4.6 The continuous trading matching algorithm shall be capable of providing results in order for all post coupling processes to be initiated in 5 minutes after gate closure time of a particular MTU.

X		X	X

5 Currency

5.1 The continuous trading matching algorithm shall only accept matching in Euro, i.e. all input and output currency data shall be in Euros. This should not prevent local currency orders and settlements.

X		X	X

Whereas

This document is a common proposal developed by all Transmission System Operators (hereafter referred to as "TSOs") and Nominated Electricity Market Operators (hereafter referred to as "NEMOs") for a common set of requirements used for the continuous trading matching algorithm (hereinafter referred to as "ID Algorithm Requirements") in accordance with article 37 of Commission Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management (hereafter referred to as the "CACM Regulation").

According to Article 37: "1. By eight months after the entry into force of this Regulation: (a) all TSOs shall jointly provide all NEMOs with a proposal for a common set of requirements for efficient capacity allocation to enable the development of the price coupling algorithm and of the continuous trading matching algorithm. These requirements shall specify functionalities and performance, including deadlines for the delivery of single day-ahead and intraday coupling results and details of the cross-zonal capacity and allocation constraints to be respected;"

In addition to the above common proposal for the TSOs Algorithm Requirements, article 37 of the CACM Regulation requires that "all NEMOs shall jointly propose a common set of requirements for efficient matching to enable the development of the price coupling algorithm and of the continuous trading matching algorithm" (hereinafter referred to as "NEMOs Algorithm Requirements") within the same deadline.

When both proposals are prepared and after the deadline of eight months, all Nominated Electricity Market Operator (hereafter referred to as "NEMO") and all TSOs will cooperate to finalise the sets of the TSOs and NEMOs Algorithm Requirements. Based on the above two sets of requirements, TSOs and NEMOs Algorithm Requirements, "all NEMOs shall develop a proposal for the algorithm in accordance with these requirements. This proposal shall indicate the time limit for the submission of received orders by NEMOs required to perform the MCO functions in accordance with Article 7(1)(b)." This NEMOs proposal for the algorithm shall be prepared no later than three months after the submission of the TSOs and NEMOs Algorithm Requirements.

In accordance with Article 37(3) of the CACM Regulation the NEMOs proposal for the algorithm "shall be submitted to all TSOs. If additional time is required to prepare this proposal, all NEMOs shall work together supported by all TSOs for a period of not more than two months to ensure that the proposal complies with paragraphs 1 and 2.

According Article 37(4) "The proposals referred to in paragraphs 1 and 2 shall be subject to consultation in accordance with Article 12". The consultation on all proposals, i.e. TSOs and NEMOs algorithm requirements and the NEMOs proposal for the algorithms was prepared in cooperation between all TSOs and all NEMOs and was consulted upon together to ensure efficient assessment of their content by market participants.

In accordance with Article 37(5) of the CACM Regulation the all NEMOs' proposal for the Algorithm Proposal, incorporating the TSOs' and NEMOs' DA and ID Algorithm Requirements and taking into account the comments from the consultation, has been submitted to the regulatory authorities for approval no later than 18 months after the entry into force of the CACM Regulati on - i.e., 14 February 2017.

This Proposal is complemented by the back up and fallback procedures that are referred in the proposal for the back-up methodology.

The timeline for the implementation of the ID functionalities mentioned in this document is settled in the Algorithm Proposal, Article7.

The current set of ID Algorithm Requirements is based on the current coupling solutions, either implemented or under development and updated or amended where seen appropriate by the TSOs and/or NEMOs.

Future evolution of capacity calculation methodologies in accordance with the CACM regulation may require additional input parameters, e.g. remedial action variables. In this case, all TSOs shall send a request for amendments of the algorithm to the NEMOs and later on for all NRAs' approval. An assessment of the additional algorithm functionalities shall take place at the latest when the proposal for the capacity calculation methodology in every capacity calculation region (CCR) in accordance with the CACM Regulation is being developed by the TSOs. All TSOs and all NEMOs shall cooperate to propose any amendments if deemed necessary when the above proposals for the capacity calculation methodology is submitted for approval to the national regulatory authorities (ten months after the approval of the all TSOs CCR Proposal).

