

**Annex 2 to the Algorithm Methodology:  
Common set of requirements for the continuous  
trading matching and the intraday auction  
algorithms**

## Background

Agency for the Cooperation of Energy Regulators (hereafter referred to as the “ACER”) on 26 July 2018 has adopted decision No 08/2018 on the methodology and the common set of requirements for the price coupling algorithm and the continuous trading matching algorithm, developed pursuant to Article 37 of Regulation (EU) 2015/1222 (hereafter referred to as the “CACM Regulation”), among which also the Annex III (Annex 2 to the Algorithm methodology) - Common set of requirements for the continuous trading matching algorithm.

On 24 January 2019, ACER has adopted decision No 01/2019, establishing a single methodology for pricing intraday cross-zonal capacity. Article 6 of this methodology requires that all Transmission System Operators (hereafter referred to as “TSOs”) shall update and complement the common set of requirements for efficient capacity allocation to enable the development of the algorithm for the IDAs in accordance with Article 37(1)(a) of the CACM Regulation and provide it to all NEMOs.

This document is a common proposal developed by all TSOs as amendment of a common set of requirements continuous trading matching algorithm (hereinafter referred to as “TSOs Algorithm Requirements”) in accordance with article 37 of CACM Regulation.

Approved by all TSOs, the amended TSOs Algorithm Requirements, update and replace the Common set of requirements for the continuous trading matching algorithm adopted by ACER decision No 08/2018 of 26 July 2018.

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.

According to CACM Regulation 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, according to Article 9(13): “TSOs or NEMOs responsible for developing a proposal for terms and conditions or methodologies or regulatory authorities responsible for their adoption in accordance with paragraphs 6, 7 and 8, may request amendments of these terms and conditions or methodologies. The proposals for amendment to the terms and conditions or methodologies shall be submitted to consultation in accordance with the procedure set out in Article 12 and approved in accordance with the procedure set out in this Article.”

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, 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.

According to paragraph 4 of Article 37 “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 will be prepared in cooperation

between all TSOs and all NEMOs and be consulted upon together to ensure efficient assessment of their content by market participants.

The all NEMOs proposal for the algorithm developed based on the TSOs and NEMOs algorithm requirements and taking into account the comments from the consultation will be submitted to the regulatory authorities for approval.

The original set of TSOs Algorithm Requirements was based on the current coupling solutions at that time, either implemented or under development and updated or amended where seen appropriate by the TSOs. This first amendment is due to Decision No 01/2019 of the Agency for the Cooperation of Energy Regulators of 25 January 2019 Establishing a Single Methodology for Pricing Cross Zonal Capacity (hereafter referred to as “IDCZCP Decision”). 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 will send a request for amendments of the algorithm to the NEMOs and later on for all NRAs’ approval.

For avoidance of doubt, TSOs do not intend to amend price coupling algorithm requirement with this amendment, however in case this amendment would lead to necessity of amending the price coupling algorithm requirements, the latter shall be prepared jointly by NEMOs and TSOs.

Disclaimer: Requirements where NEMOs are the only owner – are kept for efficiency of cooperation among TSOs and NEMOs and are not part of the amended TSO requirements.

## **Impact on the objectives of CACM Regulation and implementation timeline**

### **Impact on the objectives of CACM Regulation**

The TSOs Algorithm Requirements take into account the general objectives of capacity allocation and congestion management cooperation described in Article 3 of the CACM Regulation. The TSOs Algorithm Requirements aim in particular at ensuring optimal use of the transmission infrastructure, optimizing the calculation and allocation of cross - zonal capacity and ensuring fair and non-discriminatory treatment of TSOs, NEMOs and all market participants. For this reason (enhancing competition and fair treatment), the algorithm should for example facilitate trading with multiple NEMOs and thus, contribute to a level playing field for NEMOs. The algorithm should also allow participation by more than one TSO on one or both sides of a bidding zone border. Further, in order to ensure transparency and reliability of information, it is crucial that the algorithm documentation including information on the source code is well structured and well documented and made available to all involved parties and stakeholders. The algorithm should also respect the need for a fair and orderly market and fair and orderly price formation.

The NEMOs proposal for the algorithm to be prepared in cooperation with all TSOs should contain a detailed explanation of the impact of the algorithm and its requirements to the objectives of the CACM Regulation. TSOs are willing to cooperate with the NEMOs for the development of this assessment.

