Methodology for the price coupling algorithm, the continuous trading matching algorithm and the intraday auction algorithm

also incorporating 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

30 January 2020

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Whereas

(1)   This document ('Algorithm methodology') establishes the methodology for the price coupling algorithm, the continuous trading matching algorithm and intraday auction algorithm in accordance with Article 37(5) of Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management ('CACM Regulation'). It incorporates, as annexes, a common set of requirements for the day-ahead price coupling algorithm ('DA algorithm requirements') and for the intraday continuous trading matching algorithm and the intraday auction algorithm ('ID algorithm requirements') in accordance with Articles 37 and 55 of the CACM Regulation, and principles and indicators for their respective monitoring.

(2)   This Algorithm methodology incorporates the intraday auctions (IDAs) to comply with the requirement for pricing cross-zonal capacity in single intraday coupling (SIDC) set forth in Article 55 of the CACM Regulation and to comply with the provisions of the Methodology for pricing intraday cross-zonal capacity. Consequently, the ID algorithm requirements include the requirements for the continuous trading matching algorithm and the IDA algorithm. For the avoidance of doubt, while the single day-ahead coupling (SDAC) means the day-ahead session of market coupling, the SIDC means both the continuous trading session and the IDA session as set out in the aforementioned Methodology for pricing intraday cross-zonal capacity.

(3)   In order to be able to support the same set of products and functionalities while assuring at the same time an efficient use of resources in terms of implementation costs and time to delivery of new functionalities, as well as benefit from the SDAC algorithm's development evolution, the same algorithm used for SDAC should be used also for IDAs.

(4)   In this Algorithm methodology, any reference to the IDA algorithm directs to the same algorithm solution used in SDAC. The proposed timeline for the implementation of the IDAs is based on this assumption.

(5)   This Algorithm methodology takes into account the general objectives of capacity allocation and congestion management described in Article 3 of the CACM Regulation as set out below in paragraphs (6) to (15).

(6)   This Algorithm methodology promotes effective competition in the generation, trading and supply of electricity (Article 3(a) of the CACM Regulation) as it establishes a level playing field for competition among all market participants through an objective function, which aims to maximise the economic surplus and sets transparent conditions to participate in the SDAC and SIDC.

(7)   This Algorithm methodology ensures that the cross-zonal capacity is allocated in a way that aims to maximise the economic surplus and thus contributes to ensuring optimal use of the transmission infrastructure (Article 3(b) of the CACM Regulation).

(8)   This Algorithm methodology ensures that cross-zonal trading within the SDAC and SIDC respects the cross-zonal capacities and allocation constraints provided by coordinated capacity calculators and thereby ensures that operational security is not endangered by the operation of SDAC and SIDC (Article 3(c) of the CACM Regulation).

(9)   This Algorithm methodology facilitates both the coordinated net transmission capacity approach as well as flow-based approach and thereby supports the optimisation of the calculation of cross-zonal capacity (Article 3(d) of the CACM Regulation). As regards the allocation of cross-zonal capacity, the Algorithm methodology promotes implicit allocation of cross-zonal capacity, which is considered as more efficient than explicit allocation of cross-zonal capacity and allows for the usage of explicit cross-zonal capacity allocation.

(10) This Algorithm methodology ensures fair and non-discriminatory treatment of TSOs, NEMOs and market participants (Article 3(e) of the CACM Regulation). The non-discriminatory treatment of TSOs and NEMOs is achieved by allowing an open access to participation in SDAC and SIDC to all NEMOs and TSOs and by allowing both to define their requirements in relation to the development and operation of SDAC and SIDC. Non-discriminatory treatment of market participants is achieved through their equal access to the SDAC and SIDC regardless of their origin or chosen NEMO in Member States with multiple NEMOs. Moreover, the matching of their orders is based on an objective function, which maximises the

economic surplus. This Algorithm methodology has no impact on the non-discriminatory treatment of ACER and regulatory authorities.

(11) This Algorithm methodology ensures and enhances transparency and reliability of information (Article 3(f) of the CACM Regulation) through transparent management of the algorithms' development and operation. This is achieved via transparent rules for monitoring and managing the algorithm performance, the corrective measures and the requests for changes to the algorithms. Transparency and reliability is also achieved through the requirements on regular reporting, the publication of documents related to these processes and the disclosure to the interested public of information needed to monitor the functioning of the algorithms.

(12) This Algorithm methodology contributes to an efficient long-term operation and development of the electricity transmission system and electricity sector in the Union (Article 3(g) of the CACM Regulation) as it ensures that all electricity markets and networks in the EU and other eligible third countries can participate in the SDAC and SIDC. This provides for an environment in which these markets can operate efficiently, where the cheapest generation can meet the highest demand and where efficient signals for the operation and development of the electricity sector are provided for.

(13) The algorithms apply clear rules for the price formation, which do not allow for discrimination among market participants. Therefore, this Algorithm methodology respects the need for a fair and orderly market and a fair and orderly price formation (Article 3(h) of the CACM Regulation) by ensuring that the algorithms always maximise the economic surplus and that their outcome is repeatable and scalable to the extent needed to support the extension of SDAC and SIDC to the whole EU and other eligible third countries.

(14) This Algorithm methodology supports the creation of a level playing field for NEMOs (Article 3(i) of the CACM Regulation) as it allows the participation by more than one NEMO in one bidding zone and provides equal opportunities for all NEMOs to compete with their services, with the exception of the national legal monopoly, in accordance with Article 5 of the CACM Regulation. This Algorithm methodology also ensures that the NEMOs' needs for product customisation for their customers are treated in a non-discriminatory way, while taking into account the impact of those needs on the algorithm performance.

(15) This Algorithm methodology ensures non-discriminatory access to cross-zonal capacity (Article 3(j) of the CACM Regulation) as it ensures the application of implicit capacity allocation, which allocates cross-zonal capacities to market participants' orders in a way that maximises the economic surplus at a specific point of time.

(16) This Algorithm methodology should provide assurance that the SDAC and SIDC algorithms are able to find for all days a solution that is compliant with the concept of market coupling and implicit capacity allocation within the permitted time. This Algorithm methodology should provide an objective framework to monitor and communicate on the operational performance, as well as to ensure stakeholders' understanding of the functioning of the algorithms.

(17) Changes to the SDAC and SIDC algorithms should be managed in an open, transparent and non-discriminatory way by seeking stakeholder's input, where relevant. These changes should provide assurance that the algorithms' performance is maintained at adequate levels and over a reasonable period of time in the future, assuming plausible market growth and development. To achieve this, individual NEMO's or TSO's requests should be supported to the extent that they do not harm any NEMO or TSO or include measures to mitigate any harm in a way that ensures non-discrimination.

(18) While the existing SDAC and SIDC algorithm solutions support all existing requirements and all individual products established in the respective terms and conditions, which set the products that can be taken into account by NEMOs in the single day-ahead coupling and single intraday coupling ('Terms and conditions on SDAC products' and 'Terms and conditions on SIDC products'), such support may not be achievable in a situation where the SDAC and SIDC are extended to many additional bidding zones and where the usage of products is greatly increased. In such a situation, the algorithm should support at least a combination of products that does not significantly restrict the needs of market participants and requirements specified in a way that enables the TSOs to perform their duties pursuant to CACM Regulation. A specific set of articles for deciding on requests for changes and corrective measures is

included in this Algorithm methodology to provide clarity regarding potential limitations to products or requirements.

(19) In order to address all the requirements of the CACM Regulation, the existing SDAC and SIDC algorithm solutions require further research and development on the IT solution supporting the algorithm operation and the algorithm design, aiming to maintain adequate performance of the algorithm. All NEMOs should regularly inform the regulatory authorities and other stakeholders about the expected outcome of the research and development process, in order to allow for adapting their own operational processes to the newly developed solutions.

(20) The SDAC algorithm and the IDA algorithm need to support the products (and requirements) ranging across more than one market time unit ('MTU') and often have an all-or-nothing acceptance criterion. This requires a complex combinatorial calculations to compute a number of alternative (compliant with the CACM Regulation) solutions. In order to allow the algorithm to provide the results within the time limit specified by all TSOs in accordance with Articles 48(1) and 59(4) of the CACM Regulation, the algorithm may not have enough time to search for all feasible solutions in order to find an optimal solution, which maximises the economic surplus. In that respect, the requirement to maximise the economic surplus for SDAC or SIDC should be understood as the requirement to find the highest possible economic surplus among all the feasible solutions found by the algorithm within the time constraints. In specific cases, this may have an impact on the requirement to respect the need for a fair and orderly price formation in accordance with Article 3(h) of the CACM Regulation. Since the maximisation of the economic surplus (i.e. optimal solution) is considered as the best guarantee to fulfil this requirement, all NEMOs should minimise the degree to which the solution found within the time constraints deviates from the optimal solution.

