

All NEMOs' proposal for the price coupling algorithm and for the continuous trading matching algorithm, also incorporating TSO and NEMO proposals for a common set of requirements, in accordance with Article 37(5) of the Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management

13 November 2017

All NEMOs, taking into account the following:

Whereas

Background

- (1) This document is a common proposal developed by all Nominated Electricity Market Operators (hereafter referred to as “NEMOs”) for the price coupling algorithm and for the continuous trading matching algorithm (hereafter referred to as the “Algorithm Proposal”) in accordance with Article 37(5) of the Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (hereafter referred to as the “CACM Regulation”). It incorporates as an annex a common set of requirements proposed by NEMOs and TSOs for the price coupling algorithm and the continuous trading matching algorithm (hereinafter referred to as “DA Algorithm Requirements” and “ID Algorithm Requirements” respectively) in accordance with Article 37 of the CACM Regulation.
- (2) According to Article 37(1) of the CACM Regulation: *“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; (b) 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.”*
- (3) After both proposals for common set of requirements were prepared, all NEMOs and all TSOs have cooperated to finalise the sets of the TSOs’ and NEMOs’ DA and ID Algorithm Requirements. Subsequently, *“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).”*
- (4) 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.”*
- (5) In accordance with Article 37(4) of the CACM Regulation *“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., the TSOs’ and NEMOs’ DA and ID Algorithm Requirements and the NEMOs’ proposal for the Algorithm Proposal - 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.
- (6) 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 Regulation - i.e., 14 February 2017.
- (7) In accordance with Article 9(12) of the CACM Regulation all NRAs sent to all NEMOs a “Request for amendment by all Regulatory Authorities agreed at the Energy Regulators’ Forum”, providing a detailed request commonly agreed among NRAs of improving the Algorithm Proposal, as well as the DA Algorithm Requirements and the ID Algorithm Requirements.

- (8) In accordance with the Whereas (1) of the CACM Regulation, *“The urgent completion of a fully functioning and interconnected internal energy market is crucial to the objectives of maintaining security of energy supply, increasing competitiveness and ensuring that all consumers can purchase energy at affordable prices.”*
- (9) Future evolution of capacity calculation methodologies in accordance with the CACM regulation may require additional input parameters. In this case, all TSOs shall send a request for amendments of the DA Algorithm Requirements to all NEMOs and later on for all NRAs’ approval. An assessment of the additional functionalities shall take place at the latest when the proposal for the capacity calculation methodology in every capacity calculation region 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 NRAs.
- (10) All NEMOs shall establish, consistent with the MCO plan, through the All NEMO Cooperation Agreement entered into by all NEMOs, the All NEMO Committee and associated governance arrangements compliant with the CACM Regulation. Joint NEMOs decisions and responsibilities regarding this Algorithm Proposal shall be coordinated via the All NEMO Committee and associated governance arrangements.

Impact on the objectives of CACM Regulation

- (11) The Algorithm Proposal takes into account the general objectives of capacity allocation and congestion management cooperation described in Article 3 of the CACM Regulation. The DA and ID Algorithm Requirements aim in particular at ensuring optimal use of the transmission infrastructure (optimizing the calculation and allocation of cross-zonal capacity) and promoting effective competition in the generation, trading and supply of electricity while respecting the need for a fair and orderly market and fair and orderly price formation (encouraging the development of market liquidity).
- (12) The procedures for maintaining the algorithms aim at ensuring fair and non-discriminatory treatment of TSOs, NEMOs, market participants, NRAs and ACER. The DA and ID Algorithm Requirements support trading with multiple NEMOs while facilitating a level playing field for NEMOs. The algorithms also allow participation by more than one TSO on one or both sides of a bidding zone border.
- (13) Further, the Algorithm Proposal ensures and enhances transparency and reliability of information through the provision of suitable algorithm documentation, performance reporting to all involved stakeholders and a transparent process (including consultation where relevant) to manage changes to the algorithms.
- (14) The Algorithm Proposal establishes that the operational performance, security and compliance shall be managed in accordance with principles that:
 - a) Provide an objective basis to monitor and communicate operational performance;
 - b) Provide assurance that the Algorithm Performance (for DA and ID) is at an acceptable level. In particular, that the price coupling algorithm is for all days able to find a compliant solution to the market coupling problem in the permitted time;
 - c) Support stakeholders’ understanding of the algorithms.
- (15) The Algorithm Proposal establishes that changes to the price coupling algorithm and continuous matching algorithm shall be managed in accordance with principles that:
 - a) Provide an open, transparent, non-discriminatory way to manage Request for Changes, including stakeholder input where relevant;
 - b) Provide assurance that the Algorithm Performance shall be maintained at acceptable levels now and over a reasonable period of time in the future, assuming plausible market growth and development;
 - c) Enable individual NEMO or TSO requests to be supported where this does not harm any party or includes measures to mitigate any harm in a way that ensures non-discrimination;

- d) Establish a fair and efficient process that supports timely market development.

Interim and Enduring solutions

- (16) In order to deliver a solution fully compliant with the CACM Regulation for the price coupling algorithm and continuous matching algorithm, starting from the existing solutions, an implementation timeline is proposed. Such timeline includes an interim solution based on which all NEMOs shall carry out research and development activity (hereafter referred to as the “prototyping phase”) in order to achieve the enduring solution. Legal basis, motivation and proposals for such interim and enduring solution and for the relative implementation timeline are provided in the following paragraphs.
- (17) While the existing solutions guarantee support for all individual products referred to in the proposals for products that can be taken into account by NEMOs in the single day-ahead and intraday coupling process in accordance with Articles 40 and 53 of the CACM Regulation (hereafter referred to as the “Product Proposals”), support of some combinations of products in one single bidding zone might be not guaranteed. The same might apply to combinations of specific requirements. During the prototyping phase such combination might be adopted according to outcomes of Change Control Procedure depending on the impact on Algorithm Performance and with possible adoption of limits on the usage of such combinations.
- (18) In case the research and development activity carried out in the prototyping phase will not remove limitations on adoption of specific combinations of product as reported in Whereas 17, in the enduring solution the adoption of such combinations shall be forbidden.

Enduring solution – adequately maximized economic surplus

- (19) According to Article 38(1)(a) of the CACM Regulation, the price coupling algorithm “*aims at maximising economic surplus for single day-ahead coupling for the price-coupled region for the next trading day*”.
- (20) According to Article 51(1)(a) of the CACM Regulation, the continuous trading matching algorithm “*aims at maximising economic surplus for single intraday coupling per trade for the intraday market time-frame by allocating capacity to orders for which it is feasible to match in accordance with the price and time of submission*”.
- (21) According to Article 2(46) of the CACM Regulation, “*economic surplus for the single day-ahead or intraday coupling’ means the sum of (i) the supplier surplus for the single day-ahead or intraday coupling for the relevant time period, (ii) the consumer surplus for the single day- ahead or intraday coupling, (iii) the congestion income and (iv) other related costs and benefits where these increase economic efficiency for the relevant time period, supplier and consumer surplus being the difference between the accepted orders and the clearing price per energy unit multiplied by the volume of energy of the orders*”.
- (22) According to Article 48(1) of the CACM Regulation, “*No later than by the time specified by all TSOs in the requirements set out in Article 37(1)(a), all NEMOs performing MCO functions shall deliver the single day-ahead coupling results*”.
- (23) According to Article 59(4) of the CACM Regulation, “*The intraday energy trading for a given market time unit for a bidding zone border shall start at the latest at the intraday cross-zonal gate opening time of the relevant bidding zone borders and shall be allowed until the intraday cross-zonal gate closure time*”.
- (24) Considering that the presence of products (and TSO requirements) ranging across more than one market time unit (MTU) with all-or-nothing acceptance criterion requires combinatorial calculations to search for alternative compliant solutions, and considering the complexity of the requirements to be respected and the number of solutions to be assessed, in order to allow the algorithm to provide the results within the time limit specified by all TSOs in accordance with Article 48(1) and 59(4) of the

CACM Regulation, some stopping criterion need to be applied to the procedure for searching the optimal solution. This entails that the algorithm may not have enough time to search for all feasible solutions in order to find the global optimal solution.

- (25) An algorithm producing an adequate maximized surplus is an algorithm that delivers the solution with the highest possible economic surplus among all the feasible solutions found by the algorithm within the time limit specified in accordance with Article 48(1) and 59(4) of the CACM Regulation.

Enduring solution – adequately repeatable

- (26) According to Article 38(1)(e) and 51(1)(e) of the CACM Regulation, the algorithm must be repeatable.
- (27) The need of a stopping criterion referred to under Whereas 24 implies that any solution found by the algorithm is time dependent. As consequence repeatability can only be ensured on the same machine and at the same number of iterations, which allows for assessing exactly the same set of potential market solutions.
- (28) An adequately repeatable algorithm is an algorithm that delivers the exact same result for two different runs of the algorithm performed on the same machine and with the same number of iterations.

Enduring solution – adequately scalable

- (29) According to Article 38(1)(e) and 51(1)(e) of the CACM Regulation, the algorithm must be scalable.
- (30) According to Article 38(2) of the CACM Regulation, *“The price coupling algorithm shall be developed in such a way that it would be possible to apply it to a larger or smaller number of bidding zones”*.
- (31) The urgent completion of a fully functioning and interconnected internal energy market makes the extension of market coupling to all EU Member states the highest priority objective.
- (32) Unlimited scalability is not feasible, since any machine is subject to technical constraints that can be triggered under extreme conditions, neither efficient, since it entails costs which are not proportionate to the results that can be achieved, nor needed, since the dimensions of the market coupling are not infinite in terms of geographical scope, number of NEMOs and product usage. Hence adequate scalability is needed.
- (33) An adequately scalable algorithm is an algorithm able to accommodate the enlargement of the market coupling to new bidding zones and new NEMOs on a European scale as well as the reasonable use of products as defined in the Product Proposals.