### **Implementation timeline**

TSOs aim at the earliest possible implementation of the continuous trading matching algorithm and ID auction keeping in mind the differences between the various Member States and regions/CCRs. The

NEMOs proposal for the algorithm to be prepared in cooperation with all TSOs should allow for an early but stepwise alignment of existing solutions and application of the single intraday coupling at a regional level and later on at EU level. In particular, TSOs and NEMOs will jointly assess which functionalities are necessary at first stage of implementing IDCZCP Decision, and which can be implemented at later stages taking into account complexity of implementation and benefits for market participants.

## TITLE 1

### Requirements for continuous single intraday coupling algorithm

#### 1 Requirements on functionalities and performance

##### 1.1 General requirements

- a) The continuous trading matching algorithm shall support the continuous matching of orders as well as the continuous allocation of intraday cross-zonal capacity.
- b) The continuous trading matching algorithm shall ensure equal treatment of orders coming from all NEMOs and from requests for explicit capacity allocation.
- 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;
  - (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;
  - (iii) facilitate different market time units (MTUs) which shall be configurable in each bidding zone;
  - (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;
  - (v) support multiple scheduling areas within a bidding zone as requested by TSOs;
  - (vi) allocate cross-zonal capacities on a bidding zone border with multiple TSOs on one or both sides of the concerned bidding zone border.
- d) Intraday cross-zonal gate opening and intraday cross-zonal gate closure times (IDCZGT) shall be configurable for each bidding zone border.
- e) The continuous trading matching algorithm shall aim to ensure that economic surplus is maximised, where applicable.

Owner		State
TSO	NEMO	Requirement Deadline
X	X	IDC 1
	X	IDC 1
	X	IDC 1
X	X	IDC 2
X	X	IDC 1
X	X	IDC 1
X		IDC 1
X	X	IDC 1
X	X	IDC 1
X	X	IDC 1

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	IDC 1
g) The continuous trading matching algorithm shall be able to provide the net positions of bidding zones and scheduled exchanges between bidding zones.	X		IDC 1
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.	X		IDC 1
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.	X	X	IDC 1
j) The integrity of the continuous trading matching algorithm and the data it processes shall be properly secured from unauthorized access.	X	X	IDC 1
k) The continuous trading matching algorithm needs to provide all necessary information for the cross-NEMOs settlement and shipping.		X	IDC 1
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.	X	X	IDC 1
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.	X	X	IDC 1
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.		X	IDC 1
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 the aggressor order is not fully matched, then the second best price order is matched etc.;		X	IDC 1

- 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:
- The local view of a bidding zone corresponds to the orders that the market participants of the bidding zone can trade;
  - 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;
  - For building the same local view, the same capacity can only be considered once;
  - 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.
- 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.

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	X	IDC 1
	X	IDC 1
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	X	IDC 1

## 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.
- 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.
- 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.
- d) The continuous trading matching algorithm shall support 23, 24 or 25 hours for a trading day.
- e) The continuous trading matching algorithm shall support automatically the leap years, i.e. 366 days in a year.
- 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.
- 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.
- h) The continuous trading matching algorithm shall support negative prices as well as prices with different price boundaries.
- 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.

## 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.
- b) The continuous trading matching algorithm shall be able to calculate for each MTU the scheduled exchanges between bidding zones.
- c) The continuous trading matching algorithm shall be able to calculate for each MTU the scheduled exchanges between scheduling areas.
- d) Once allocated by the continuous trading matching algorithm, the capacity is firm (cannot be changed by TSOs).
- 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 algorithm shall