(21) According to Article 38(1)(e) of the CACM Regulation, the SDAC algorithm must be repeatable, which means that it must consistently produce the same results during a repeated execution with identical inputs. However, since the solution found by the SDAC algorithm and IDA algorithm is time dependent, the repeatability can only be ensured under the same conditions, i.e. on the same specific configuration of hardware and software and the same number of algorithm iterations. Furthermore, the application of a concept of full repeatability in a 'multi-threading' approach, as the one implemented in the SDAC algorithm and IDA algorithm in order to maximise its scalability and its ability to find more and better solutions given the constraints recalled in whereas (20), would drastically reduce such benefits. For this reason, the repeatability of the SDAC algorithm and IDA algorithm in operations should be adequate to accommodate the objectives of the CACM Regulation. It means that the differences between alternate runs of the algorithm with the same input data (given the same specific configuration of hardware and software and the same number of algorithm iterations) respect the conditions defined in this Algorithm methodology. At the same time, the NEMOs should be able to fully replicate the outcome of specific algorithm runs upon the request of ACER or of one or more regulatory authorities.

(22) According to Article 51(1)(a) and (e) of the CACM Regulation, the continuous trading matching algorithm must aim at maximising the economic surplus and be repeatable and scalable. Since the matching of orders in the continuous trading matching algorithm is based on their price and submission time, the continuous trading matching algorithm does not contain any welfare optimization feature or any element of randomness. Therefore, the continuous trading matching algorithm is by default maximizing welfare and repeatable. For this reason, the monitoring of continuous trading matching algorithm's optimality and repeatability is not necessary.

(23) According to Articles 38(1)(e) and 51(1)(e) of the CACM Regulation, the algorithms must be scalable. This means that they must be able to accommodate an enlargement of the SDAC and SIDC to new bidding zones (and new NEMOs), as well as the increased usage of the products and the implementation of the algorithm requirements. However, an unlimited scalability is (i) not feasible, since any configuration of hardware and software is subject to technical constraints that can become limiting under extreme conditions, (ii) not efficient, since it entails costs, which are not proportionate to the results that can be achieved and (iii) not needed, since the dimensions of the market coupling are not infinite in terms of geographical scope, number of NEMOs, products and requirements. Hence, the scalability should be adequate to accommodate the objectives of the CACM Regulation.

(24) With regard to additional bidding zones, the completion of a fully functioning and interconnected internal energy market makes the extension of market coupling to all eligible bidding zones and NEMOs the highest priority objective. Thus, at the time of the adoption of this Algorithm methodology, the algorithm should support all eligible bidding zones and NEMOs as well as the existing requirements of TSOs and existing. However, as the number of eligible bidding zones and NEMOs will increase in the future (e.g. due to extension to third countries), the algorithms should be continuously upgraded to accommodate all additional bidding zones (and NEMOs) eligible to participate in the SDAC and SIDC, as well as the additional requirements from TSOs that may arise from the development of capacity calculation methodologies in capacity calculation regions.

(25) The implementation and management of the SDAC and/or SIDC algorithms (according to the CACM Regulation's requirements) in terms of security of operation as well as of adequate performance, trigger different activities in the responsibility of all NEMOs and/or all TSOs. Such activities are the monitoring on a structured basis of the algorithm performance and of the usage of the functionalities therein supported, an efficient planning of the modifications to be implemented to the algorithms in the mid-long term, together with the establishment of a research and development process aimed at improving the SDAC and/or SIDC algorithm performance.

(26) If due to an unexpected evolution in the framework of the monitoring of the algorithm performance, the performance of the algorithm deteriorates, all NEMOs in cooperation with all TSOs should apply corrective measures to restore the performance. These measures should be timely communicated to stakeholders. An efficient and transparent governance is crucial for this process.

(27) The future evolution of the algorithms in terms of their scalability requires changes to the algorithms' functionalities or to the usage of already existing functionalities. To accommodate these changes, all NEMOs should cooperate with all TSOs where these changes affect TSOs' algorithms' requirements or algorithms' performance and communicate these changes to stakeholders in a timely manner. An efficient and transparent governance is crucial for this process.

(28) In order to assess the impact on performance of the SDAC and/or SIDC algorithm by any change in the usage of its functionalities, all NEMOs in cooperation with all TSOs should define usage scenarios for each functionality, usage of which could vary on a daily basis.

(29) The concept of effective usage refers to the actual value of usage of these functionalities over a past period. This should be the basis for the monitoring of usage of requirements and the performance of the SDAC and SIDC algorithms.

(30) The concept of anticipated usage refers to the future value of the usage of the SDAC and SIDC algorithm's functionalities, when assessing an expected variation of the performance of the algorithms due to the implementation of requests for change or due to the expected growth of their usage. This should be the basis for assessing the impact on the algorithms' performance induced by requests for change as well as for the periodic assessment of adequate scalability against anticipated growth of the usage of functionalities.

(31) The concept of usage range refers for each functionality to the maximum estimated usage of such functionality supported by the algorithm, consistent with adequate levels of scalability. The individual usage ranges of the functionalities should be jointly estimated on the basis of their anticipated usage. Considering that the joint usage of many functionalities affects performance, the usage range should not represent any maximum allowed or reserved level of usage of the functionalities. The usage range should rather indicate a prudent measure of an individual usage consistent with overall adequate performance and indicate potential area of application of corrective measures in case the overall performance is reducing the predefined thresholds.

(32) The development and operation of the SDAC and SIDC algorithms require close cooperation between all NEMOs and all TSOs as part of the day-to-day management of the single day-ahead and intraday coupling pursuant to Article 10 of the CACM Regulation, because the algorithms must satisfy the requirements from NEMOs and TSOs. For this purpose, NEMOs and TSOs should collaborate in the processes for managing the algorithm performance, in the processes leading to a change in the algorithms, as well as in the development of the underlying rules governing these processes.

(33) The development and operation of the algorithms require highly transparent processes. For this reason, all NEMOs should publish in a timely manner all relevant information, procedures, contracts, descriptions and reports having an impact on the algorithm operation, management, performance and future evolution. Moreover, all NEMOs should ensure that the interested public is able to understand the functioning of the SDAC and SIDC algorithms.

(34) The future evolution of various terms and conditions or methodologies developed by TSOs or NEMOs in accordance with the CACM Regulation may require some additional changes to the SDAC and SIDC algorithms. In such a case, all TSOs and all NEMOs should update the DA and ID algorithm requirements and subsequently all NEMOs should update this Algorithm methodology and submit it to ACER for decision, in accordance with Article 37(5) of the CACM Regulation.

(35) The SDAC and SIDC algorithm indicators are meant to provide an objective basis for the management of all the activities related to the management of the SDAC and/or SIDC coupling and to inform stakeholders and interested public, as far as both operations and development are involved.

(36) The usage indicators are meant to support the day-to-day management of the SDAC and SIDC referred to in Article 10 of the CACM Regulation. They provide the information on the evolution of the effective usage of the SDAC and SIDC algorithms over a historical set and serve as the basis for application of corrective measures.

(37) The performance indicators are meant to measure the properties of the algorithms in terms of compliance with the CACM Regulation's requirements of maximising the economic surplus, repeatability and scalability. They provide the information on evolution of the actual performance of the SDAC and/or SIDC algorithms over the same historical scenario of the usage indicators, as a consequence of the growth of the usage.

(38) The performance indicators are also meant to measure the capability of the algorithm to support the anticipated market growth and extension of requirements in the medium and long term, thus providing the basis for the decisions on the long-term development of the SDAC and SIDC algorithms. Moreover, they measure the impact on performance of any requests for change.

(39) In particular, the performance indicators on scalability should provide the basis for an impact assessment of requests for change including, but not limited to, those for corrective measures, which secure the reliability of the algorithm's operation. They measure the impact of such changes on calculation time based on the anticipated usage of SDCA and/or SIDC requirements, in order to assess the risk that the requests for change are expected to have on: (i) the reliability of operation of the existing version of the algorithms in the short term; (ii) the necessity of triggering or revising the research and development activity in order to be able to support the request for change in the medium or long term, or (iii) the likelihood that the proposed corrective measures are sufficient to restore adequate reliability of operation.

(40) In order to ensure transparency on the process of development of the SDAC and SIDC algorithms, all indicators should be published in the yearly reports and constitute the basis for periodic reporting from NEMOs and TSOs.

TITLE 1
General provisions

Article 1

Subject matter and scope

1. This Algorithm methodology determines the SDAC algorithm, the single intraday continuous trading matching algorithm and the IDA algorithm in accordance with Article 37 and 55 of the CACM Regulation.

The Algorithm methodology incorporates the DA and ID algorithm requirements (as per Annex 1 and Annex 2) and the DA and ID algorithm monitoring methodologies (as per Annex 3 and Annex 4).

2. This Algorithm methodology sets forth the principles for the submission, evaluation, decision and implementation of requests for change related to the SDAC and/or SIDC algorithms.

3. The following provisions and related decisions of all NEMOs shall apply subject to applicable laws and regulations.

Article 2

Definitions and interpretation

1. The terms used in this Algorithm methodology shall have the meaning given to them in Article 2 of Regulation (EU) 2019/943, in Article 2 of Regulation (EU) 543/2013, in Article 2 of the CACM Regulation, in Article 2 of Directive 2009/72/EC, in Article 3 of Regulation (EU) 2017/1485, with the exception of the definition of 'scheduling area', and in the Market Coupling Operator ('MCO') Plan.