Decisions of the NEMO Committee in this proposal refers to decisions of All NEMOs coordinated via the NEMO Committee.

TITLE 1

General provision

Article 1

Definitions

For the purpose of this proposal, terms used in this document have the meaning of the definitions included in Article 2 of the CACM Regulation and Regulation 543/2013, definitions included in Section 2 of MCO Plan and the definitions included in Article 2 of the Algorithm Proposal.

In addition, hereafter following definitions apply:

NEMO Trading hub means the set of orders submitted by the market participants to a specific NEMO within a Bidding Zone.

Article 2

Approach

The table below sets out the ID Algorithm Requirements to be complied with for the SIDC. Each requirement has been classified according to the following criteria:

Owner: owner of the requirement for a given functionality (TSOs, NEMOs, or joint TSOs and NEMOs) with meaning as defined in the MCO Plan.

Nature:

MCO Function: a requirement that relates to the joint responsibility of NEMOs to carry out MCO functions in accordance with Article 7(2) of the CACM Regulation.

Scheduled Exchange Calculation ("SEC") Function: a requirement that relates to the joint responsibility of TSOs to calculate and publish scheduled exchanges on borders between bidding zones in accordance with Article 8(2)(g) of the CACM Regulation, where such requirement shall be supported by the continuous trading matching Algorithm (i.e., the SOB and/or CMM). In many cases these requirements are not yet specified ("Future") and it may be that the calculations will be performed outside the continuous trading matching Algorithm – e.g., as a separate post-matching process, or a local/regional process. The solution shall be agreed between the relevant NEMOs and TSOs.

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Article 3

Continuous trading matching Algorithm requirements

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, meaning matching of orders between multiple NEMOs in one bidding zone and between multiple bidding zones

(i)

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Intraday Gate Opening Time (GOT) and Gate Closure Time (GCT)

b)

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For each bidding zone the result from application of the continuous trading matching algorithm shall be one price and one net position for each MTU. For the bidding zones containing several TSOs separating their scope in different scheduling areas, the net position for each MTU shall be calculated for each scheduling area with at least one NEMO hub. For scheduling areas where more than one NEMO operates, the net position for each MTU shall be calculated for each NEMO trading hub.

c)

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For each bidding zone the result from application of the continuous trading matching algorithm shall be one price and one net position for each MTU. For the bidding zones containing several TSOs separating their scope in different scheduling areas, the net position for each MTU shall be calculated for each scheduling area with at least one NEMO hub. For scheduling areas where more than one NEMO operates, the net position for each MTU shall be calculated for each NEMO trading hub.

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advanced hybrid coupling, where the algorithm is able to accomodate coordinated net transmission capacity approach and flow based approach on different bidding zone borders and the mutual impact of cross-zonal capacity allocation between these borders is taken into account within the price coupling algorithmadvanced hybrid coupling, where coordinated net transmission capacity approach and flow based approach coexist within different capacity calculation regions and the mutual impact of cross-zonal capacity allocation between two capacity calculation regions is taken into account within the continious trading matching algorithm.		X	X	

rounded and unrounded net position for each bidding zone, which is defined as the difference between matched supply and demand orders within a bidding zone, where rounding shall follow the rounding rules defined for each bidding zone.; Where applicable, the rounded and unrounded net position for each NEMO trading hub in bidding zones with several NEMOs shall be provided;	X		X	X
wWhere applicable, the rounded and unrounded net position for each NEMO trading hub in bidding zones with several NEMOs shall be provided;	X			X

The algorithmcontinuous trading matching algorithm shall respect the agreed cross-zonal GOT and GCT in accordance with the all TSOs proposal in accordance with Article 59 of the CACM Regulation.	X		X	X