Interim solution

- (34) According to Whereas 14 of the CACM Regulation, *“For efficiency reasons and in order to implement single day-ahead and intraday coupling as soon as possible, single day-ahead and intraday coupling should make use of existing market operators and already implemented solutions where appropriate, without precluding competition from new operators”*.
- (35) According to Article 36(4) of the CACM regulation, *“Where possible, NEMOs shall use already agreed solutions to efficiently implement the objectives of this Regulation”*.
- (36) The existing solutions for DA and ID markets were designed before the entry into force of the CACM Regulation and therefore they were not designed to necessarily meet all requirements of the CACM Regulation.
- (37) In order to make the DA and ID existing solutions fully compliant with all requirements of the CACM Regulation, further development is needed, including research and development activity on the IT solution supporting the algorithm operation and the algorithm design, aiming to increase the performance of the algorithm; prototyping activity aiming to test the performance of the newly proposed solutions; industrialization activity aiming to deliver a full functioning algorithm deployed in its expected production environment; timely communication to NRAs and other stakeholders of the

expected outcome of the process, in order to allow them adapting their own operational processes to the newly delivered solutions.

- (38) Since the final outcome of the research and development activity is still unknown, an amended detailed description of the enduring solution if needed shall be communicated to all NRAs and other stakeholders by the end of the prototyping phase.
- (39) In order to implement the SDAC and SIDC as soon as possible (e.g. market coupling in all EU plus Norway), an interim solution, based on the existing solutions, shall be adopted until solution fully compliant with the CACM Regulation, the enduring solution, is delivered.
- (40) In order to minimize the risk of decoupling, some limits to the usage of the existing Functionalities might be imposed as a last resort measure.

Day to day management

- (41) According to Article 10 of the CACM Regulation, *“TSOs and NEMOs shall jointly organise the day-to-day management of the single day-ahead and intraday coupling. They shall meet regularly to discuss and decide on day-to-day operational issues. TSOs and NEMOs shall invite the Agency and the Commission as observers to these meetings and shall publish summary minutes of the meetings”*.
- (42) The implementation of the proposed algorithms requires close cooperation between NEMOs and TSOs, especially with regard to the algorithm management and change management. The modalities of such cooperation shall be jointly agreed by TSOs and NEMOs in the organization of the day-to-day management of the single day-ahead and intraday coupling in accordance with Article 10 of the CACM Regulation.
- (43) The day to day management shall include, among others, the management of operational incidents, aiming to secure reliability of market coupling, plus the monitoring of algorithm performance and the management of Request for Changes to the algorithm from the NEMOs or TSOs, aiming to preserve adequate scalability.
- (44) According to Article 51(1)(e) of the CACM Regulation, continuous trading matching algorithm should be repeatable. Since continuous trading matching algorithm is based on price order principle and input time order principle and since it doesn't contain any element of randomness, current version of algorithm on the initial products is already repeatable from a theoretical point of view. This is the reason why there are no indicators about repeatability included in this Algorithm Proposal.

Implementation timeline

- (45) The implementation timeline for both single day-ahead coupling (SDAC) and single intraday coupling (SIDC) relies on the approval by All NRAs of All NEMOs Methodologies and proposals, on the approved MCO Plan implementation timeline and content until June 2018.
- (46) The implementation timeline shall include a proper phase dedicated to research and development activity to be carried out on existing solutions for DA and ID aimed at reaching a solution complying with the properties of the enduring solution, e.g. based on stipulations described in Whereas 16-40 above (prototyping phase).

SUBMIT THE FOLLOWING ALGORITHM PROPOSAL TO ALL REGULATORY AUTHORITIES:

Article 1

Subject matter and scope

1. The present Algorithm Proposal shall be considered as the common proposal of all NEMOs in accordance with Article 37 of the CACM Regulation.
2. The annexed DA and ID Algorithm Requirements shall be considered as the common proposal of all NEMOs and all TSOs, in accordance with Article 37 of the CACM Regulation.
3. The following provisions and related decisions of all NEMOs shall apply subject to applicable laws and regulations.

Article 2

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, the other items of legislation referenced therein and MCO Plan. In addition, the following definitions shall apply:

1. **Algorithm Monitoring Procedure:** means a procedure designed by all NEMOs in coordination with all TSOs in order to control the performance of the price coupling algorithm respectively continuous trading matching algorithm.
2. **Algorithm Performance:** means the ability of the price coupling algorithm and continuous matching algorithm to ensure reliability of the elaborated solution, to aim to maximize economic surplus and to ensure an adequate level of repeatability and scalability, as described in Article 3. Algorithm Performance is measured and monitored according to dedicated metrics (indicators) described in DA and ID Algorithm Requirements and established by all NEMOs in coordination with all TSOs.
3. **Anticipated Usage:** means a reasonable expected Effective Usage of a Functionality by each individual NEMO or TSO. The Anticipated Usage for a new Functionality is indicated by the same NEMO or TSO in the submitted Request for Change. For existing Functionalities, the Anticipated Usage shall be derived from the Effective Usage according to a formula commonly defined amongst all NEMOs and stated in the Change Control Procedure. Anticipated Usage is used for the purpose of testing the impact of Request for Changes at a time horizon set by all NEMOs (typically 1 year).
4. **Change Control Procedure:** means a procedure designed by all NEMOs in coordination with all TSOs in order to manage Requests for Change to the price coupling algorithm respectively continuous trading matching algorithm.
5. **Corrective measures:** means a last resort measure to be taken based on all NEMOs decision with the aim to allow restoring adequate scalability.
6. **Effective Usage:** means the observed relevant historic usage of a Functionality in production by each individual NEMO or TSO.
7. **Existing DA Algorithm Solution:** means the algorithm which has been developed and implemented for the day-ahead market coupling within the DA coupling project pre-existing the CACM Regulation among some NEMOs, as recognized under Article 5(1) of the approved MCO Plan.
8. **Existing ID Algorithm Solution:** means the algorithm which has been developed for the intraday market coupling within the ID coupling project pre-existing the CACM Regulation among some NEMOs, as recognized under Article 5(2) of the approved MCO Plan.
9. **Functionality:** means any market or network feature or design element embodied in the systems, communications and procedures that support the DA or ID Algorithm in accordance with the Algorithm Requirements.
10. **Future Requirements:** means requirements proposed according to Article 37 of the CACM Regulation which the price coupling algorithm and continuous matching algorithm shall comply with after the initial start of the single day-ahead or intraday coupling, where necessary subject to clarification of the requirements and technical assessment of the impact on Algorithm Performance.

11. **Initial Requirements:** means requirements proposed according to Article 37 of the CACM Regulation which the price coupling algorithm and continuous matching algorithm shall comply with from the start of operation of the single day-ahead or intraday coupling (as further defined in the MCO Plan).
12. **MCO Plan:** means the document developed by all NEMOs in order to describe the plan that sets out how they jointly set up and perform the MCO functions, elaborated according to requirements of Article 7(3) of the CACM Regulation and approved by all NRAs in June 2017.
13. **MTU:** means market time unit.
14. **NEMO trading hub:** means the set of orders submitted by the market participants to a specific NEMO within a bidding zone.
15. **Request for Change:** means a formal request by one or more NEMO(s) or TSO(s) for any modification to be made to the price coupling algorithm and continuous matching algorithm or to its usage in production.
16. **Scheduled Flow:** means allocated flow between two bidding zones, two scheduling areas or two NEMO trading hubs that is obtained as a result of the MCO function.
17. **Usage Range:** means an assessment of the maximum level of usage of a specific requirement supported by the algorithm in conditions of adequate scalability related to the Anticipated Usage through a function defined by all NEMOs in coordination with all TSOs.

Article 3

Algorithm Requirements

1. The algorithm requirements comprise a common set of requirements proposed by TSOs, a common set of requirements proposed by NEMOs and a common set of requirements jointly proposed by both TSOs and NEMOs, in line with Article 37 (1) of the CACM Regulation.
2. The DA Algorithm Requirements are those set out in Annex 1 of this Algorithm Proposal, the ID Algorithm Requirements are those set out in Annex 2 of this Algorithm Proposal.
3. All NEMOs shall maintain the Functionalities to be compliant with the list of Initial Requirements plus Future Requirements (following their implementation) that are set out in Annex 1 and Annex 2.
4. Any modification to the Functionality, including the modifications needed to meet Future Requirements, shall be implemented according to a Request for Change, including assessment of feasibility and algorithm performance impact.
5. The price coupling algorithm and the continuous trading matching algorithm shall support scheduled exchange calculation function requirements, which relate 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.
6. While the price coupling algorithm respectively the continuous trading matching algorithm shall guarantee support for all individual products referred to in the DA (respectively ID) Product Proposal and for all requirements under Annex 1 and Annex 2, support of specific combination of products in one single bidding zone or specific combination of requirements could not be guaranteed (i.e. feasible only under limited scalability) or even not allowed. Such combinations shall be indicated in the Algorithm Monitoring Procedure as further specified under Article 9(3).
7. All NEMOs shall ensure that the price coupling algorithm fulfils the requirements described in Annex 1 of the Algorithm Proposal and the set of requirements referred to in Article 38(1) and Article 40(2) of the CACM Regulation, aimed at ensuring an adequate level of performance:
 - a) The price coupling algorithm shall aim at maximizing the economic surplus for SDAC for the next trading day while respecting cross-zonal capacity and allocation constraints and being consistent with time limitations. The price coupling algorithm shall facilitate efficient price formation by using the marginal price principle, in order to ensure that all accepted bids have the same price per bidding zone and per market unit. The results of the price coupling algorithm shall fulfil the maximization thresholds defined according to Article 9(3);

- b) The price coupling algorithm shall be repeatable, thus ensuring the delivery of the same result for two different runs of the algorithm on the same machine and after the same number of iterations;
 - c) The price coupling algorithm shall be scalable, ensuring the possibility to apply the algorithm to a larger number of i) bidding zones, ii) NEMOs, iii) volumes of bids and offers, with reference to the whole European extension. At the end of the prototyping phase, the enduring solution of the price coupling algorithm shall at least:
 - i. support the coupling of all bidding zones in the EU plus Norway;
 - ii. respect allocation constraints applying both ATC methodology and flow-based approach;
 - iii. support the operation of multiple NEMOs in a same bidding zone;
 - iv. accommodate orders resulting from products covering one MTU and at least one kind of product covering multiple MTUs, in line with Article 40(2) of the CACM Regulation;
 - v. Support a reasonable usage of the products reported under previous letter iv), to be assessed against the anticipated/effective usage;
 - d) The price coupling algorithm shall be reliable. By reliability, it is meant the ability of the algorithm to ensure finding at least one solution within the given timeframe.
8. All NEMOs shall ensure that the continuous trading matching algorithm fulfils the requirements described in Annex 2 of the Algorithm Proposal and the set of requirements referred to in Article 51(1), Article 53(2) and Article 53(3) of the CACM Regulation, aimed at ensuring an adequate level of performance:
- a) The continuous trading matching algorithm shall aim at maximizing the economic surplus for SIDC for the intraday market time-frame by allocating capacity to orders for which it is feasible to match in accordance with the price and time of submission while respecting cross-zonal capacity and allocation constraints. The results of the continuous trading matching algorithm shall fulfil the optimality thresholds defined according to Article 9(4);
 - b) The continuous trading matching algorithm shall respect the delivery of results according to Article 60 of the CACM Regulation;
 - c) The continuous trading matching algorithm shall be repeatable, which means that, given a set of order books, their associated time stamp and existing grid constraints for a specified delivery date, provided an adequate and suitable capacity in terms of storage and calculation, the same results originally obtained for the indicated delivery date can be reproduced;
 - d) The continuous trading matching algorithm shall be scalable, thus ensuring the possibility to apply the algorithm to a larger number of i) bidding zones, ii) NEMOs, iii) volumes of bids and offers and at least one kind of product covering multiple MTU, in line with Article 53(3) of the CACM Regulation, with reference to the whole European extension.