2. In addition, the terms used in this Algorithm methodology shall have the meaning given to them in the Methodology for pricing intraday cross-zonal capacity.

3. In addition, the following definitions shall apply:

   a) **Algorithm monitoring methodology**: means a methodology developed in accordance with Article 8 of this Algorithm methodology, which is necessary to assess the performance of the SDAC and SIDC algorithms, as set out by Annex 3 and Annex 4 to this Algorithm methodology, for the DA and ID timeframes respectively.

   b) **Algorithm monitoring procedure**: means a procedure, which provides in more detail the assessment of the performance of the respective SDAC and/or SIDC algorithms and the process of determining and calculating the algorithm monitoring indicators, and is developed in accordance to the principles set out in this Algorithm methodology as set out in Annex 3 and Annex 4 to this Algorithm methodology. It shall be published in accordance with Article 20(7).

   c) **Algorithm performance**: means the ability of the SDAC and SIDC algorithms to ensure reliability of the process to find solutions, maximise economic surplus, and ensure an adequate level of repeatability and scalability.

   d) **Back-up methodology**: means the methodology developed in accordance with Article 36(3) of the CACM Regulation and approved in accordance with Article 9 of the CACM Regulation, including any amendments, which have been approved in accordance with that Article 9.

   e) **Back-up procedure**: means a procedure, which provides in more detail the processes set out in the Back-up methodology. It shall be published in accordance with Article 20(7).

   f) **Change control procedure:** means a procedure, which provides in more detail the process of managing requests for change in the respective DA and/or ID timeframe and is developed in accordance to the principles set out in this Algorithm methodology. It shall be published in accordance with Article 20(7).

   g) **Corrective measure**: means a last resort measure taken by all NEMOs in cooperation with all TSOs in case of performance degradation of the SDAC and/or SIDC algorithms with the aim to restore their adequate performance.

   h) **Existing DA algorithm solution**: means the algorithm, which has been developed and implemented by some NEMOs for the day-ahead market coupling within the day-ahead coupling project pre-existing the CACM Regulation in accordance with the MCO Plan.

   i) **Existing ID algorithm solution**: means the continuous trading algorithm, which has been developed and implemented by some NEMOs for the intraday market coupling within the intraday coupling project pre-existing the CACM Regulation in accordance with the MCO Plan.

   j) **Fallback methodology**: means the methodology developed for robust and timely fallback procedures to ensure efficient, transparent and non-discriminatory capacity allocation in the event

that the single day-ahead coupling process is unable to produce results, in accordance with Article 44 of the CACM Regulation and approved in accordance with Article 9 of the CACM Regulation, including any amendments, which have been approved in accordance with that Article 9.

k) **Fallback procedure**: means a procedure, which provides in more detail the processes set out in the Fallback methodology. It shall be published in accordance with Article 20(7).

l) **First solution:** when referring to the SDAC algorithm or the IDA algorithm, it means the first solution found that satisfies all input constraints up to a pre-defined numerical tolerance level published in the public description of the algorithms. A solution is considered satisfactory when there exists an acceptance tolerance problem in all the constraints up to a maximum value known as the technical limit. SDAC algorithm provides the utility of each one of the solutions that improve the previously solutions found.

m) **Functionality**: means any market or network feature or design element embodied in the systems, communications and procedures that support the SDAC and SIDC algorithms in accordance with the DA and ID algorithm requirements.

n) **Go-live date**: means, with respect to each request for change, the date within a specific go-live window on which such request for change is to be implemented in operation

o) **Go-live window**: means a period in a calendar year, during which the: (i) requests for change may be submitted; (ii) the assessment process of requests for change will take place; or (iii) the request for change will go-live. It shall be managed in accordance with Article 16.

p) **MCO Plan**: means the plan on joint performance of market coupling operator functions developed in accordance with Article 7(3) of the CACM Regulation and approved in accordance with Article 9 of the CACM Regulation, including any amendments, which have been approved in accordance with that Article 9.

q) **Methodology for calculating scheduled exchanges**: means the methodology developed in accordance with Articles 43(1) and 56(1) of the CACM Regulation and approved in accordance with Article 9 of the CACM Regulation, including any amendments, which have been approved in accordance with that Article 9.

r) **Methodology for pricing intraday cross-zonal capacity**: means the methodology developed in accordance with Article 55 of the CACM Regulation and approved in accordance with Article 9 of the CACM Regulation, including any amendments, which have been approved in accordance with that Article 9.

s) **NEMO trading hub**: means a virtual trading point collecting all orders received by a NEMO with delivery in a specific scheduling area.

t) **Operational contract:** means the contract between NEMOs only or TSOs only or between NEMOs and TSOs governing the SDAC or SIDC market coupling operations. It shall be published in accordance with Article 20(7).

u) **Operational procedure:** means a procedure, which provides in more detail the processes set out in this Algorithm methodology and is concluded between NEMOs only or TSOs only or between NEMOs and TSOs. It shall be published in accordance with Article 20(7).

v) **Originator**: means one or more NEMO(s) or TSO(s) submitting a request for change.

w) **Paradoxically rejected order**: means any sell/buy order covering multiple MTUs, which, although its order price is lower/higher than the average market clearing price for all the MTUs included in the order, are nonetheless rejected by the SDAC algorithm on the grounds that, if they had been accepted, the average market clearing price in the respective MTUs would have either decreased/increased below/above their order price or the economic surplus calculated by the SDAC algorithm would have decreased.

x) **DA products, ID products and IDA products**: means the products that can be taken into account in the SDAC, intraday continuous trading or IDAs, respectively, developed in accordance with Articles 40(1) and 53(1) of the CACM Regulation and approved in accordance with Article 9 of the CACM Regulation, including any amendments, which have been approved in accordance with that Article 9.

y) **Request for change**: means a formal request by an originator for any modification to the SDAC and/or SIDC algorithm or to its usage.

z) **Scheduling area**: means a scheduling area according to Article 3(2)(91) of the Regulation (EU) 2017/1485 with at least one NEMO trading hub.

aa) **Scheduled exchange between NEMO trading hubs**: means an electricity transfer scheduled between NEMO trading hubs within or between scheduling areas or bidding zones.

bb) **Switchover**: means all the technical processes to be taken in advance or at the IDAs' deadline for bid submissions in order to switch from the intraday continuous capacity allocation mechanism to the intraday auction based capacity allocation mechanism, avoiding the double allocation of cross-zonal capacity.

cc) **Switchback**: means all the technical processes to be taken in order to continue with the intraday continuous capacity allocation once the allocation of capacity through an IDA has finished, avoiding the double allocation of cross-zonal capacity.

4. Unless the context requires otherwise or unless specified otherwise:

   a) the singular indicates the plural and vice versa;
   b) the table of contents and headings are inserted for convenience only and do not affect the interpretation of this Algorithm methodology; and
   c) any reference to legislation, regulations, directives, decisions, orders, instruments, codes or any other enactment shall include any modification, extension or re-enactment thereof when in force.

TITLE 2
Algorithms

Article 3

Algorithm requirements

1. The DA and ID algorithm requirements comprise a common set of requirements proposed by all TSOs, a common set of requirements proposed by all NEMOs and a common set of requirements jointly proposed by both all TSOs and all NEMOs, in line with Article 37(1) of the CACM Regulation and are set out in Annex 1 and Annex 2 of this Algorithm methodology.

2. All NEMOs shall maintain the functionalities (following their implementation) to be compliant with the DA and ID algorithm requirements.

3. The SDAC and SIDC algorithms shall support the requirements for the calculation of scheduled exchanges between bidding zones and between scheduling areas as well as scheduled exchanges between NEMO trading hubs in accordance with the methodology for calculating scheduled exchanges for the day-ahead and intraday timeframes.

4. The SDAC and SIDC algorithms shall support products listed in the Terms and conditions on SDAC and SIDC products and all DA and ID algorithm requirements. However, if such support leads to a deterioration of the algorithm performance, all NEMOs may apply, through the procedures for corrective measure and/or change requests:

   a) limitations to specific products or their usage in specific bidding zones; and/or
   b) limitations to specific algorithm requirements or their usage, if these requirements are specified in a way that excessively impacts the algorithm performance.

   When applying those limitations, all NEMOs shall respect the rules referred to in Article 12 of this Algorithm methodology.