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X	X	IDA 1



(i) support switchover to auction mode where ID auction (IDAs) requirements apply to allocation of cross zonal capacity;			
(ii) support switch back from auction mode to continuous trading mode where continuous trading requirements apply to allocation of cross zonal capacity;			
(iii) make available for the TSOs the allocation results on the different borders when suspension occurs;			
(iv) allow setting priority level of AAC files in the same manner as for NTC files, depending on the sender of the AAC file;			
(v) allow automatization of halting and unhalting of allocation of cross-zonal capacities on continuous trading basis;			
(vi) allow for automatization of switchover to allocation of cross-zonal capacities into IDAs;			
(vii) allow for automatization of switch back from IDAs to allocation of cross-zonal capacities to continuous trading mode;			
(viii) ensure no double allocation of capacity;			
(ix) allow for the timings of all process steps to be configurable;..			
h) TSOs shall receive the allocation results on the different borders when suspension occurs.		X	IDA 1
i) The algorithm shall allow setting priority level of AAC files depending on the sender of the file the same as it happens with NTC files.	X	X	IDA 1
j) The continuous trading algorithm shall allow automatization of halting and unhalting of allocation cross-zonal capacities on continuous trading basis.	X	X	IDA 1
k) The continuous trading shall allow for automatization of switchover to allocation of cross-zonal capacities into IDAs, avoiding double allocation of capacity.	X	X	IDA 1
l) Times when suspension, switchover and reactivation into/from IDAs shall allow for automatization and shall be configurable, avoiding double allocation of capacity.	X	X	IDA 1
m) Timeout time shall be configurable.	X	X	IDA 1
n) The continuous trading matching algorithm shall support the possibility of continuous matching of orders during the IDA without continuous allocation of intraday cross-zonal capacity.	X	X	IDA 1
o) The continuous trading algorithm and ID auction shall be aligned in relevant aspects in order to avoid inconsistencies that would endanger proper functioning of single intraday coupling, including but not limited to:			
(i) the losses functionality shall be aligned in relevant aspects;	X	X	IDA 1
(ii) there shall be no case when cross zonal capacity is allocated by continuous trading algorithm and by ID auction algorithm at the same time.			

- p) The continuous trading algorithm and ID auction algorithm shall support updating relevant data<sup>1</sup>:
- (i) Upon switchover into IDAs – the continuous trading algorithm shall allow processes for sending of capacity data and other relevant input data to the auction
  - (ii) Upon switch back from IDAs the continuous trading algorithm shall allow processes for updating the cross-zonal capacities and other results accordingly.
- q)
- r) 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.
- s) Once IDAs 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.

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	X	IDC 1
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#### 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;

X		IDC 2
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<sup>1</sup> The design of cooperation between continuous trading algorithm and ID auction algorithm, e.g. whether switchover/switch are performed automatically or manually, are relevant data transferred directly or via IT systems of TSOs/CCCs, possible validation, are out of scope of these requirements. The possible approaches will be assessed, and finally NEMOs and TSOs will agree on the best solution for implementation.

- 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 referred 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, and one NEMO. In case of halting of one bidding zone, one instrument and one NEMO, all the relevant orders will be halted or inactivated.
- n) handle situations for relevant bidding zone borders where the calculated cross-zonal capacity value applying coordinated net transmission capacity approach

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X		IDC 2
X	X	IDC 2
X		IDC 1
X	X	IDC 1
X		IDC 1

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

- 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.

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

X		IDC 2
X		IDC 2

### 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 capacity allocations, i.e. physical transmission rights, day-ahead scheduled exchanges, and auction SIDC scheduled exchanges, where applicable. The constraint shall be handled on a single DC interconnector and multiple DC interconnectors in combination (i.e. ramping);
- 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.

- 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”. 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.

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X		IDC 2
X		IDC 2

- 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.

X		IDC 2
X		IDC 2

#### 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.
- 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	IDC 1
	X	IDC 1
	X	IDC 1
	X	IDC 2
X		IDC 1
X		IDC 1
	X	IDC 1
X	X	IDC 2
X	X	IDC 2
X	X	IDC 1
X	X	IDC 1

#### 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.

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## TITLE 2

### Requirements for single intraday coupling auctions in accordance with methodology for intraday capacity pricing

#### 6. Requirements on functionalities and performance

##### 6.1. General requirements

- a) For each bidding zone, the ID auction algorithm shall be able to:
- (i) facilitate orders for several Market Time Units (hereafter referred as “MTUs”), such as 15 minutes, 30 minutes and hourly;
  - (ii) support the products as defined in the IDAs section of the All NEMOs’ methodology for products ;
  - (iii) 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 45 of the CACM regulation;
  - (iv) support multiple scheduling areas within a bidding zone as requested by TSOs;
  - (v) allocate cross-zonal capacities on a bidding zone border with one or multiple TSOs on one or both sides of the concerned bidding zone border;
- b) The ID auction algorithm shall aim at maximising the economic surplus of the SIDC auction for the market time units, are part of the delivery period of the auction, consistent with time limitations, conditions and requirements established by NEMOs and TSOs;
- c) The ID auction algorithm shall provide for a fair and orderly price formation in accordance with Article 3(h) of the CACM Regulation;

Owner		State
TSOs	NEMOs	Requirement deadline
X	X	IDA 2
	X	IDA 1
X	X	IDA 1
X		IDA 1
X		IDA 1
X	X	IDA 1
	X	IDA 1



- g) The calculation process of the ID auction algorithm, including prices and scheduled exchanges resulting from this calculation process, shall be transparent, auditable, and explainable. This requirement applies also to all deterministic rules and applied algorithm heuristics and occurrence rate of these rules and heuristics;
- h) The price coupling algorithm source code shall be well structured and well documented;
- i) The ID auction algorithm shall support negative prices for each bidding zone;
- j) The ID auction algorithm shall be able to round calculated prices and volumes according to bidding zone specific ticks and rounding rules.