Article 4

Price coupling algorithm

1. The price coupling algorithm shall be based on the Existing DA Algorithm Solution, as improved at the end of the prototyping phase dedicated to research and development processes.
2. The price coupling algorithm shall provide as outcome a solution, composed by a set of values for the following variables, which respect the market and network constraints:
 - a) the market clearing prices of each bidding zone for each relevant MTU,
 - b) the matched volumes of each bidding zone for each relevant MTU,
 - c) the net position of each bidding zone, scheduling area and NEMO hub for each relevant MTU,
 - d) the Scheduled Flow between bidding zones, NEMO Hubs and scheduling areas for each relevant MTU,
 - e) the selection of executed block, complex, merit, and PUN orders,
 - f) the accepted percentage for each curtailable block.
3. Between two solutions with the same value of economic surplus, the price coupling algorithm shall select the one that maximizes the traded volume.

4. The price coupling algorithm shall calculate the Scheduled Flows between bidding zones, scheduling areas and NEMO trading hubs, ensuring consistency among the three different kind of flows.
 - a) For the bidding zones containing several NEMOs, the net position for each MTU will be calculated for each NEMO trading hub.
 - b) For the bidding zones containing several TSOs separating their scope in different scheduling areas, the net position for each MTU and where relevant for each NEMO Hub will be calculated for each scheduling area.
5. The inter bidding zone flow calculation functionality shall ensure that, when several routes might be possible for a given set of net positions, the price coupling algorithm shall provide the Scheduled Flows of the solution by minimizing a cost function on Scheduled Flows, using for this calculation a deterministic rule.
6. To find solutions, the price coupling algorithm shall evaluate different combinations of selected/non-selected blocks and complex orders, trying to find values for the resting variables that fulfil the market and network constraints. Every new evaluated combination is a node.
7. In order to ensure reliability of operation, the price coupling algorithm shall first aim to find a first solution compliant with the input constraints. In order to maximize the economic surplus, it shall then seek to find new solutions with higher economic welfare by exploring new nodes until the stopping criterion is reached.
8. The price coupling algorithm shall stop when one of following stopping criteria is met:
 - a) The optimal solution is found;
 - b) Time limit: the elapsed time has reached the set permitted time to run;
 - c) Iteration limit: the algorithm stops after it has completely processed a number of nodes;
 - d) Solution limit: the algorithm stops after having found a number of solutions.
9. Under normal operations, NEMOs shall run the price coupling algorithm using the time limit stopping criterion, set to the maximum calculation time allowed. This maximum allowed time shall be established in the operational procedure referred to under Article 4(15).
10. The price coupling algorithm shall perform checks on every solution found to validate that all the market and network constraints are respected within a given tolerance.
11. The last solution found that is fulfilling the checks under Article 4(10) contains the values that are considered the result of the execution of the price coupling algorithm.
12. Orders shall be anonymous – i.e., there shall be no identification of the originating market participant.
13. A single instance of the price coupling algorithm operated by the Coordinator shall calculate the results for all coupled NEMO trading hubs.
14. The input data shall be available to any authorised Operator, who is entitled to perform the price coupling calculation in parallel.
15. All NEMOs, in cooperation with TSOs where relevant, shall establish the operational procedure and timings, including both normal procedures and back-up procedures, consistent with operational requirements under the CACM Regulation. NEMOs shall be required to comply with these procedures.
16. Under normal operations, NEMOs shall submit orders to the MCO Function by the time stated in the operational procedure or else backup procedures shall apply.
17. Under normal operations, NEMOs shall provide all TSOs with the relevant outcome referred to under Article 4(2) (a), (b) and (c) of the SDAC by 13:00 market time day-ahead and anyway not later than 15:30 market time day-ahead.
18. NEMOs shall provide TSOs with the relevant outcome referred to under Article 4(4) in case such TSOs decide to use the price coupling algorithm to provide the single scheduled exchange calculator functionality recalled to in the methodology for the calculation of Scheduled Exchanges, according to Article 43 of the CACM Regulation.
19. All NEMOs shall create and maintain a document with the detailed description of the price coupling algorithm, including the rules to calculate Scheduled Flows between NEMO trading hubs. This document shall be kept updated with every new version of the price coupling algorithm. The document is made publicly available by all NEMOs on public internet webpage.

20. All NEMOs shall activate continuous research and development activities to allow for incremental improvement of the performance of the price coupling algorithm in order to ensure adequate scalability, according to principles laid out in Article 3(7)(c).

Article 5

Price coupling algorithm Implementation timeline

1. The price coupling algorithm implementation timeline begins with the approval of the Algorithm Proposal by all NRAs.
2. In order to reach to an enduring solution compliant with requirements reported in Article 3 by starting from the adoption of Existing DA Algorithm Solution, the implementation timeline is structured in three phases:
 - I. Prototyping phase: up to three years dedicated to developing the activity of research and development on the Existing DA Algorithm Solution aimed at reaching a solution complying with the properties of the enduring solution described under Article 3. During the prototyping phase all NEMOs adopt the DA interim solution as further described in Article 5(4)(i);
 - II. Extended prototyping phase: up to one further year at the end of the prototyping phase, if necessary to finalize the research and development activity;
 - III. Industrialization phase: up to one year, dedicated to the industrialization of the prototype delivered by the research and development activity, if such prototype has been proven suitable, announcing to stakeholders the specific features of the enduring solution and to draft if needed an amended version of the Algorithm Proposal.
3. All NEMOs shall have the chance, at any phase, to introduce modifications in the approach adopted for the research and development activity in case the latter does not provides outcomes compatible with the target of the enduring solution within the proposed timeline. Such change shall be properly reported to all NRAs according to Article 5(7).
4. All NEMOs shall ensure at least the achievement of the following mid-term milestones:
 - i. By the end of June 2018 the DA interim solution shall be able to support all Initial Requirements reported in Annex 1, the requirement of adequate maximization described under Article 3(7)(a), the Multi-Nemo operation, the schedule exchange calculation functionalities according to methodology for the calculation of Scheduled Exchanges and the coupling of all bidding zones in the EU plus Norway, as described in Article 3(7)(c)(i).
 - ii. By June 2020 the DA interim solution shall be able to support the requirement of adequate repeatability described in Article 3(7)(b).
 - iii. By the end of the first year of the prototyping phase, all NEMOs shall communicate to all NRAs and make publicly available to all stakeholders the Change Control Procedure and the Algorithm Monitoring Procedure referred to the existing solutions.
 - iv. By the end of the extended Prototyping Phase, all NEMOs shall consult with the relevant stakeholder forums organised in accordance with Article 11 of the CACM Regulation and send to all NRAs the report on outcomes of the research and development activities carried out;
 - v. By the end of the industrialization phase the DA interim solution shall be able to support all Future Requirements reported in Annex 1 and the requirement of adequate scalability, described under Article 3(7)(c).
 - vi. By the end of the industrialization phase, all NEMOs shall also communicate to all NRAs and make publicly available to all stakeholders the detailed description of the enduring solution, the Change Control Procedure and the Algorithm Monitoring Procedure referred to the enduring solution.
 - vii. By the end of the industrialization phase, all NEMOs shall start the prototyping phase of the other functionalities as described in Annex 1, following the Change Control Procedure.

5. The consultation indicated in Article 5(4)(iv) shall be carried out latest at the end of the extended prototyping phase activity and shall be considered for the activation of the one-year extension to perform the industrialization.
6. At the end of consultation indicated in Article 5(4) (iv) all NEMOs shall, if the prototyping phase(s) and the following consultation has led to a need to amend the Algorithm Proposal, send to all NRAs for approval an amended version of Algorithm Proposal.
7. On a periodic basis, at least on a yearly basis, during the prototyping phase all NEMOs shall send to all NRAs a report on research and development activities providing:
 - a) Status of the research and development (prototyping) activity in relation to beforehand among All NEMOs agreed approach(es) and targets;
 - b) Planning of the research and development activity for the coming period, including estimation on identified workload.
8. In case the prototyping phase does not conclude in the given timeframe, the activation of the extended prototyping phase may take place. In such a case, all NEMOs shall inform all NRAs about such activation three months prior to the deadline of the prototyping phase.
9. The timely delivery of the specific schedule exchange calculator functionalities, requested by all TSOs in the methodology for the calculation of Scheduled Exchanges shall be dependent on the final approval by all NRAs of such methodology and on the confirmation of the formulas for Scheduled Flows between bidding zones and scheduling areas already implemented in the existing solution or in course of implementation.