5. All NEMOs shall ensure that the SDAC algorithm produces the results set out in Article 39(2) of the CACM Regulation while fulfilling the requirements referred to in Article 38(1) and Article 40(2) of the CACM Regulation:

a) the SDAC algorithm shall aim at maximising the economic surplus for all biding zones participating in the SDAC for the next trading day while respecting cross-zonal capacity and allocation constraints within the maximum calculation time. The SDAC algorithm shall facilitate efficient price formation by using the marginal price principle according to which all accepted orders have the same price per bidding zone and per MTU;

b) the SDAC algorithm shall be repeatable, which means that the outcome of alternate executions of the algorithm on the same hardware and software and their configuration after the same number of iterations consistently delivers the same result and shall respect the thresholds set forth in Article 3(3) of Annex 3. All NEMOs shall be able to fully replicate the results of the SDAC algorithm for a specific historic delivery day if requested by any regulatory authority or ACER pursuant to their monitoring duties in accordance with Article 82(1) of CACM Regulation;

c) the SDAC algorithm shall be scalable, thus ensuring that it can support in a non-discriminatory way all bidding zones and all NEMOs eligible to participate in the SDAC at any time, all DA algorithm requirements and DA products, as well as their reasonable usage based on anticipated and effective usage;

d) the SDAC algorithm shall be able to accommodate orders resulting from products covering one MTU and multiple MTUs;

e) the SDAC algorithm shall be reliable, which means that it shall be able to find at least one solution within the time limit as set out in the operational procedure and timings; and

f) the SDAC algorithm shall provide for a fair and orderly price formation as required by Article 3(h) of the CACM Regulation.

6. All NEMOs shall ensure that the continuous trading matching algorithm produces the results set out in Article 52(1) of the CACM Regulation while fulfilling the requirements of Article 51(1) and Article 53(3) of the CACM Regulation:

a) the continuous trading matching algorithm shall aim at maximising economic surplus for the SIDC per trade for the intraday market time-frame by allocating cross-zonal capacity to orders, which can be matched in accordance with their price and submission time, while respecting the cross-zonal capacity and allocation constraints;

b) the continuous trading matching algorithm shall be repeatable, which means that for a given (i) set of orders, their associated submission time and cross-zonal capacities and allocation constraints for a specified delivery date and (ii) an adequate and suitable storage and computational capacity of the algorithm and related IT assets, the same results originally obtained for the indicated delivery date can be reproduced;

c) the continuous trading matching algorithm shall be scalable, thus ensuring that it can support in a non-discriminatory way all bidding zones and all NEMOs eligible to participate in the SIDC at any time, all ID algorithm requirements and all products listed in the Terms and conditions on SDAC products, as well as their reasonable usage based on anticipated and effective usage; and

d) the continuous trading matching algorithm shall be able to accommodate orders covering one MTU and multiple MTUs.

7. All NEMOs shall ensure that the IDA algorithm produces the results and fulfils the requirements defined for SDAC algorithm in the previous paragraph 5, mutatis mutandis, and in Title 2 of the ID algorithm requirements as set out in Annex 2 of this Algorithm methodology.

Article 4

Price coupling algorithm

1. The SDAC algorithm shall produce at least the following results simultaneously for each MTU:

a) a single clearing price for each bidding zone and MTU in EUR/MWh;

b) a single net position for each bidding zone and each MTU;

c) the matched volumes of each bidding zone for each relevant MTU;

d) the scheduled exchanges between bidding zones (in case of DC interconnectors separately for each of them) and between scheduling areas as well as scheduled exchanges between NEMO trading hubs for each relevant MTU;

e) the information which enables the execution status of orders to be determined; and

f) the acceptance ratio for each block as defined in the Terms and conditions on SDAC products.

2. The SDAC algorithm shall calculate scheduled exchanges between bidding zones and between scheduling areas as well as scheduled exchanges between NEMO trading hubs in accordance with the methodology for calculating scheduled exchanges for the day-ahead timeframe.

3. For the purpose of calculating scheduled exchanges, the SDAC algorithm shall calculate the net positions as follows:

a) for the bidding zones consisting of more than one scheduling area, the net position for each MTU will be calculated for each scheduling area; and

b) for the scheduling areas where more than one NEMO operates, the net position for each MTU will be calculated for each NEMO trading hub.

4. Where applicable, to find a solution, the SDAC algorithm shall evaluate the acceptance criteria combinations of all DA products, which are not simple or aggregated hourly, half-hourly or quarter-hourly products that fulfil the market and network DA algorithm requirements expressed as constraints in the optimisation problem. Every evaluated combination is a node.

5. In order to ensure reliability of operation, the SDAC algorithm shall first aim to find a first solution compliant with the input constraints. In order to maximise the economic surplus, it shall then seek to find new solutions with higher economic surplus by exploring new nodes until the overall optimal solution is found and verified in the process of maximising the economic surplus or until the time limit referred to in paragraph 6 has been reached. In case the SDAC algorithm finds two or more solutions with the same value of economic surplus, it shall select the one that maximises the traded volume.

6. Under normal operations, all NEMOs shall execute the SDAC algorithm using the time limit stopping criterion, which shall be equal to the maximum calculation time established in the operational procedure and timings referred to in paragraph 16.

7. The SDAC algorithm shall perform checks on every solution found to validate that all the market and network requirements, expressed as constraints in the optimisation problem, are respected within a tolerance, which shall be defined in operational procedures. The last solution found that is fulfilling this condition shall be the result of the execution of the SDAC algorithm.

8. Orders used in the SDAC algorithm shall be anonymous and processed in a non-discriminatory way. There shall be no identification of the originating market participant or NEMOs.

9. A single execution of the SDAC algorithm operated by the coordinator shall calculate the results for all NEMO trading hubs participating in the SDAC.

10. The input data to the SDAC algorithm referred to in Article 39(1) of the CACM Regulation shall be available to any authorised operator, who is entitled to perform the SDAC calculation in parallel.

11. Under normal operations, all NEMOs shall submit orders to the MCO function systems by the time defined in the operational procedures. If applicable, back-up procedures shall be applied in accordance with the Back-up methodology.

12. Under normal operations, all NEMOs performing the MCO functions shall provide (i) all TSOs, all coordinated capacity calculators and all NEMOs with the results of the SDAC referred to in paragraph 1(a),(b),(c) and (d) above; and (ii) all NEMOs with the results specified in paragraph 1 above, by 13:00 market time day-ahead and anyway not later than 15:30 market time day-ahead.

13. All NEMOs shall provide TSOs with the scheduled exchanges between bidding zones and between scheduling areas as referred to in paragraph (2) above, calculated in accordance with the methodology for calculating scheduled exchanges for the day-ahead timeframe.

14. All NEMOs shall ensure that the SDAC algorithm meets the algorithm requirements as follows:

   a) the SDAC algorithm shall be able to support all existing requirements and functionalities:

      (i) set out in Annex 1 to this Algorithm methodology and denoted as 'existing';
      (ii) the requirement of maximisation of the economic surplus as referred to in Article 3(5)(a);
      (iii) the requirement on delivery of results as referred to in paragraph 1;
      (iv) the requirement for the operation of multiple NEMOs in a bidding zone;
      (v) the requirement of scalability as referred to in Article 3(5)(c); and
      (vi) the requirement for the calculation of scheduled exchanges as referred to in paragraph 2.

   b) by 1 February 2020, the SDAC algorithm shall be able to support the requirement of adequate repeatability referred to in Article 3(5)(b);

   c) by 1 January 2021, the SDAC algorithm shall be able to support half-hourly and quarter-hourly granularity of DA products as set out in paragraph 1.1(a)(i) in Annex 1 to this Algorithm methodology; and

   d) by 1 August 2022, the SDAC algorithm shall be able to support all requirements denoted as 'AUG 2022' as set out in Annex 1 to this Algorithm methodology.

15. In the case of amendments of the Methodology for the calculation of scheduled exchanges for day-ahead timeframe, the delivery of the amended functionality for the calculation of scheduled exchanges shall be postponed until 12 months after the approval of the methodology for the calculation of scheduled exchanges for the day-ahead timeframe.

16. All NEMOs in cooperation with all TSOs shall jointly establish the operational procedures and timings for the SDAC algorithm to comply with Article 48 of the CACM Regulation. These operational procedures and timings shall define the modalities for coordinating the operation of the SDAC market between NEMOs and TSOs both in ordinary and non-ordinary conditions and shall detail all relevant actions to be taken together with relevant subjects, timings and processes. These operational procedures and timings shall make reference to the Back-up methodology developed in accordance with Article 36(3) of the CACM Regulation.

17. Every year, all NEMOs shall provide all regulatory authorities with a report on incidents in the operation of the SDAC algorithm and the application of back-up and fallback procedures in accordance with the Back-up methodology and Fallback methodology. The report shall provide at least a list of incidents in the operation of the SDAC algorithm and the application of back-up and fallback procedures, including the reasoning of their occurrence and applied or anticipated remedies to prevent their recurrence in the future.

18. All NEMOs shall create and maintain a document with the detailed description of the SDAC algorithm, including the description of the calculation of scheduled exchanges in accordance with the methodology for calculating scheduled exchanges for the day-ahead timeframe. This document shall be published and kept updated with every new version of the SDAC algorithm. The document shall be publicly available by all NEMOs on a public webpage.

Article 5

Continuous trading matching algorithm

1. All NEMOs, as part of their MCO function, shall ensure that the continuous trading matching algorithm produces at least the following results:

   a) the execution status of orders and prices per trade;
   b) a single net position for each bidding zone participating in the SIDC and each MTU; and
   c) the scheduled exchanges between bidding zones (in case of DC interconnectors separately for each of them) and between scheduling areas as well as scheduled exchanges between NEMO trading hubs for each relevant MTU.

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 and allocate cross-zonal capacities and allocation constraints.