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	X	IDA 1
	X	IDA 1
X	X	IDA 1

### 6.3. Performance

- a) The ID auction algorithm shall be robust and reliable and it shall be resilient to pretested data configurations such as, but not limited to, non-crossing of bids and offer curves, orders' curtailment, maximum and minimum prices, price and volume indeterminacy;
- b) The ID auction algorithm shall always produce a unique result, i.e. price and volume indeterminacy shall be resolved;
- c) The ID auction algorithm shall use reliable IT technology, e.g. reliable third party software;
- d) The ID auction algorithm shall be available at all times when required;
- e) The ID auction algorithm shall be adequately scalable when the number of bidding zones increases. The ID auction algorithm shall cope with new markets that need to be incorporated in the price coupling, either corresponding to geographical extensions, or with additional NEMOs in existing bidding zones.

X	X	IDA 1
X	X	IDA 1
X	X	IDA 1
X	X	IDA 1
X	X	IDA 1

## 7. Requirements related to cross-zonal capacities

### 7.1. The ID auction algorithm shall be able for each MTU to:

- a) allow setting cross-zonal capacity value for each bidding zone border in accordance with the CACM Regulation in case coordinated net transmission capacity is applied;
- b) constrain scheduled exchanges to the respective cross-zonal capacity value for each bidding zone border for each direction, including capacity allocated under previous timeframes, in case the coordinated net transmission capacity approach is applied;
- c) where applicable, allow TSOs 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;

X		IDA 1
X		IDA 1
X		IDA 1



- d) constrain, where appropriate, an aggregated set of cross-zonal interconnectors with one global cross-zonal transmission capacity limit (cumulative ATC), 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 to define a positive and a negative limit to the net position for each bidding zone;
- f) process flow-based parameters, if provided at the defined MTU, when allocating cross-zonal capacities for each bidding zone border;
- g) allow definition and application of the following flow-based parameters for each network element of a given bidding zone for the 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 referred to in Regulation (EU) 543/2013;
- h) ensure that the PTDF matrix multiplied by the net position from the current IDA is less than or equal to the available margins for each critical network element adjusted for already existing exchanges;
- i) receive 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;
- j) allow the coexistence of both flow-based and coordinated net transmission capacity approaches within the coupled regions, i.e. hybrid coupling;
- k) 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.

7.2. Multiple flow-based approaches, i.e. plain and bilaterally intuitive, may be used for different capacity calculation regions.

## 8. Requirements related to allocation constraints

8.1. The ID auction algorithm shall be able 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 before first auction MTU and the first auction MTU;

X		IDA 1
X		IDA 2
X		IDA 1
X		IDA 1
X		IDA 1
X		IDA 1
X		IDA 2
X		IDA 1
X		IDA 1
X		IDA 1
X		IDA 1
X		IDA 1

- b) constrain the increase/decrease of scheduled exchanges over one DC interconnector and/or a combination of DC interconnectors from a MTU to the following MTU or between the last MTU before first auction MTU and the first auction MTU taking into account the results of previous allocation including nominations of long term capacity allocations, i.e. physical transmission rights, where applicable. The constraint shall be handled on a single DC interconnector and multiple DC interconnectors in combination;
- c) constrain the increase/decrease of net positions of a single bidding zone between MTUs;
- d) incorporate losses functionality on interconnector(s) between bidding zones during capacity allocation, and activate this functionality during allocation, if requested by the owner(s) of the relevant interconnector after the approval by the relevant NRAs.

X		IDA 2
X		IDA 1
X		IDA 1
X		IDA 1
X		IDA 1
X		IDA 1
X		IDA 1

8.2. The ID auction algorithm shall allow to set a minimum price difference between adjacent bidding zones when a DC interconnector is used for electricity exchange. For this requirement, the price coupling algorithm shall model the costs incurred for each MWh passing through a DC interconnector as a “flow tariff”. The “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 exchange shall be set to zero. If there is a scheduled exchange, the price difference shall 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 price coupling algorithm and activated during allocation if requested by the owner(s) of the interconnector after approval by the relevant NRAs.