Article 6

Continuous trading matching algorithm

1. The continuous trading matching algorithm shall be based on Existing ID Algorithm Solution.
2. The continuous trading matching algorithm shall comprise a shared order book (SOB) module and a capacity management module (CMM). The SOB module shall manage order entry, order management and order matching, while the capacity management module shall manage transmission capacity management and allocation.
3. The continuous trading matching algorithm enables multiple NEMOs to connect to the SOB module. Orders are entered in the local trading solutions; all valid orders entered in time in the local trading solution are automatically entered into the SOB; market participants are not entitled to access the SOB module directly.
4. The continuous trading matching algorithm shall calculate the Scheduled Flows between bidding zones, scheduling areas and NEMO trading hubs, ensuring consistency among the three different kind of flows.
5. Matching of contracts shall be performed in the SOB module, irrespectively of the scheduling areas the orders were entered (including from the same area). The SOB module maintains a consolidated order book for all contracts based on available transmission capacity and allocation constraints between bidding zones.
6. The CMM shall provide the current capacity availability information. When cross border trades are performed, the required cross border capacity shall be implicitly allocated in the CMM.
7. Explicit participants shall directly access the CMM to perform explicit capacity reservations.
8. The SOB module shall determine the local view of all orders that can be executed in the selected scheduling area.
9. The SOB module shall apply deterministic matching procedures. Contracts shall be executed in the SOB module on the price-time-priority principle:
 - a) Price: orders shall be executed at the best price. The best buy order shall be executed against the best sell order first (the best price for buy orders is the highest price, for sell orders it is the lowest price).
 - b) Time: when an order is entered into the SOB, it shall be assigned a timestamp. This timestamp is used to prioritize orders with the same price limit. At the same time orders with earlier timestamps shall be executed with a higher priority than orders with a later timestamp.

10. The clearing price for a newly entered order that is matched shall be the order price of the best order which is already in the SOB:
 - a) If a newly entered buy order is matched against an existing sell order, the limit price of the sell order becomes the trade execution price.
 - b) If a newly entered sell order is matched against an existing buy order, the limit price of the buy order becomes the trade execution price.
11. Where a cross-zonal trade is identified in the SOB module, a request for the associated cross-zonal capacity shall be made to the CMM. Requests for implicit capacity shall be queued along with explicit capacity requests and treated in time sequence. If the necessary cross-zonal capacity is not available, the cross-zonal trade is not matched.
12. There shall be no discrimination between the matching of single-time-unit orders, the matching of multiple-time-unit (i.e. block) orders and granting explicit capacity requests. These requests from both implicit continuous matching and explicit allocation shall all be treated in the CMM on a first-come-first served basis.
13. NEMOs shall provide TSOs with the relevant outcome referred to under Article 6(4) in case such TSOs decide to use the continuous trading matching algorithm to provide the single scheduled exchange calculator functionality recalled to in the methodology for the calculation of Scheduled Exchanges, according to Article 43 of the CACM Regulation. For such purpose and in such cases NEMOs shall, together with TSOs, implement the Shipping Module (SM). The SM shall be able to provide the necessary information for calculating Scheduled Exchanges between bidding zones and scheduling areas and Scheduled Flows between NEMO trading hubs.
14. NEMOs shall create and maintain a document with the detailed description of the continuous trading matching algorithm. This document shall be kept updated with every new version of the continuous trading matching algorithm. The document is made publicly available by NEMOs on public internet webpage.
15. All NEMOs shall activate continuous research and development activities to allow for incremental improvement of the performance of the continuous trading algorithm in order to ensure adequate scalability, according to principles laid out in Article 3(8)(d).

Article 7

Continuous trading matching algorithm implementation timeline

1. The continuous trading matching algorithm implementation timeline begins with the approval of the algorithm proposal by all NRAs.
2. In order to reach to an ID enduring solution compliant with requirements listed in Article 3, the implementation timeline is structured in four phases:
 - I. First implementation phase: up to one year dedicated for go-live of the Existing ID Algorithm Solution, to be considered as SIDC interim solution;
 - II. Prototyping phase: up to three years after the first implementation phase is completed: dedicated to the activity of research and development aimed to reach a solution complying with the properties of the enduring one described under Article 3;
 - III. Extended prototyping phase: up to one further year, to be granted to all NEMOs by all NRAs at the end of the prototyping phase, based on a request provided by all NEMOs in order to finalize the research and development activity;
 - IV. Industrialization phase: up to one further year, dedicated to the industrialization of the prototype delivered by the research and development activity, if such prototype has been proven suitable, announcing to stakeholders the specific features of the enduring solution and to draft if needed an amended version of the Algorithm Proposal.

3. All NEMOs shall have the chance, at any phase, to introduce modifications in the approach adopted for the research and development activity in case the latter does not provides outcomes compatible with the target of the enduring solution within the proposed timeline. Such change shall be properly reported to all NRAs according to Article 7(6).
4. All NEMOs shall ensure at least the achievement of the following mid-term milestones:
 - i. By the end of 2018 the SIDC interim solution shall be able to support all Initial Requirements reported in Annex 2, the Multi-Nemo support and the requirement on delivery of results described under Article 3(8)(b) and maximization the economic surplus described under Article 3(8)(a);
 - ii. To ensure the second go-live, the SIDC interim solution shall be updated with the rest of the functionality of enhanced preferred shipper by 2019;
 - iii. By the end of the first year of the prototyping phase, all NEMOs shall communicate to NRAs and make publicly available to all stakeholders the Change Control Procedure and the Algorithm Monitoring Procedure;
 - iv. By the end of the industrialization phase, all NEMOs shall communicate to NRAs and make publicly available to all stakeholders the detailed description of the SIDC enduring solution;
 - v. By the end of the industrialisation phase, all Future Requirements reported in Annex 2 and adequate scalability described under Article 3(8)(d), shall be supported.
 - vi. By the end of the industrialization phase, all NEMOs shall communicate to NRAs and make publicly available to all stakeholders the Change Control Procedure and the Algorithm Monitoring Procedure referred to the SIDC enduring solution.
5. At the end of consultation indicated in Article 7(4) (iv) all NEMOs shall, if the prototyping phase(s) and the following consultation has led to a need to amend the Algorithm Proposal, send to all NRAs for approval an amended version of Algorithm Proposal.
6. On a periodic basis, at least on a yearly basis, during the prototyping phase all NEMOs shall send to all NRAs a report on research and development activities providing:
 - a) Status of the research and development (prototyping) activity in relation to beforehand among All NEMOs agreed approach(es) and targets;
 - b) Planning of the research and development activity for the coming period, including estimation on identified workload.
7. In case the prototyping phase does not conclude in the given timeframe, the activation of the extended prototyping phase may take place. In such a case, all NEMOs shall inform NRAs about such activation three months prior to the deadline of the prototyping phase.
8. The timely delivery of the specific schedule exchange calculator functionalities, during properly planned phase, as described in Article 3(5), requested by all TSOs in the methodology for the calculation of Scheduled Exchanges, shall be dependent on the final approval by all NRAs of such methodology and on the confirmation of the formulas for Scheduled Flows between bidding zones and scheduling areas already implemented.

Day to day management

1. All NEMOs and all TSOs shall jointly organize the day to day management of the single day-ahead and intraday coupling, pursuant to Article 10 of the CACM Regulation. The scope of such activity and of the provisions pursuant the following Articles 8(2), 8(3) and 8(4) shall be limited to the management of the joint responsibilities of NEMOs and TSOs, without prejudice for the specific responsibilities of separately all NEMOs and of all TSOs. The modalities and scope of such joint organization and cooperation shall be elaborated jointly by the TSOs and NEMOs in accordance with Article 10 of the CACM Regulation.
2. The day to day management of both single day-ahead and intraday coupling shall include, among others and without prejudice for other agreements of TSOs and NEMOs pursuant to Article 10 of the CACM Regulation, the joint drafting with TSOs and the application in cooperation with TSOs of:
 - a) the operational procedure, referred to under Article 4(15);
 - b) the procedures for the management of operational incidents;
 - c) the procedures for monitoring of the price coupling algorithm and continuous matching algorithm usage and performance, according to principles laid out in Article 9;
 - d) the procedures for the management of Request for Changes to the price coupling algorithm and continuous matching algorithm, according to principles laid out in Article 10.
3. All NEMOs shall also cooperate with all TSOs in the definition of the principles, scope and workload for the development of the algorithm, according to principles laid out in Article 4 (20) and Article 6(15).
4. All NEMOs and all TSOs shall jointly:
 - a) define the needed joint governance arrangements to support day to day management of the of the single day-ahead and intraday coupling;
 - b) meet regularly to discuss and decide on day-to-day operational issues;
 - c) invite the Agency and the Commission as observers to these meetings;
 - d) publish summary minutes of these meetings on public internet webpage.

Article 9

Algorithm Management Principles

1. All NEMOs shall manage operational performance and compliance of the price coupling algorithm and the continuous trading matching algorithm according to the principles in this Article 9. The principles shall be incorporated into the Algorithm Monitoring Procedure as provided under Article 8(2) (c), which will be published and maintained updated according to Article 11(2) provisions.

Algorithm Monitoring

2. Performance shall be controlled and measured by all NEMOs, in coordination with all TSOs, according to the provisions of the Algorithm Monitoring Procedure.
3. Such Algorithm Monitoring Procedure shall include at least, for the price coupling algorithm:
 - a) the relevant indicators to monitor algorithm optimality which shall include at least:
 - i. indicators of the level of welfare;
 - ii. indicators to evaluate the loss of welfare due to time limitation;
 - iii. indicators of the time spent by the algorithm to reach a first solution;
 - iv. indicators on paradoxically rejected block orders and paradoxically rejected minimum income condition orders;
 - v. indicators on the fulfilment of the network constraints.
 - b) the relevant indicators to monitor algorithm repeatability which shall include at least:
 - i. indicators on repeatability of results in the same machine.
 - c) the relevant indicators to monitor algorithm scalability which shall include at least:

- i. indicators on the evolution of the topology over time, in terms of number of bidding zones and network constraints;
 - ii. indicators on the evolution of the number of submitted orders of each product type per bidding zone over time, and the corresponding total volume;
 - iii. Indicators on the evolution of number of matched orders and paradoxically rejected orders of each product type per bidding zone over time, and the corresponding total volume;
 - iv. indicators on the evolution of the use of network constraints along the time;
 - v. indicators on time spent in every phase of the algorithm calculation along the time.
 - d) the relevant thresholds (including critical thresholds) to identify performance deteriorations;
 - e) the frequency, level of detail, confidentiality and process for the different reporting of the outcome of the monitoring activity towards all NEMOs, all TSOs, all NRAs and the relevant stakeholder forums organised in accordance with Article 11 of the CACM Regulation;
 - f) the process to be followed to address performance deterioration in case needed, in coordination with all TSOs and informing all NRAs;
 - g) the introduction and detailed elaboration of rules for performance improvement;
 - h) the relevant information to be disclosed to third parties and the relative channels.
4. The Algorithm Monitoring Procedure shall include at least, for continuous trading matching algorithm:
- a) the relevant indicators to monitor algorithm optimality which shall include at least:
 - i. Indicators of the time needed to process an order;
 - ii. Indicators of the time needed to process a trade;
 - iii. Indicators of the time needed to produce post-coupling output.
 - b) the relevant indicators to monitor algorithm scalability which shall include at least:
 - i. indicators on the evolution of the topology over time, in terms of number of bidding zones and network constraints;
 - ii. indicators on the evolution of the number of submitted orders of each product type per bidding zone over time, and the corresponding total volume.
 - c) Indicators on the evolution of number of matched orders of each product type per bidding zone over time, and the corresponding total volume;
 - d) the relevant thresholds (including critical thresholds) to identify performance deteriorations;
 - e) the frequency, level of detail, confidentiality and process for the different reporting of the outcome of the monitoring activity towards all NEMOs, all TSOs, all NRAs and the relevant stakeholder forums organised in accordance with Article 11 of the CACM Regulation;
 - f) the process to be followed to restore performance and compliance in case needed, in coordination with all TSOs and informing all NRAs;
 - g) the relevant information to be disclosed to third parties and the relative channels.
5. Algorithm Performance shall be measured against criteria as specified in this Article 9. Whenever performance deterioration or non-compliance with an implemented Algorithm Requirement is detected according to the procedures under previous Article 9(1), all NEMOs shall:
- a) promptly inform all TSOs and all NRAs;
 - b) investigate and to the fullest extent possible share its findings with relevant stakeholder forums organised in accordance with Article 11 of the CACM Regulation;
 - c) evaluate any potential improvement of the algorithm, to be introduced following a Request for Change;
 - d) communicate to all TSOs and all NRAs the solution identified, supported by relevant documentation;
 - e) eventually initiate the Request for Change process described under Article 10.

Scalability management

6. The usage in production by any NEMO or TSO of any Functionality impacting the Algorithm Performance, with related adequacy of scalability and impact on the Algorithm Performance, shall be guaranteed only up to an upper bound defined by the Usage Range.
7. The Effective Usage in production by any NEMO or TSO of any Functionality impacting the Algorithm Performance shall be subject to monitoring following the Algorithm Monitoring Procedure.
8. After a Functionality is available in production, the Effective Usage and the Anticipated Usage of the Functionality shall serve as the basis for future assumptions related to the impact on Algorithm Performance of this Functionality (including the testing of other Requests for Change).
9. The Usage Range of any Functionality impacting the Algorithm Performance shall be reviewed yearly, on the basis of the estimated level of adequate scalability.
10. The level of adequate scalability is estimated each year for the following years on the basis of, among others, the information included in the Request for Change referred to:
 - a) The extension of the SDAC and SIDC;
 - b) The implementation of local multi NEMO operation;
 - c) The extension of usage of products and requirements in further bidding zones or NEMO trading hubs;
 - d) The anticipated results from the activity of research and development.
11. All NEMO shall send to all NRAs and publish a yearly report including:
 - a) The methodology and the outcome of the assessment of the estimated level of adequate scalability for the following years;
 - b) The perspective projects scoped for the research and development activity with related estimated workload.

Corrective measures

12. In case Algorithm Performance degradation below critical thresholds indicated in Article 9(3)(d) and 9(4)(d) is detected according to the Algorithm Monitoring Procedure, due to an overall Effective Usage higher than the Usage Range, all NEMOs shall decide which specific Corrective measures are to be applied, if any, as a last resort measure with the aim to allow restoring adequate scalability.
13. Where a decision in accordance with previous Article 9(12) impacts the algorithm requirements proposed by all TSOs (or by all TSOs and all NEMOs jointly), all TSOs shall have the right to approve or reject the decision from all NEMOs. For this purpose, all NEMOs shall provide all TSOs all relevant information and deemed approval of all NEMOs decisions will apply in case no different decision is communicated by TSOs before an agreed timeline.
14. Corrective measures may include, among others, application of limitations to combination of products or requirements, or of the usage, based on the Usage Range.
15. Any Corrective measure shall guarantee non-discriminatory principles among Market Participants and NEMOs.
16. In case limitations to the usage are applied, all NEMOs shall issue a public report indicating the Corrective measures applied and the reasons for applying the Remedial Action(s).
17. All NEMOs or TSOs shall in such case implement measures to prevent violation of the agreed limitations to the usage. In case any NEMO or TSO breaches the limitations to the usage and fails to take timely measures, the other NEMOs are entitled to report it to all NRAs.
18. At the end of industrialization phase, all NEMOs are entitled to apply Corrective measures only on a temporary basis, and anyway not beyond 6 months, to solve unanticipated impacts on Algorithm Performance. In the prototyping phase, all NEMOs are entitled to apply Corrective measures to manage the consequences of limited scalability.

Article 10

Change Management Principles

1. All NEMOs shall manage changes to the price coupling algorithm or continuous trading matching algorithm Functionalities and usage according to the principles in this Article 10. The principles shall be incorporated into the Change Control Procedure as provided under Article 8(2)(d), which will be published and maintained updated according to Article 11(2) provisions.

Moderation and control

2. Any Request for Change shall induce only a proportionate, controlled impact on the Algorithm Performance and no significant harm to any other Functionality already included in the price coupling algorithm or continuous trading matching algorithm.
3. Any Request for Change shall be compatible with the Initial Requirements and Future Requirements following their implementation.
4. Any impact on the performance of related MCO function systems and processes shall also be taken into account.

Fair and Non-Discriminatory Treatment of Requests for Change

5. All NEMOs and TSOs are entitled to use any Functionality subject to approval of a Request for Change.
6. NEMOs shall handle any Request for Change in an objective and non-discriminatory manner, according to the criteria set out in the Change Control Procedure.
7. Requests for Change that aim to improve Algorithm Performance are deemed to be of benefit to all NEMOs, and shall be decided upon by all NEMOs. Similarly, all NEMOs are entitled to decide that any Request for Change is considered a common proposal of all NEMOs.
8. Any NEMO respectively TSO is entitled to join another NEMOs' respectively TSOs' Request for Change provided that (i) the additional NEMO(s) respectively TSO(s) is entitled to request modifications to the Request for Change and which the original requesting NEMO(s) respectively TSO(s) shall consider in good faith and not unreasonably reject, and that (ii) the original requesting NEMO(s) respectively TSO(s) and any additional NEMO respectively TSO shall, as long as Article 10(7) is not deemed by all NEMOs to apply, bear the associated costs (where any cost sharing shall be in accordance with the CACM Regulation).
9. All NEMOs respectively TSOs are entitled to request for the implementation of a new Functionality subject to approval of a Request for Change. Such new Functionality is available to be used by all NEMOs respectively TSOs that initially contributed to its development plus any other NEMO respectively TSO that is willing to contribute to the development cost of this new Functionality in compliance with the CACM Regulation sharing rules.

Request for Change process

10. The NEMO(s) respectively TSO(s) proposing a change shall issue a Request for Change to all NEMOs according to a template and process described in the Change Control Procedure referred to under Article 10(1).
11. The NEMO(s) respectively TSO(s) proposing a Request for Change is responsible for fully specifying their requirement, including the requested Anticipated Usage and any subsequent effect on processes or other systems.
12. The impact of a Request for Change on Algorithm Performance, existing Functionalities, adjacent systems and processes shall be assessed based on Anticipated Usage of the new Functionality together with Anticipated Usage of existing Functionalities, in order to ensure technical feasibility and consistency with performance criteria approved in the Algorithm Monitoring Procedure.

13. Depending on the Impact assessment reported in the Request for Change submission, Requests for Change are classified as
 - a) Non-Notifiable change (type I): where no impact on market parties nor potential adverse impact on the Algorithm Performance in such a case stakeholders are not informed of change;
 - b) Notifiable change (type II): where the change has no potential adverse impact on the Algorithm Performance but impact on market parties. In such a case stakeholders are informed of change ahead of implementation;
 - c) Consulted change (type III): where there is potential adverse impact on the Algorithm Performance. In such a case NEMOs shall consult stakeholders, according to the format agreed upon in the relevant Stakeholders Committee and will take response into consideration;
 - d) Methodology amendment (type IV): where change is required to the Algorithm Proposal or its annexes. In such a case the NEMOs shall follow formal CACM Regulation amendment process, including consultation process as described in Article 12 of the CACM Regulation.
14. Requests for Change can be submitted on a continuous basis, provided that evaluation is carried out periodically in different assessment timeframes on the basis of issuing date and/or anticipated go live date of the Request for Change, according to criteria described in following articles, with such periodicity being defined in the Change Control Procedure.
15. The assessment of Request for Change related to the same implementation timeframe shall first be considered in combination. Where such combination breaches the acceptance criteria, a second assessment based on individual impact shall be done.
16. In case multiple Requests for Change are supported individually but not together, the following prioritization shall apply:
 - a) Extending the SDAC or SIDC to the scope anticipated under the CACM Regulation;
 - b) Supporting multiple NEMO operation per bidding zone;
 - c) Supporting extension of the set of products or requirements used in one or more bidding zones, in order to allow for fair and non-discriminatory treatment of different parties.
17. In case the Requests for Change involves simultaneously more than one of the principles under Article 10(16), the Requests for Change shall be evaluated case by case depending on the specific nature of the request and a public report shall be issued, indicating the decision, the reason for the decision, the principles behind the decision and the specific assessments incurred, according to Article 11(3).
18. In case the Requests for Change implies a change in the methodologies as envisioned in Article 10(13)(d), after the technical assessment by all NEMOs, and before taking any decision, the Requests for Change shall be submitted by all NEMOs to all NRAs for approval as provided by the CACM Regulation.
19. At the end of the industrialization phase, all Requests for Change respecting previous criteria, shall be implemented within a reasonable timeframe, following if needed the prioritization principles recalled under previous Articles 10(16) and 10(17). In the prototyping phase, the same principles could be applied to identify which Requests for Change shall not be supported.