3. The continuous trading matching algorithm shall enable all NEMOs to connect to the SOB module. All NEMOs shall enter orders into the SOB module through local trading solutions. All valid orders entered in time in the local trading solution shall automatically enter the SOB module. Market participants are not entitled to access the SOB module directly.

4. The continuous trading matching algorithm shall calculate the scheduled exchanges between bidding zones and between scheduling areas as well as scheduled exchanges between NEMO trading hubs in accordance with the methodology for calculating scheduled exchanges for the intraday timeframe. This functionality shall be implemented by all NEMOs, together with all TSOs, through the shipping module.

5. Matching of orders shall be performed within the SOB module, irrespectively of the scheduling areas through which the orders were entered, including from the same area. The SOB module shall maintain a consolidated order book for all contracts based on the available cross-zonal capacities and allocation constraints.

6. The CMM shall provide information on the currently available cross-zonal capacities and allocation constraints. When cross-zonal matching is performed, the required cross-zonal capacities shall be implicitly allocated in the CMM.

7. Market participants requesting explicit access to cross-zonal capacity in accordance with Article 64 of the CACM Regulation and subject to regulatory approval shall directly access the CMM for explicit cross-zonal capacity allocation.

8. The SOB module shall determine the local view of all orders that can be matched in a selected scheduling area.

9. The SOB module shall apply deterministic matching. Orders shall be matched in the SOB module on the price-time-priority principle:
   a) price: orders shall be executed at the best price. This means that the best buy order, i.e. the order with the highest price, shall be executed against the best sell order, i.e. the order with the lowest price, first.
   b) Time: when an order is entered into the SOB, it shall be assigned a timestamp. This timestamp is used to prioritise orders with the same price. At the same price, orders with earlier timestamps shall be executed with a higher priority than orders with a later timestamp.

10. The trade execution 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 price of the sell order shall become the trade execution price.
    b) if a newly entered sell order is matched against an existing buy order, the price of the buy order shall become the trade execution price.

11. Where a possible cross-zonal trade is identified in the SOB module, a request for implicit allocation of cross-zonal capacity shall be submitted to the CMM. Requests for implicit capacity allocation shall be queued along with requests for explicit capacity allocation, and cross-zonal capacity shall be allocated on a first-come-first serve basis respecting also allocation constraints. If the necessary cross-zonal capacity is not available, the cross-zonal trade shall not be matched.

12. CMM shall not discriminate between implicit capacity allocation for matching of single-time-unit products (e.g. hourly, half-hourly and quarter-hourly), implicit capacity allocation for matching of user-defined blocks and explicit capacity allocation to explicit capacity allocation 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 scheduled exchanges between bidding zones and between scheduling areas as referred to in paragraph 4 above and in accordance with the methodology for calculating of scheduled exchanges for the intraday timeframe.

14. All NEMOs shall ensure that the continuous trading matching algorithm meets the algorithm requirements as follows:

    a) the continuous trading matching algorithm shall be able to support all existing requirements and functionalities:

    (i) all requirements defined in Annex 2 to this Algorithm methodology, denoted as 'existing';
    (ii) the requirement of maximisation of economic surplus as referred to in Article 3(6)(a);
    (iii) the requirement for the operation of multiple NEMOs in a bidding zone;
    (iv) the requirement of scalability as referred to in Article 3(6)(c);
    (v) the requirement of adequate repeatability as referred to in Article 3(6)(b);
    (vi) the requirement on delivery of results as referred to in paragraph 1;
    (vii) the requirements for the calculation of schedule exchanges as referred to in paragraph 4; and
    (viii) the complete functionality of the enhanced preferred shipper;

    b) by 1 January 2023, the continuous trading matching algorithm shall be able to support all requirements denoted as 'JAN 2023' set out in TITLE 1 of Annex 2 to this Algorithm methodology; and

    c) by 1 August 2023, the continuous trading matching algorithm shall be able to support all requirements denoted as 'AUG 2023' set out in Annex 2 to this Algorithm methodology.

15. In the case of amendments of the Methodology for the calculation of scheduled exchanges for intraday timeframe, the delivery of the amended functionality for the calculation of scheduled exchanges shall be postponed until 12 months after the approval of the methodology for calculating scheduled exchanges for the intraday timeframe.

16. All NEMOs in cooperation with all TSOs shall jointly establish the operational procedures and timings for the continuous trading matching algorithm to comply with Article 60 of the CACM Regulation. These operational procedures and timings shall define the modalities for coordinating the operation of the SIDC market between NEMOs and TSOs both in ordinary and non-ordinary conditions and shall detail all relevant actions to be taken together with relevant subjects, timings and processes. These operational procedures and timings shall make reference to the Back-up methodology developed in accordance with Article 36(3) of the CACM Regulation.

17. Every year, all NEMOs shall provide all regulatory authorities with a report on incidents in the operation of the continuous trading matching algorithm and the application of back-up and fallback procedures in accordance with the Back-up methodology and Fallback methodology. The report shall provide at least a list of incidents in the operation of the continuous trading matching algorithm and the application of back-up procedures, including the reasoning of their occurrence and applied or anticipated remedies to prevent them in the future.

18. All NEMOs shall create and maintain a document with the detailed description of the continuous trading matching algorithm, including the description of calculation of scheduled exchanges in accordance with the methodology for calculating scheduled exchanges for the intraday timeframe. This document shall be published and kept updated with every new version of the continuous trading matching algorithm. The document shall be publicly available on all NEMOs' public webpage.

19. In order to accommodate IDAs, the cross-zonal capacity allocation within the continuous SIDC shall be suspended for a limited period during which the cross-zonal capacities shall not be allocated through the continuous SIDC. This period for suspension shall not be longer than 40 minutes and shall consist of:

    (a) the suspension before the deadline for bid submissions of each IDA. This suspension shall not be longer than 20 minutes and allow maximum of 5 minutes for recalculating and/or updating of cross-zonal capacities, which shall be published no later than 15 minutes before the deadline for bid submissions for each IDA as specified in the single methodology for pricing intraday cross-zonal capacity adopted in accordance with Article 55 of the CACM Regulation; and

(b) the suspension after the deadline for bid submissions of each IDA, which shall not be longer than 20 minutes and allow for the calculation of auction results, verification of results and the recalculation and/or update of cross-zonal capacities for the continuous SIDC.

20. If all NEMOs and/or all TSOs identify during the testing of IDAs, that they are not able to implement IDAs within the time constraints provided in paragraph 19, they may start the implementation of IDAs with extended time constraints which are 30 minutes for suspension before the deadline for bid submissions of each IDA and 30 minutes for the suspension after the deadline for bid submissions of each IDA. These extended time constraints may be applied for up to maximum 12 months starting from the implementation date of IDAs and shall not affect the deadline for publication of cross-zonal capacities as referred to in paragraph 19(a). All NEMOs shall announce and publish the start and end of the application of extended deadlines at least two months before their application.

Article 6

Intraday auction algorithm

1. The IDA algorithm shall produce at least the following results simultaneously for each MTU:
   a) a single clearing price for each bidding zone and MTU in EUR/MWh;
   b) a single net position for each bidding zone and each MTU;
   c) the matched volumes of each bidding zone for each relevant MTU;
   d) the scheduled exchanges between bidding zones (in case of DC interconnectors separately for each of them) and between scheduling areas as well as scheduled exchanges between NEMO trading hubs for each relevant MTU;
   e) the information which enables the execution status of orders to be determined; and
   f) the acceptance ratio for each block as defined in the Terms and conditions on SIDC products.

2. The IDA algorithm shall calculate scheduled exchanges between bidding zones and between scheduling areas as well as scheduled exchanges between NEMO trading hubs in accordance with the methodology for calculating scheduled exchanges for the day-ahead timeframe, applied for the needs of IDAs mutatis mutandis.

3. For the purpose of calculating scheduled exchanges, the IDA algorithm shall calculate the net positions as follows:
   a) for the bidding zones consisting of more than one scheduling area, the net position for each MTU will be calculated for each scheduling area; and
   b) for the scheduling areas where more than one NEMO operates, the net position for each MTU will be calculated for each NEMO trading hub.

4. Where applicable, to find a solution, the IDA algorithm shall evaluate the acceptance criteria combinations of all IDA products, which are not simple or aggregated hourly, half-hourly or quarter-hourly products that fulfil the market and network ID algorithm requirements expressed as constraints in the optimisation problem. Every evaluated combination is a node.

5. In order to ensure reliability of operation, the IDA algorithm shall first aim to find a first solution compliant with the input constraints. In order to maximise the economic surplus, it shall then seek to find new solutions with higher economic surplus by exploring new nodes until the overall optimal solution is found and verified in the process of maximising the economic surplus or until the time limit referred to in paragraph 6 has been reached. In case the IDA algorithm finds two or more solutions with the same value of economic surplus, it shall select the one that maximises the traded volume.

6. Under normal operations, all NEMOs shall execute the IDA algorithm using the time limit stopping criterion, which shall be equal to the maximum calculation time established in the operational procedure and timings referred to in Article 5(16).