8.3. The ID auction algorithm shall allow for adverse scheduled exchanges, i.e. scheduled exchanges from higher price bidding zone to lower price bidding zone, if this leads to an increase in overall economic surplus.

8.4. The ID auction algorithm shall enforce intuitive scheduled exchange in flow-based areas, i.e. scheduled exchange from lower price bidding zone to higher price bidding zone, where requested by the relevant party for a bidding zone border.

### 9. Requirements related to balance constraints

9.1. For overall balance of all bidding zones, the price coupling algorithm shall ensure that the sum of unrounded net positions and transmission losses, where applicable, of all bidding zones shall be zero.

9.2. For overall balance of a bidding zone, the ID auction algorithm shall ensure for each bidding zone the sum of unrounded net position and transmission losses, where applicable, shall be equal to the sum of import and export of this bidding zone resulting from the intraday capacity allocation.

X		IDA 1
X		IDA 1

## 10. Requirements on algorithm output and deadlines for the delivery of auction SIDC results

10.1. Regarding the prices for each MTU the output of the ID auction algorithm shall be:

- a) rounded and unrounded price in Euros for each bidding zone;
- b) shadow prices of critical network elements as needed for flow-based capacity allocation; and
- c) regional reference prices, in a network in which the cross-zonal capacity constraints are relaxed, e.g. Nordic region.

X	X	IDA 1
X		IDA 1
X	X	IDA 1

10.2. Regarding the quantities for each relevant MTU, the output of the ID auction algorithm shall be:

- a) rounded and unrounded net position for each bidding zone, which is defined as the difference between accepted supply and demand orders within a bidding zone, where rounding shall follow the rounding rules defined for each bidding zone;
- b) where there are multiple NEMOs within a bidding zone and scheduling area, the rounded and unrounded net position for each NEMO trading hub in a bidding zone;
- c) the information which enables the execution status of orders to be determined;
- d) number and volume of accepted block orders for each bidding zone and paradoxically rejected orders, if any;
- e) scheduled exchanges into and out of individual relevant DC network elements (difference in scheduled exchanges in/out reflecting losses where applicable);
- f) scheduled exchanges on relevant bidding zone borders (scheduled exchanges in/out reflecting losses where applicable);
- g) scheduled exchanges on relevant scheduling area borders (scheduled exchanges in/out reflecting losses where applicable);
- h) available margin on critical network elements or the remaining allowable scheduled exchange on the network element in case of flow-based approach.

X	X	IDA 1
X	X	IDA 1
	X	IDA 1
	X	IDA 1
X		IDA 1
X		IDA 1
X		IDA 1
X		IDA 2

10.3. For each relevant MTU the ID auction algorithm shall provide scheduled exchanges resulting from SIDC auctions in the form of:

- a) bilateral and multilateral scheduled exchanges between scheduling areas;
- b) bilateral and multilateral scheduled exchanges between bidding zones; and
- c) bilateral and multilateral scheduled exchanges between NEMO trading hubs;

X		IDA 1
X		IDA 1
X	X	IDA 1

and pursuant to the methodology for calculating scheduled exchanges resulting from day ahead. This is to support the scheduled exchanges calculation and/or multi-NEMO arrangements function<sup>2</sup>.

10.4. Regarding the calculation results, the output of the ID auction algorithm shall be:

- a) the overall economic surplus and economic surplus for each bidding zone; and
- b) the output necessary for monitoring in accordance with Article 82(2) and (4) of the CACM Regulation.

10.5. The ID auction 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 price coupling algorithm.

10.6. The ID auction algorithm shall be able to implement a change of bidding zone configurations following the change control procedure referred to in Article 9 of the Algorithm methodology.

10.7. The ID auction algorithm shall be capable of finding results within the agreed time limit that is established in the operational procedure of the Algorithm methodology.

10.8. The ID auction algorithm shall be able to deliver the volume of matched orders and not-matched orders of each NEMO for bidding zones or scheduling areas if requested by the relevant TSOs.

X	X	IDA 1
X	X	IDA 1
X	X	IDA 1
X		IDA 1
X	X	IDA 1
X		IDA 1

## 11. Currency

11.1. The ID auction algorithm shall for auctions under the SIDC arrangements 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	IDA 1
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<sup>2</sup> The ID Auction 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.