Decision-making

20. Requests for Change must be approved by all NEMOs based on an objective evaluation report.
21. Approved and rejected Requests for Change are made publicly available, with the relevant motivation, in order to ensure the objective and non-discriminatory treatment of Requests for Change, unless such Request for Change includes commercial sensitive information.
22. All impacted parties are entitled to receive all relevant information regarding the status of a Request for Change.
23. Where a decision in accordance with this Algorithm Proposal impacts the algorithm requirements proposed by all TSOs (or by all TSOs and all NEMOs jointly), all TSOs shall have the right to approve or reject the decision from all NEMOs, such right being subject to complying with the provisions of this methodology and

in particular with the prioritization rules set out in Article 10(16). For this purpose, all NEMOs shall provide all TSOs all relevant information and deemed approval of all NEMOs decisions will apply in case no different decision is communicated by TSOs before an agreed timeline.

24. Any decisions required by all NEMOs in accordance with this Algorithm Proposal shall be motivated by reference to the objectives set out in Articles 3 and 37 of the CACM Regulation.
25. Before rejecting the Request for Change, all NEMOs are entitled to decide to refer a decision in accordance with this Algorithm Proposal to an independent arbitral tribunal for a binding decision.
26. Any NEMO or TSO is entitled to challenge a Request for Change approved or rejected in accordance with this Algorithm Proposal by requesting a referral to an independent arbitral tribunal for a binding decision.
27. Referrals under Articles 10(25) and 10(26) shall:
 - a) follow procedures jointly established by all NEMOs, in coordination with all TSOs;
 - b) be submitted to an independent arbitral tribunal whose members shall be jointly appointed by all NEMOs and all TSOs.

Article 11

Stakeholders involvement

1. In order to promote market transparency and proper level of stakeholder involvement, and to ensure that the price coupling algorithm and the continuous trading matching algorithm is managed and developed in an objective and non-discriminatory manner, the following provisions apply.
2. All NEMOs shall maintain a public description, to be formally updated on a periodic basis and consulted with the relevant stakeholder forums organised in accordance with Article 11 of the CACM Regulation, of the following documents:
 - a) the public description of the price coupling algorithm and the continuous trading matching algorithm as referred to under Articles 4 and 6;
 - b) the Algorithm Monitoring Procedure as referred to under Article 9;
 - c) the Change Control Procedure, referred to under Article 10;
 - d) the appointment of the independent arbitral tribunal, referred to under Articles 10(27).
3. All NEMOs shall maintain an updated public record of:
 - a) approved and rejected Requests for Change referred to under Article 10(21), with the relevant motivation;
 - b) applied Corrective measures, referred to under Article 9(16);
 - c) the performance results of the algorithm, measured accordingly to the criteria referred to in the Algorithm Monitoring Procedure;
 - d) any incident visible to market parties, and the application of back up and fall-back procedures.
4. All NEMOs shall also involve stakeholders in the price coupling algorithm implementation timeline activities as further detailed in Article 5 and in the continuous trading matching algorithm implementation timeline activities as further detailed in Article 7.

Article 12

Language

1. The reference language for this proposal shall be English. For the avoidance of doubt, where NEMOs need to translate this proposal into their national language(s), in the event of inconsistencies between the English version published by the NEMOs in accordance with Article 9(14) of the CACM Regulation and any version in another language, the relevant NEMOs shall be obliged to dispel any inconsistencies by providing a revised translation of this proposal to their relevant national regulatory authorities.

ANNEX 1 – Price coupling algorithm requirements
ANNEX 2 – continuous trading matching algorithm requirements

Proposal for a common set of requirements for the DA price coupling algorithm

13 November 2017

1. Background

- (1) 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 for the price coupling algorithm (hereinafter referred to as “DA 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”).
- (2) 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;”*
- (3) 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.*
- (4) 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 shall 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.
- (5) 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.*
- (6) According to 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.
- (7) 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 Regulation - i.e., 14 February 2017.
- (8) This Proposal is complemented by the back up and fallback procedures that are referred in the proposal for the back-up methodology. The clearing prices will be calculated taking into account the harmonized maximum and minimum clearing prices Proposal for Single Day Ahead Coupling.
- (9) The timeline for the implementation of the Initial and Future DA requirements and Other DA Functionalities mentioned in this document is settled in the Algorithm Proposal, Article 5.

2. 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 definition applies:

1. **Algorithm:** means the price coupling algorithm.

3. Approach

The table below sets out the DA Algorithm Requirements. Each requirement has been classified according to the following criteria:

1. **State:**
 - a. Initial Requirement: a requirement that must be complied with at the point the Single Day-Ahead Coupling (SDAC) first commences operation. Such requirements are normally already incorporated into the already agreed solution for price coupling algorithm.
 - b. Future Requirement: a requirement that must be complied with at a point after the SDAC first commences operation, as further specified in the timeline for implementation of the price coupling algorithm. Such requirements shall need to be properly specified and implemented via a Request for Change (which shall include technical feasibility and performance impact assessment).
2. **Owner:** owner of the requirement (TSOs, NEMOs, or joint TSOs and NEMOs) with meaning as defined in the MCO Plan.
3. **Nature:**
 - a. 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.
 - b. 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 price coupling algorithm. In many cases these requirements are not yet specified ("Future") and it may be that the calculations will be performed outside the price coupling 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.

At the end of the document, some other possible future functionalities for the price coupling algorithm are mentioned. Those functionalities are not part of the price coupling algorithm requirements.

4. Price coupling algorithm requirements

Title 1: Requirements on functionalities and performance

1. General requirements.
 - a. For each bidding zone the 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 DA Products Proposal, in-accordance with Article 40(2) of the CACM regulation;
 - iii. facilitate configurations with more than one NEMO for a given bidding zone, meaning several day-ahead trading hubs within a bidding zone;
 - 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 Algorithm shall maximize economic surplus (as defined in Article 2(46) of the CACM Regulation) for single day-ahead coupling for the next trading day, consistent with time limitations, conditions and requirements established by NEMOs and TSOs.
 - c. The Algorithm shall be able to deal with multiple bidding zones by country and shall be scalable to cover all Europe.
 - d. The Algorithm shall apply deterministic rules in case of solutions with equivalent social welfare in order to define prices and net positions for each bidding zone.
 - e. The Algorithm shall be reliable, thus able to find a solution within the allowed time limit, including the potential to extend the processing time in case allowed calculation time is exceeded.
 - f. The Algorithm shall be able for each MTU to provide the net position per NEMO trading hub and the input for the calculation of the Scheduled Flows between bidding zones.
 - g. The Algorithm shall be able to calculate the Scheduled Flows per bidding zone.
 - h. For each bidding zone the result from application of the Algorithm shall be one price and one net position for each MTU. For the bidding zones containing several NEMOs, the net position for each MTU shall be calculated for each NEMO trading hub.

State		Owner		Nature	
Initial Requirement	Future Requirement	TSOs	NEMOs	MCO Function	SEC Function
	X	X	X	X	
X			X	X	
X		X	X	X	
X		X			X
X		X		X	
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X			X
X		X	X	X	

- i. For each bidding zone the result from application of the 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.

2. Qualitative requirements with precision and price ranges.

- a. The Algorithm shall apply to all orders of market participants providing non-discriminatory access to cross zonal capacity in accordance with Article 3 of the CACM Regulation.
- b. In case of tie rules (between two or more orders) and for branching decisions (if any), deterministic rules shall be implemented. Such choices shall be logged.
- c. The Algorithm shall allow for partial decoupling, including per bidding zone that belong to a predefined set of bidding zones.
- d. The Algorithm shall be able to deal automatically and easily with leap years, i.e. 366 days in a year.
- e. The Algorithm shall be able to deal automatically and easily with day-light savings related to winter and summer time changes, i.e. algorithm shall support 23, 24 or 25 hours for a trading day.
- f. The calculation process of the Algorithm, including prices and Scheduled Flows 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.
- g. The Algorithm source code shall be well structured and well documented.
- h. The Algorithm shall be able to deal with negative prices for each bidding zone.
- i. The Algorithm shall be able to round calculated prices and volumes according to bidding zone specific ticks and rounding rules.

3. Performance.

State		Owner		Nature	
Initial Requirement	Future Requirement	TSOs	NEMOS	MCO Function	SFC Function
X		X			X
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X	X	X	

- a. The 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 Algorithm shall always produce a unique result, i.e. price and volume indeterminacy shall be resolved.
- c. The Algorithm shall use proven IT technology, e.g. proven third party software.
- d. The Algorithm shall be available at all times when required and shall perform according to requirements.
- e. The Algorithm shall scale well when the number of bidding zones increases: The 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.
- f. Price taking orders are buy (respectively sell) limit orders submitted at the maximum (respectively minimum) prices. The failure to accept these price taking orders corresponds to a curtailment situation:
 - i. In case of over-supply, not all price taking supply orders can be accepted;
 - ii. In case of under-supply, not all price taking demand orders can be accepted.

Curtailment can be partially mitigated by exporting excess energy or importing deficit energy. In case more than one bidding zones faces a curtailment situation, when we increase the curtailment of one, the curtailment of the other will decrease. Per bidding area, it should be possible to either:

 - i. Prevent sharing of curtailment: the local curtailments remain local: no support is received from adjacent zones, nor support is provided to adjacent zone;
 - ii. Share curtailment: the difference in relative (percentage) curtailment between the different bidding zones is minimized.

The latter option of sharing curtailment also applies in a Flow-based setting, where sharing curtailments may be at the cost of the economic surplus.

The Algorithm shall provide a mechanism that allows for a sharing of curtailment between bidding zones in a Flow-based capacity allocation.