7. The IDA algorithm shall perform checks on every solution found to validate that all the market and network requirements, expressed as constraints in the optimisation problem, are respected within a tolerance, which shall be defined in the operational procedures. The last solution found that is fulfilling this condition shall be the result of the execution of the IDA algorithm.

8. Orders used in the IDA algorithm shall be anonymous and processed in a non-discriminatory way. There shall be no identification of the originating market participants or NEMOs.

9. A single execution of the IDA algorithm operated by the coordinator shall calculate the results for all NEMO trading hubs participating in the IDA.

10. The input data to the IDA algorithm referred to in Article 39(1) of the CACM Regulation shall be available to any authorised operator, who is entitled to perform the IDA calculation in parallel.

11. Under normal operations, all NEMOs shall submit orders to the MCO function systems by the time defined in the operational procedures or otherwise back-up procedures shall be applied as set out in the Back-up methodology.

12. Under normal operations, all NEMOs performing the MCO functions shall provide (i) all TSOs, all coordinated capacity calculators and all NEMOs with the results of the IDA referred to in paragraph 1(a),(b),(c) and (d) above; and (ii) all NEMOs with the results specified in paragraph 1 above, in due time to allow at least 30 minutes of cross-zonal continuous trading for any given MTU after the publication of the auction results as set out in the Methodology for pricing intraday cross-zonal capacity.

13. All NEMOs shall provide TSOs with the scheduled exchanges between bidding zones and between scheduling areas as referred to in paragraph (2) above, calculated in accordance with the methodology for calculating scheduled exchanges for the day-ahead timeframe.

14. Under normal operations, the IDA shall be completed and publish results no longer than 20 minutes after the deadline for bid submission.

15. All NEMOs shall ensure that the ID auction algorithm meets the algorithm requirements as follows:

    a) by 1 January 2023, all NEMOs shall organize and operate the IDAs and the IDA auction algorithm shall be able to support:

        (i) all requirements denoted as 'JAN 2023', set out in TITLE 2 of Annex 2 to this Algorithm methodology;
        (ii) the requirement of maximisation of the economic surplus as referred to in Article 3(5)(a);
        (iii) the requirement of adequate repeatability referred to in Article 3(5)(b)
        (iv) the requirement of scalability as referred to in Article 3(5)(c);
        (v) the requirement on delivery of results as referred to in paragraph 1;
        (vi) the requirement for the calculation of scheduled exchanges as referred to in paragraph 2 ; and
        (vii) the requirement for the operation of multiple NEMOs in a bidding zone.

    b) by 1 August 2023, the ID auction algorithm shall be able to support all requirements denoted as 'AUG 2023' set out in TITLE 2 of Annex 2 to this Algorithm methodology.
    c) by 1 January 2023, only the net transfer capacity approach shall be implemented in operation. The flow-based approach shall be implemented in operation for those regions where cross-zonal capacity is calculated following the flow-based methodology no later than when continuous trading matching algorithm is adapted to support flow-based allocation. The evolution of the flow-based approach for auctions prior to the implementation of the full flow-based solution is subject to further technical evaluation.

16. All NEMOs shall create and maintain a document with the detailed description of the IDA algorithm, including the description of the calculation of scheduled exchanges in accordance with the methodology for calculating scheduled exchanges for the day-ahead timeframe, applied for the needs of IDAs mutatis mutandis. This document shall be published and kept updated with every new version of the IDA algorithm. The document shall be publicly available by all NEMOs on a public webpage from the date set out in paragraph 15(a).

TITLE 3
Algorithm performance management

Article 7

Calculation of effective usage, anticipated usage and usage range

1. Usage is a quantitative indication of the average usage of a functionality over a predefined time range. Such information is needed whenever the usage of such functionality is dependent on decisions of market participants, thus can vary on daily basis (e.g. number of orders of a specific product) or TSOs (e.g. hourly value of ATC or the number and value of PTDFs).

2. All NEMOs in cooperation with all TSOs shall ensure that each functionality of the SDAC and SIDC algorithms is associated with a quantification of the effective usage and the anticipated usage. These usages provide the basis for the quantification of the usage range and the assessment of the performance impact on any request for change, according to the principles described in Article 13. Moreover, they provide for the monitoring of the evolution of the performance of the SDAC and SIDC algorithms, according to the provisions of Article 8.

3. The effective usage of a functionality is equal to the mean of its actual usage observed over the recent historical set defined in Article 2(a) of Annex 3 and Article 2(a) of Annex 4 for the DA and ID timeframes respectively, based on the following principles:

   a) the recent historical set shall be the same for all functionalities; and
   b) the computation of the effective usage shall reflect the observed historical growth trend in the assessment process and the application of corrective measures.

4. The anticipated usage of a functionality is the expected effective usage observed over the near future set defined in Article 2(d) of Annex 3 and Article 2(c) of Annex 4 for the DA and ID timeframes respectively, based on the following principles:

   a) the near future set shall be the same for all the functionalities and wide enough to avoid the influence of seasonal effects;
   b) in case of existing functionalities already used in bidding zones or on the borders subject to assessment, the anticipated usage shall be derived from the effective usage, where relevant, according to a growth rate associated to the functionality; and
   c) in case of new functionalities or functionalities not already being used in bidding zones, scheduling areas, NEMO trading hubs or on the borders between them that are subject to assessment, the anticipated usage shall be communicated by the originator in its request for change.

5. The usage range of a functionality is the maximum estimated usage of that functionality supported by the algorithm consistent with an adequate level of performance, according to the indicators defined in the Article 9 of Annex 3 and Article 7 of Annex 4, for the DA and ID timeframes respectively. The usage range of each functionality shall be jointly estimated in a single simulation set with the purpose of calculating in a single step the individual usage range of all the functionalities, each based on its anticipated usage. All NEMOs and all TSOs shall review, when relevant and at least annually, the usage range of any functionality impacting the algorithm performance on the basis of the estimated level of scalability indicated in the scalability report described in Article 9.

Article 8

Monitoring algorithm performance

1. All NEMOs in coordination with all TSOs, shall monitor the performance of the SDAC and SIDC algorithms and their compliance with the CACM Regulation and this Algorithm methodology. This monitoring shall be based on the principles set out in this Article and on the principles and the indicators described in the Algorithm monitoring methodology in Annex 3 and Annex 4 and shall be further detailed in the monitoring procedures.

2. The algorithm performance shall be measured against the thresholds specified in the Article 3(3) and (4) of Annex 3 and Article 3(3) of Annex 4. In case all NEMOs detect an unanticipated degradation of the algorithms' performance below the thresholds referred to in Article 3(4) of Annex 3 and Article 3(3) of Annex 4 or a non-compliance with an implemented functionality is detected according to Article 3(4) of Annex 3 and Article 3(3) of Annex 4, all NEMOs in cooperation with all TSOs shall:

   a) promptly inform all regulatory authorities and ACER;
   b) investigate to the fullest extent possible and share its findings with relevant stakeholder fora organised in accordance with Article 11 of the CACM Regulation;
   c) evaluate any potential improvement of the algorithm performance, to be introduced following a request for change or following research and development activity as described in Article 11;
   d) communicate to all regulatory authorities the solution identified, supported by relevant documentation; and
   e) whenever the conditions described in Article 12(1) apply, initiate the request for change process described in that Article 12.

3. By 1 July of every year, all NEMOs in coordination with all TSOs shall jointly develop and publish a report on the outcome of the monitoring of the algorithm performance for the past calendar year and upon request provide ACER with the data (in electronic form, which allows for data processing) used for the production of the report. The report shall contain at least:

   a) all items listed in Annex 3 and Annex 4 of this Algorithm methodology;
   b) all cases of performance deterioration or non-compliance with an implemented functionality;
   c) for the SDAC: analysis on the usage of each product and its impact on algorithm performance. The analysis on the usage shall include at least the total annual volume and number of orders submitted and cleared, number of bidding zones using each product and the number of NEMOs using each product. The impact of each individual product on algorithm performance shall contain a comparison of algorithm performance with and without the product on a historical sample of days from a at least previous calendar year;
   d) a description of the reasons of these occurrences and the used or suggested remedies or future improvements, according to Article 5 of Annex 3 for SDAC and Article 5 of Annex 4 for SIDC; and
   e) a presentation of the conclusions made in cooperation with the relevant stakeholder fora organised in accordance with Article 11 of the CACM Regulation.

Article 9

Scalability report

1. All NEMOs in cooperation with all TSOs shall identify the limit and monitor the usage of any functionality by any NEMO or TSO that affects the algorithm performance up to an upper bound defined by the usage range, taking into account the requirement of adequate scalability. The usage range shall take as basis the anticipated usage and shall assess the usage beyond it.

2. When the algorithm supports a specific functionality, the effective usage and the anticipated usage of the functionality shall serve as the basis for future assumptions related to the impact on the algorithm performance of this functionality (including the testing of other requests for change).

3. All NEMOs in coordination with all TSOs shall estimate each year for the following years the level of scalability, according to Article 5 of Annex 3 and Article 5 of Annex 4, on the basis of at least the following information related to the received requests for change and research and development activities:

   a) the extension of the SDAC and SIDC to additional bidding zones and/or NEMOs;
   b) the implementation of operation of multiple NEMOs within a bidding zone or a scheduling area;
   c) the extension of the usage of products and requirements to additional bidding zones and/or NEMO trading hubs; and
   d) the anticipated results from the activity of research and development.