State		Owner		Nature	
Initial Requirement	Future Requirement	TSOs	NEMOs	MCO Function	SFC Function
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X	X	X	

Title 2: Requirements related to Cross-zonal capacities

1. The 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 Flows to the respective cross-zonal capacity value for each bidding zone border for each direction, 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;
- 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 bound 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 Flow-based approach:
 - i. power transfer distribution factor (PTDF) as the contribution of 1 MW of a net position change to the Scheduled Flow over the network element; and
 - ii. remaining available margin (RAM) or the remaining allowable Scheduled Flow on the network element;
- h. ensure that PTDF multiplied by net position is less or equal to than RAM for each network element and net positions concerned by the Flow-based parameters for Flow-based approach;

State		Owner		Nature	
Initial Requirement	Future Requirement	TSOs	NEMOS	MCO Function	SEC Function
X		X		X	
X		X		X	
X		X		X	
X		X		X	
	X	X		X	
X		X		X	
X		X		X	
X		X		X	
X		X		X	

- i. receive the Flow-based parameters as:
 - i. “zero balanced” meaning that the remaining available margin of critical branches applies from zero exchanges and that pre-existing exchanges are transmitted aside; or
 - ii. “not zero balanced” meaning that the remaining available margin of critical branches 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. facilitate the Standard hybrid coupling, where cross-zonal capacity values and Flow-based parameters coexist implying that TSOs shall reserve margins ex-ante.
2. Multiple Flow-based approaches, i.e. plain, bilaterally intuitive, may be used for different capacity calculation regions.

Title 3: Requirements related to allocation constraints

- 1. The Algorithm shall be able to:
 - a. for direct current (“DC”) interconnectors constrain increase/decrease of Scheduled Flows over one interconnector and/or a combination of 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;
 - b. for direct current (“DC”) interconnectors constrain increase/decrease of Scheduled Flows over one interconnector and/or a combination of 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 taking into account the 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 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
 - d. incorporate losses functionality on interconnector(s) between bidding zones during capacity allocation, and activate this functionality during allocation, if requested by relevant owner of the interconnector after approval by relevant NRAs.

State		Owner		Nature	
Initial Requirement	Future Requirement	TSOs	NEMOS	MCO Function	SEC Function
	X	X		X	
X		X		X	
X		X		X	
X		X		X	
X		X		X	
X		X		X	
	X	X		X	
X		X		X	
X		X		X	

2. The Algorithm shall allow to set a minimum price difference between adjacent bidding zones when DC interconnector is used for power exchange. For this requirement, the 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 Flow shall be set to zero. If there is a Scheduled Flow, the price difference shall equal the “flow tariff”, unless there is congestion. Once the price difference exceeds the “flow tariff” the congestion income becomes positive. This functionality shall be incorporated in the Algorithm and activated during allocation if requested by the owner(s) of the interconnector after approval by relevant NRAs.
3. The Algorithm shall allow for adverse Scheduled Flows, i.e. Scheduled Flows from higher price bidding zone to lower price bidding zone, to materialize if this leads to an increase in overall economic surplus. The Algorithm shall enforce intuitive Scheduled Flow in Flow-based areas, i.e. Scheduled Flow from lower price bidding zone to higher price bidding zone, where requested by the relevant party for a bidding zone border.

Title 4: Requirements related to balance constraints

1. For overall balance of all bidding zones, the Algorithm shall ensure that the sum of unrounded net positions and transmission losses, where applicable, of all bidding zones shall be zero.
2. For overall balance of a bidding zone, the 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 day ahead capacity allocation.

Title 5: Requirements on algorithm output and deadlines for the delivery of single day-ahead coupling results

1. Regarding the prices for each MTU the output of the Algorithm shall be:
 - a. rounded and unrounded price in Euros for each bidding zone;
 - b. shadow prices of critical branches as needed for Flow-Based (FB) capacity allocation; and

State		Owner		Nature	
Initial Requirement	Future Requirement	TSOs	NEMOs	MCO Function	SEC Function
X		X		X	
X		X		X	
X		X		X	
X		X		X	
X		X	X	X	
X		X		X	

- c. regional reference prices, in a network in which the cross-zonal capacity constraints are relaxed - e.g., Nordic region.
2. Regarding the quantities for each relevant MTU the output of the Algorithm shall be:
- 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 there are multiple NEMOs within a bidding zone, the rounded and unrounded net position for each NEMO trading hub in a bidding zone;
 - number and volume of matched block orders for each bidding zone and paradoxically rejected orders, if any;
 - Scheduled Flows into and out of individual Relevant DC Network Elements (difference in Scheduled Flows in/out reflecting losses where applicable);
 - Scheduled Flows on Relevant Bidding Zone borders (Scheduled Flows in/out reflecting losses where applicable);
 - Scheduled Flows on Relevant Scheduling Area borders (Scheduled Flows in/out reflecting losses where applicable);
 - remaining available margin (RAM) or the remaining allowable Scheduled Flow on the network element under FB capacity allocation.
3. Where required, regarding the quantities for each relevant MTU, with the output of the Algorithm, a process which shall not interfere with the market coupling results calculation, shall provide Scheduled Flows, resulting from day ahead market coupling, in the form of:
- Bilateral and Multilateral Scheduled Flows between Scheduling Areas;
 - Bilateral and Multilateral Scheduled Flows between Bidding Zones;
 - Bilateral and Multilateral Scheduled Flows between NEMO trading hubs;

State		Owner		Nature	
Initial Requirement	Future Requirement	TSOs	NEMOs	MCO Function	SEC Function
X		X	X	X	
X		X	X	X	
X		X	X	X	
X			X	X	
X		X			X
X		X			X
X		X			X
	X	X		X	
X		X			X
X		X			X
X		X			X

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. Regarding the calculation results the output of the Algorithm shall be:
 - a. overall economic surplus and economic surplus for each bidding zone; and
 - b. output necessary for monitoring in accordance with Article 82(2) and (4) of the CACM Regulation.
5. The Algorithm shall provide NEMOS and TSOs with information necessary to comply with monitoring of REMIT regulation where the Algorithm is the only feasible source.
6. The Algorithm shall be able to implement a change of bidding zone configurations following the Change Control Procedure referenced on Article 10 of the Algorithm Proposal.
7. The Algorithm shall be capable of finding results normally within the time limit that is established in the operational procedure referenced in the Algorithm Proposal article 4(15).
8. The Algorithm shall be able to deliver the volume of matched orders and not-matched orders of each NEMO for the bidding zones of the control area if requested by TSOs locally and approved by relevant NRAs.

Title 6: Currency

1. The Algorithm shall for Single Day Ahead Coupling 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.

State		Owner		Nature	
Initial Requirement	Future Requirement	TSOs	NEMOS	MCO Function	SFC Function
X		X	X	X	
X		X	X	X	
X		X	X	X	
X		X		X	
X		X	X	X	
X		X		X	
X		X	X	X	

5. Other functionalities

These functionalities are not part of the requirements for the price coupling algorithm. They shall need to be properly specified and implemented via Request for Change (which shall include technical feasibility and performance impact assessment) following the Change Control Procedure referenced in Article 10 of the Algorithm Proposal. They will be included in the enduring solution only in case the adequate optimality, repeatability and scalability of the price coupling algorithm is preserved:

	Owner		Nature	
	TSOs	NEMOS	MCO Function	SEC Function
1. For each bidding zone the Algorithm shall be able to cross-match between orders with different MTUs.	X	X	X	
2. For each bidding zone the Algorithm shall be able to facilitate different MTUs which shall be configurable in each bidding zone;	X	X	X	
3. For the DC interconnectors the Scheduled Flow shall not be below the minimum stable flow (“MSF”), other than at zero. The MSF shall be given for each DC interconnector and activated during allocation, if requested by the owner(s) of the interconnectors after approval by relevant NRAs. The 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	
4. The Algorithm shall be able for each MTU to facilitate the Advanced hybrid coupling, where realized cross-zonal capacity transactions are taken into account in the margin of the Flow-based critical branches (using virtual bidding areas).	X		X	

The timeline for these functionalities is included in the Article 5 of the Algorithm Proposal.

Proposal for a common set of requirements used for the continuous trading matching algorithm

13 November 2017

1. Background

1. 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”).
2. 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;”
3. 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.
4. 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.
5. 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.
6. 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.
7. 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 Regulation - i.e., 14 February 2017.

8. This Proposal is complemented by the back up and fallback procedures that are referred in the proposal for the back-up methodology.
9. The timeline for the implementation of the Initial and Future ID requirements mentioned in this document is settled in the Algorithm Proposal, Article 7.
10. 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.
11. 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).
12. Decisions of the NEMO Committee in this proposal refers to decisions of All NEMOs coordinated via the NEMO Committee.

2. 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:

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

3. 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:

1. **State:**
 - a. **Initial Requirement:** a requirement that must be complied with at the point the single intraday coupling (SIDC) already agreed interim solution commences into operation. Such requirements are normally already incorporated into the already agreed SIDC interim solution.
 - b. **Future Requirement:** a requirement that must be complied with at a point after the SIDC commences into operation. Such requirements shall be part of SIDC enduring solution, that need to be properly specified and implemented via a Request for Change. Some Future Requirements may already be under development within the already agreed SIDC interim solution.
2. **Owner:** owner of the requirement (TSOs, NEMOs, or joint TSOs and NEMOs) with meaning as defined in the MCO Plan.
3. **Nature:**
 - a. **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.
 - b. **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.

4. Continuous trading matching Algorithm requirements

Title 1: Requirements on functionalities and performance

1. General requirements

- a. The algorithm shall support the continuous matching of orders as well as the continuous allocation of intraday interconnection capacity.
- b. The algorithm shall ensure equal treatment of orders coming from all NEMOs and from explicit capacity requests.
- c. For each bidding zone the algorithm shall be able to:
 - i. support at least the order types included in the Intraday Product Proposal;
 - ii. support non-standard products 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, meaning matching of orders between multiple NEMOs in one bidding zone and between multiple bidding zones;
 - 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 Gate Opening Time (GOT) and Gate Closure Time (GCT) shall be configurable for each bidding zone border
- e. The algorithm shall aim to ensure that economic surplus is maximised, where applicable.
- f. The algorithm shall be able to deal with one or multiple bidding zones within a country and shall be scalable to cover all Europe.
- g. The algorithm shall be able to provide the net positions and Scheduled Flows for each bidding zone.
- h. For each bidding zone the result from application of the 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 algorithm must ensure/support 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 algorithm and the data it processes shall be properly secured from unauthorized access.