4. All NEMOs in cooperation with all TSOs shall develop, publish and send to all regulatory authorities a yearly scalability report including at least:

   a) the outcome of the assessment of the estimated level of scalability for the following years and whether this level meets the adequate scalability, including the assessment of the effective usage, anticipated usage and usage range; and
   b) the perspective projects scoped for the research and development activity with the related estimated workload.

Article 10

Roadmap for planning of changes

1. In order to support a timely and consistent development of the SDAC and SIDC algorithms, every year all NEMOs in cooperation with all TSOs shall agree on a multi-year roadmap incorporating all requests for change related to:

   a) new releases of the SDAC and SIDC algorithms;
   b) amendments of requirements of the SDAC and SIDC algorithms;
   c) outcomes of the research and development activity, according to Article 11;
   d) major amendments in the usage of the existing functionalities; and
   e) future requirements as defined in the Annex 1 and 2 of this Algorithm methodology.

   This roadmap shall be updated at the end of each year and shall include requests for change with the expected go-live dates for at least next 24 months.

2. According to the roadmap, all NEMOs in cooperation with all TSOs shall elaborate a feasible calendar for the implementation of each request for change;

3. In order to include a request for change in the roadmap, the originator shall prepare and submit to all NEMOs the related requests for change, which shall include at least information under Article 15(2), letters a), b), c), d), e), i), j), k) and l).

4. Requests for change included in the roadmap process shall be preliminary assessed by all NEMOs in cooperation with all TSOs by the end of the next go-live window, in accordance with Article 17(3).

5. The requests for change in the roadmap shall have a specific priority according to Article 17(7), under the condition that the complete set of information requested under Article 15(2) is received before the time requested under Article 16(5). Once the information is completely received, the request for change shall be assessed according to Article 17.

Article 11

Research and development activities

1. All NEMOs in cooperation with all TSOs shall perform continuous research and development activities to allow for incremental improvement of the performance of the DA and ID algorithms. This shall ensure an adequate scalability as referred to in Article 3(5)(c) in order to monitor and preserve the fairness of the price formation, according to the principles laid out in Article 3(h) of the CACM Regulation and to develop new functionalities.

2. At the end of every year, all NEMOs in cooperation with all TSOs shall elaborate a research and development program for the next year. The program shall indicate at least the technical solutions subject to research and development, their qualitative expected impact on the CACM Regulation compliance, the timeline for prototyping and the estimated prototyping costs. All NEMOs in cooperation with all TSOs shall agree on the program.

3. The research and development program shall have up to two yearly assessments, depending on the needs of the originator and development activities. At the beginning of each assessment, new requests for change can be added.

4. According to the research and development program, all NEMOs in cooperation with all TSOs shall elaborate a feasible calendar for the implementation of type IV changes as set out in Article 14(3)(d), including an estimation of the identified workload;

5. All NEMOs might be required to create algorithm prototypes in order to implement the list of type IV changes elaborated by all NEMOs in cooperation with all TSOs, if the decision body considers it necessary.

6. Assessment of type IV changes shall be carried out according to Article 6 of Annex 3 and Article 6 of Annex 4.

7. If the outcome of the research and development is positive and improves beyond the thresholds defined in Article 6(2) of Annex 3 and Article 6(2) of Annex 4 for accepting the algorithm prototype, then a type I, II or III change might be issued for implementing the prototyped changes.

8. Every year, all NEMOs in cooperation with all TSOs shall provide all regulatory authorities with a report on research and development activities on the SDAC and SIDC algorithms. All NEMOs shall consult the draft report with the relevant stakeholder fora organised in accordance with Article 11 of the CACM Regulation, before submitting it to all regulatory authorities. The report shall provide at least:

   a) the status of the research and development activity in relation to the earlier agreed all NEMOs' approaches and targets; and
   b) the planning of the future research and development activity, including an estimation of the identified workload and the associated budget.

Article 12

Corrective measures

1. In case all NEMOs detect an unanticipated degradation of the algorithms' performance below the thresholds referred to in Article 3(4) of Annex 3 and/or Article 3(3) of Annex 4, due to an overall effective usage higher than the usage range, in accordance with Article 3(2) of Annex 3 and Article 3(2) of Annex 4, all NEMOs in cooperation with all TSOs may decide to apply specific corrective measures with the aim to maintain an adequate performance of the SDAC and/or SIDC algorithms. Corrective measures shall be applied also in cases when the algorithms' performance is expected to be degraded by a request for change, which cannot be rejected or postponed, in accordance with Article 19(2).

2. Any NEMO(s) and/or TSO(s) may initiate a proposal for the application of a corrective measure. The proposal shall be submitted to all NEMOs by a request for change in accordance with Article 13.

3. All NEMOs in cooperation with all TSOs shall evaluate and decide on any requests for change proposing the application of corrective measures in an objective and non-discriminatory manner in accordance with the principles defined in Article 17 and Article 19 and based on the evidence of the impact a corrective measure would have on an algorithm's performance.

4. The corrective measures referred to in paragraph 1 may be applied only for a limited time period to solve unanticipated impacts on the algorithm performance. After the deadlines referred to in Article 4(14)(d) and Article 5(14)(c), the application of a corrective measure shall be limited to eight months and an extension of it shall be possible only in accordance with paragraph 5.

5. If the algorithm performance cannot be restored within this deadline as referred to in paragraph (4), all NEMOs shall address problems related to algorithm performance by developing a proposal for amendment of this Algorithm methodology or the Terms and conditions on SDAC or SIDC products. This proposal for amendment shall be submitted for approval by the expiry of the deadline as referred to in paragraph (4). The application of corrective measures shall, in such case, be extended until the algorithm performance can be restored pursuant to amended Algorithm methodology.

6. The corrective measures referred to in paragraph 1 shall be limited to:

   a) limitations to the selection of products that NEMOs are allowed to offer;
   b) limitations to the availability of the technical features or parameters of a product or an algorithm requirement;
   c) limitations on the overall usage of products or requirements based on usage range; and
   d) changes in parameters related to the operation of the SDAC and/or SIDC algorithms, or to the thresholds described in Article 1(3) of Annex 3 and Article 1(3) of Annex 4 and in the relevant DA and/or ID change control procedures.

7. Corrective measures referred to in paragraph 6 should only be applied based on evidence of the proportional impact of different product types on the algorithm performance. Such measures may be applied on requirements pursuant to Article 14(2) only if other corrective measures prove to be infeasible or insufficient for restoring the algorithm performance.

8. In case all NEMOs in cooperation with all TSOs apply a corrective measure to limit the usage of products or requirements whose effective usage is higher than the usage range pursuant to paragraph 6(c), they shall limit the usage of these functionalities according to the sharing rules that shall be defined in the relevant change control procedure.

9. Without prejudice to what is set out in previous paragraph 8, sharing rules shall ensure a reasonable limitation on the usage of involved products or requirements to all bidding zones and/or scheduling areas and/or NEMO trading hubs. The adoption of sharing rules shall restore a value of the overall effective usage compatible with the usage range and thus an adequate level of SDAC and/or SIDC algorithm performance. In particular, the sharing rules reported in the relevant change control procedures shall introduce a limitation on the overall usage of the involved product or requirement equal to the excess of overall effective usage compared to the overall usage range, increased by a safeguard parameter. Such reduction shall be applied on a proportional basis to the NEMOs and/or TSOs using that product or requirement.

10. In case of application of corrective measures, all NEMOs in cooperation with all TSOs shall implement measures to ensure their compliance with these agreed limitations. In case any NEMO or TSO breaches such limitations and fails to take timely measures, each NEMO shall report such events to the competent regulatory authority.

11. Any corrective measure shall guarantee non-discriminatory principles among market participants and NEMOs.

12. All NEMOs shall announce publicly any introduction or discontinuation of a corrective measure at least seven calendar days before its introduction or discontinuation and maintain an up-to-date publicly accessible list of currently applied corrective measures.

13. No later than four weeks after the introduction of a corrective measure, all NEMOs shall publish a report indicating the corrective measure applied and the reasons for applying it. After the discontinuation of a corrective measure, the report shall be updated with additional information on the future measures planned by all NEMOs to address the problems that have caused the application of a corrective measure.

TITLE 4
Algorithm change management

Article 13

Principles and criteria for requests for change management

1. All NEMOs in cooperation with all TSOs shall manage all requests for change to the SDAC and SIDC algorithms' functionalities and their usage, according to the principles set out in this Article.

2. Any approved change to the SDAC or SIDC algorithm and any changes to the MCO function systems, including any modifications needed to meet future requirements, shall be implemented based on a request for change, which shall require an assessment of its feasibility and of its impact on the relevant algorithm's performance.

3. As a basic principle, a decision on requests for change shall be made by all NEMOs in cooperation with all TSOs. The related provisions concerning the decision-making shall be provided in the operational contracts among the NEMOs and/or TSOs. All NEMOs in coordination with all TSOs shall ensure that the assessment of all requests for change is done according to the provisions established in the DA or ID change control procedures among the NEMOs and/or TSOs.