State		Owner		Nature	
Initial requirement	Future requirement	TSO	NEMO	MCO Function	SEC Function
X		X	X	X	
X			X	X	
X		X	X	X	
	X	X	X	X	
X		X	X	X	
X		X			X
X		X	X	X	
X		X	X	X	
X		X			X
X		X			X
X		X	X	X	
X		X	X	X	

- k. The algorithm needs to provide the all necessary information for the Cross-NEMOs settlement and shipping.
- l. Problem in one area, one border or for one NEMO shall not, as far as possible, prevent trading in the other areas, borders or for other NEMOs.
- m. The algorithm must support but not to be limited to:
 - i. Receive the available capacity information in real time
 - ii. Request capacity when pairs of matchable orders are identified
- n. Algorithm must support Transaction cancellation functionalities: the system must be able also 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 algorithm shall request capacity in the opposite direction.
 - ii. The system must support deadline for transaction cancellation to be initiated.
- o. The algorithm shall match orders according to price, time priority and, for cross-border trades, allocation constraints and available capacity. The configuration of the matching rules must support but not to 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 algorithm checks if it can be executed.
 - iii. A buy (sell) order can be matched if
 - On the opposite side, there is a sell (buy) order with an inferior (superior) or equal price.
 - If there are several orders on the sell (buy) side fulfilling a), the order with best price is executed first and if the aggressor order is not fully executed, then the second best price order is executed etc.
 - If there are several orders on the sell (buy) side fulfilling a) and with the same price, the order with the oldest timestamp is executed first and if the aggressor order is not fully executed, then the second oldest is executed etc.
 - The matching price of a transaction take into account the harmonised max and min prices of bidding zones

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

State		Owner		Nature	
Initial requirement	Future requirement	TSO	NEMO	MCO Function	SEC Function
X			X	X	
X		X	X	X	
X		X	X	X	
X			X	X	
X			X	X	

- p. The orders are all centralised in a consolidated order book that is used to generate the local views, considering the relevant allocation constraints and available capacity between the areas.
- q. All incoming orders and explicit capacity requests are queued in the same queue. The algorithm shall guarantee a first come first serve principle. Only one matching and/or capacity allocation event can occur at the same time.
- r. The algorithm supports increase and decrease of capacity. When the capacity available increased due to netting, capacity publication or update, it may lead to a crossed order book. The algorithm must include a mechanism to solve this situation (pair matching or auction).
- s. The algorithm must calculate local view of order books based on available orders and capacities. The configuration of the local views must support but not to be limited to the following rules:
- The local view of area 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 areas (unless Flow Base 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 price limits set per bidding zone
- t. The 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 algorithm must allow to as part of SIDC cross-match the different order types in the Product Description within one and between multiple Bidding Zones, respecting the capacity and order restrictions.¹

State		Owner		Nature	
Initial requirement	Future requirement	TSO	NEMO	MCO Function	SEC Function
X			X	X	
X		X	X	X	
X		X	X	X	
X			X	X	
X			X	X	
	X		X	X	

¹ In case of introduction of cross product matching, repeatability as defined in point 11 of Art.5 of current document could not be valid anymore. In case of intraday auction, in fact, an implicit auction mechanism, similarly to what happens in the day ahead timeframe, should be applied. Furthermore, in such cases, heuristic strategies, not normally used in continuous trading, should be probably developed to find a valid solution in a reasonable time

2. Qualitative requirements with precision and price ranges

- a. The algorithm shall provide all market participants non-discriminatory access to cross-zonal capacity in accordance with Article 3 of CACM.
- b. The algorithm shall aim to ensure that in case there are matching opportunities the matching shall always take place taking into account the intraday cross-border GCT.
- c. The algorithm shall be able to reproduce the same results with the same input data coming in exactly identical sequence and timing.²
- d. The algorithm shall be able to deal automatically and easily with day-light savings related to winter and summer time changes, i.e. algorithm supports 23, 24 or 25 hours for a trading day.
- e. The algorithm shall be able to deal automatically and easily with leap years, i.e. 366 days in in a year.
- f. The matching process of the 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 algorithm heuristics, if any, and occurrence rate of these rules and heuristics.¹
- g. The algorithm shall be well structured and well documented. A description of the algorithm should be made publicly available, and should be kept up to date. The documentation shall be written in English.
- h. The algorithm shall be able to deal with negative prices as well as with different price boundaries.
- i. The 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

3. Other functionalities related to cross-zonal capacity allocation

- a. The algorithm shall be able to match both implicit (NEMOs) and explicit capacity allocation requests.
- b. The algorithm shall be able to calculate for each MTU the Scheduled Flows between bidding zones.
- c. The algorithm shall be able to calculate for each MTU the Scheduled Flows for each scheduling area
- d. Once allocated by the 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.

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

² Algorithm has been built repeatable, so that it works continuously in a deterministic way, providing the same results for the same input conditions. Although the Algorithm is ready for repeatability, in order to deliver and prove such requirement in a certain period of negotiation, some infrastructure would be required for setting the conditions of the system in that point in time. That facility need to be evaluated within research and development' three year's phase, following the timeline proposed in Article 7 Algorithm requirement.

- f. All incoming orders and explicit capacity requests are treated in a non-discriminatory fashion (e.g. single queue). The system must implement first come first serve principle. Only one matching event can be executed at the same time.
- g. Algorithm shall allow for non-zero pricing of intraday capacity in accordance with Article 55 of CACM Regulation, where the pricing intraday cross-zonal capacity shall reflect market congestion and shall be based on actual orders and 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 CZIDCP methodology will be in force, combining one or more pan-European auctions with continuous trading, algorithm shall include the necessary mechanisms for:
 - a. allowing the operational integration with the auctions, in terms of gate opening and closing time.
 - b. allowing the incorporation of the auctions' results to the continuous trading, in terms of cross-zonal capacity.

4. Performance

- a. Algorithm shall produce and log performance indicators with minimum level of those indicators in order to monitor its performance, which include among others report on number of and the frequency of unmatched feasible trades and their volumes, statistics related to the usage of different products with regards to their impact on algorithm performance, in relation to particular products, to be calculated per market time unit³
- b. All TSOs and NEMOs shall develop performance indicators in order to monitor the performance of the algorithm.

Title 2: Requirements related to Cross-zonal capacities

1. The algorithm shall be able for each MTU to:
 - a. allow TSOs to set constant cross-zonal capacity and ramping values for each bidding zone border in accordance with CACM Regulation in case coordinated net transmission capacity is applied; this cross-zonal capacity value may also be a very high value;
 - b. constrain Scheduled Flows 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 (CNTC) approach is applied;

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

³ These measurements should include for every bidding zone the number and volume of bids per product, the number and volume of accepted bids per product, paradoxically rejected bids per product and the time needed for the algorithm to find the final solution.

- 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 NTC), 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 the contribution of 1 MW of a net position change to the Scheduled Flows over the network element; and
 - ii. remaining available margin (RAM) or the remaining allowable Scheduled Flow on the network element.
- g. ensure that PTDF multiplied by net position is less than or equal to RAM for each network element and net positions concerned by the flow-based parameters for flow-based approach;
- h. allow the reception of the flow-based parameters as:
 - i. "zero balanced" meaning that the remaining available margin of critical branches applies from zero exchanges and that pre-existing exchanges are transmitted aside; or
 - ii. "not zero balanced" meaning that the remaining available margin of critical branches 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. facilitate the following hybrid couplings:
 - i. standard hybrid coupling, where cross-zonal capacity values and flow-based parameters coexist implying that TSOs shall reserve margins ex-ante on flow-based critical branches; and
 - ii. advanced hybrid coupling, where realized cross-zonal capacity transactions are taken into account in the margin of the flow-based critical branches.
- 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 algorithm shall match the relevant orders with the aim of maximizing economic surplus.
- l. allow for configuring the moment when the update is applied or become effective once the cross-zonal capacity is updated;
- m. enable to halt/unhalt one bidding zone, one border, one instrument, 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	X		X	
	X	X		X	
	X	X		X	
	X	X		X	
	X	X		X	
	X	X		X	
	X	X		X	
	X	X		X	
	X	X		X	
X		X		X	
X		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
 - 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. Multiple flow-based approaches, i.e. plain, intuitive, bilaterally intuitive, may be used for different capacity calculation regions.

Title 3: Requirements related to allocation constraints

- a. The algorithm shall allow to:
 - i. for direct current (DC) interconnectors constrain increase/decrease of Scheduled Flows over one interconnector and/or a combination of 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 Flows, where applicable. The constraint shall be handled on a single DC interconnector and multiple DC interconnectors in combination (i.e. ramping)
 - ii. constrain 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
 - iii. incorporate losses on interconnector(s) between bidding zones during capacity allocation, if requested by the owner(s) of the interconnector after approval by relevant NRAs
- b. For the DC interconnectors the Scheduled Flows 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.
- c. The algorithm shall allow to set a minimum price difference between adjacent bidding zones when DC interconnector is used for power exchange. For this requirement, the algorithm shall model the costs incurred for each MWh passing through a DC interconnector as a “flow tariffs”. 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 Flows will be set to zero. If there is a Scheduled Flows the price difference will equal the “flow tariff”, unless

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

there is a congestion. Once the price difference exceeds the “flow tariff” the congestion income becomes positive. This functionality shall be incorporated in the algorithm if requested by the owner(s) of the interconnector after approval by relevant NRAs.

- d. The algorithm shall allow for adverse Scheduled Flows, i.e. Scheduled Flows from higher price bidding zone to lower price bidding zone
- e. The 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.

Title 4: Requirements on algorithm output for the delivery of single intraday coupling results

- a. Regarding the quantities for each MTU the output of the algorithm shall be:
 - i. 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;
 - ii. number and volume of matched block orders for each bidding zone and paradoxically rejected orders, if any;
- b. Where required regarding the quantities for each relevant MTU, with the output of the algorithm, an ex-post process which shall not interfere with the market coupling results calculation, shall provide Scheduled Flows, resulting from intraday market coupling, in the form of:
 - i. Scheduled Flows between Scheduling Areas
 - ii. Scheduled Flows between Bidding Zones
 - iii. Scheduled Flows 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

- c. Regarding the calculation results the output of the algorithm, that output shall be necessary for monitoring in accordance with Article 82(2) and (4) of CACM Regulation
- d. The algorithm shall provide NEMOS and TSOs with information necessary to comply with monitoring of REMIT regulation where the algorithm is the only feasible source.
- e. The algorithm shall respect the agreed cross-zonal GOT and GCT in accordance with the all TSOs proposal in accordance with Article 59 of the

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

CACM Regulation.

- f. The 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.
- g. The 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 particular MTU.

Title 5: Currency

- a. The 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	X	
X		X	X	X	
X			X	X	