4. The originator submitting a request for change shall include a preliminary assessment of feasibility and the expected impact on the relevant algorithm's performance, with the aim of demonstrating that the request for change will induce only a proportionate and controlled impact on the relevant algorithm's performance, will avoid significant harm to any other functionality already included in the relevant algorithm and is in line with the objectives of the CACM Regulation.

5. All NEMOs in cooperation with all TSOs shall conduct assessments of all requests for change in an objective and non-discriminatory manner. In order to ensure the objectivity of the assessment process, all requests for change must be submitted according to a standard format and shall be assessed according to a standard procedure, as described in this methodology and as further detailed in the relevant change control procedures.

6. When evaluating a request for change, all NEMOs in cooperation with all TSOs shall take into account any impact of a request for change on the performance of the MCO functions, systems and processes. The impact of a request for change on the relevant algorithm's performance, existing functionalities, adjacent systems and processes shall be evaluated based on the anticipated usage of the new functionality, together with the effective usage of existing functionalities, in order to ensure its technical feasibility and consistency with the performance criteria set forth in Annex 3 and Annex 4.

7. All NEMOs in cooperation with all TSOs may reject any request for change, which induces an unproportionate and/or uncontrolled impact on the relevant algorithm's performance, or where all NEMOs in cooperation with all TSOs reasonably consider that the request for change could cause significant harm to another functionality of the relevant algorithm, nevertheless in accordance with Article 19(2).

8. Requests for change shall be compatible with the algorithm requirements after they have been implemented in accordance with the deadlines specified in Article 4(14) and Article 5(14).

9. All NEMOs, in coordination with all TSOs, shall jointly ensure the transparency of the request for change process by publishing in due time all information relevant to the evaluation of the request for change, in accordance with Article 20.

Article 14

Request for change – purpose and types

1. The purpose of a request for change is (one or more or any combination):
   a) compliance with any legal and/or regulatory requirement, including the DA and ID algorithm requirements;
   b) bug fixes and incomplete algorithm requirements;
   c) application of corrective measures pursuant to Article 12;
   d) implementation of modifications that affect the performance of the SDAC algorithm and/or SIDC algorithm, including those modifications arising from the research and development activity as described in Article 11;
   e) introduction/removal/modification of an algorithm requirement requested by NEMOs and/or TSOs, including products and network elements;
   f) implementation of a new release of the SDAC algorithm and/or SIDC algorithm, including those arising from research and development activity carried out pursuant to Article 11;
   g) modification of the topology not requiring changes in the algorithm requirements, but limited to the addition or removal of network elements (e.g. the addition or removal of bidding zone borders, scheduling areas, interconnectors between bidding zones or scheduling areas or PTDFs) or NEMO trading hubs;
   h) change in configuration of the parameters of the SDAC algorithm and/or SIDC algorithm used to set the internal numerical tolerances or heuristics applied; and
   i) hardware update, including but not limited to machine upgrades and firmware updates.
2. The following requests for change shall be deemed to be a direct legal requirement pursuant to the CACM Regulation:
   a) all requirements included in the DA and ID algorithm requirements;
   b) all requirements for scalability to all bidding zones eligible to participate in SDAC and SIDC;
   c) the following requirements in accordance with the Terms and conditions on SDAC products: orders covering single MTU and the simple block orders, which are block orders, excluding linked block orders, exclusive block orders and flexible MTU orders; and
   d) the following requirements in accordance with the Terms and conditions on SIDC products: continuous single intraday coupling products and mandatory products for intraday auctions.
3. Requests for change shall be classified, depending on the expected impact of the requested change on the SDAC and/or SIDC algorithm performance and on the market participants, into one of the following categories:
   a) Non-notifiable change ('type I change'): is a change that does not directly affect the MCO function assets, does not cause any detriment to the performance of the relevant algorithm and is not relevant to market participants. Such changes are not included in the public list of all requests for change required by Article 13(9) and Article 20.
   b) Fast-track change ('type II change'): is a change that needs to be implemented with urgency. This type includes bug fixes and the application of corrective measures.
   c) Standard change ('type III change'): is a change that has a potential detrimental impact on the performance of the relevant algorithm and/or market participants. Any request for change not being of type I, type II or type IV shall be considered as type III.
   d) Research and Development change ('type IV change'): is a change aimed at activating the research and development analysis on the specific functionality involved. The assessment is carried out in the test framework according to the relevant research and development; hence, the management of such request for change is carried out according to a dedicated process as more particularly described in Article 11.
4. In derogation from general provisions under Article 16 and Article 19, all NEMOs in cooperation with all TSOs shall assess type I changes and type II changes on a continuous basis (i.e. without the periodic assessment in a given go-live window). Decisions on type I changes shall be completed within one month from the issuing date.

5. In derogation from general provisions under Article 15, Article 16, Article 17 and Article 19, a bug fix (as a subset of the type II change) may be treated in a separate process for assessment and approval as determined in the relevant change control procedure.

Article 15

Request for change – submission content

1. Any originator is entitled to submit to all NEMOs at any time a request for change with respect to the SDAC and/or SIDC algorithms and/or to the MCO function systems in a format corresponding to the template annexed to the relevant DA and ID change control procedures.

2. The request for change shall include the following information to be considered as complete:
   a) the purpose of the request for change, according to Article 14(1) and the general description of the request for change.
   b) indication of the type of request for change according to Article 14(3);
   c) originator;
   d) issuing date;
   e) expected go-live date;
   f) fully specified technical requirement;
   g) anticipated usage of the functionality;
   h) estimated impact on algorithm performance, following principles set in Article 13(4);
   i) estimated effect on other processes or systems;
   j) risk assessment;
   k) bidding zones, scheduling areas or NEMO trading hubs affected by the implementation of the request for change; and
   l) specification of the cost categorization in accordance with Article 80(2) of the CACM Regulation.

3. Where an assessment of a request for change, pursuant to Article 13(4), induced by one or more regulatory authorities indicates an adverse impact on the algorithm's performance, the originator shall inform the requesting regulatory authority(ies) and ACER about the impact. Consecutively, the originator shall enclose written evidence of the original or amended instructions from the relevant regulatory authority(ies).

4. All NEMOs in cooperation with all TSOs can decide at any moment to contact the originator with the purpose of requesting an additional information on the request for change. The originator is always entitled to receive all relevant information regarding the status of its request for change.

5. Any NEMO(s) or TSO(s) may join a request for change submitted by the originator. The originator and the NEMO(s) or TSO(s) joining the request for change may decide jointly to modify the submitted request for change.

6. Requests for change that aim to improve the algorithm performance shall be deemed beneficial to all NEMOs and all TSOs and those NEMOs and/or TSOs shall be entitled to define such requests for change as a common proposal of all NEMOs and/or all TSOs.

7. The associated costs of any request for change shall be treated in accordance with Article 80 of the CACM Regulation.

Article 16

Request for changes – timing for submission and assessment

1. A request for change may be submitted at any time, provided that the timing requirements according to this Article and the criteria described according to Article 13 are fulfilled, also taking into account provisions under Article 10.

2. The assessment of requests for change shall be carried out periodically by all NEMOs in cooperation with all TSOs in go-live windows, based on the expected go-live date of the request for change.

3. The periodic assessment of a request for change with an expected go-live date within a specific go-live window shall include all requests for change with an expected go-live date within the same go-live window in such a manner as to allow a cumulative impact assessment tests.

4. Each DA and/or ID change control procedure shall define the number of go-live windows in each calendar year. Additional go-live windows can be introduced by all NEMOs in cooperation with all TSOs as a new ad-hoc go-live window or by increasing the frequency of regular go-live windows. There shall be at least two go-live windows in a calendar year.

5. The originator shall send each request for change to the all NEMOs in cooperation with all TSOs by no later than at the end of the second go-live window prior to the go-live window during which the go-live date of such request for change is expected to occur.

6. In derogation from the previous paragraph, all NEMOs in cooperation with all TSOs shall carry out the assessment of type II change, due to their exceptional urgency, within the same go-live window of their submission or in a separate additional go-live window for quicker implementation. In the first case, the requests for change can be collectively tested and shall be prioritized according to a principle of urgency by applying prioritization rules set out in Article 17(7), to be justified by the all NEMOs in cooperation with all TSOs, while in case of a dedicated go-live window all NEMOs in cooperation with all TSOs shall implement an individual assessment of the request for change.

7. The assessment process of requests for change and the decisions shall be concluded within the go-live window antecedent the one in which the go-live date will occur. In case of a preliminary consultation under Article 19(7) or escalation process described in the relevant operational contract the time for the decision process can be extended, even beyond the duration of the go-live window.

8. If the originator submits the requests for change to all NEMOs before the time set out in paragraph 5, the requests for change can be considered validly received even if they are not reporting all information under Article 15(2), provided that:

   a) the originator provides the list of considered options and the magnitude of new products or network elements (or constraints) to be added to the algorithm; and
   b) the missing information is provided to all NEMOs in cooperation with all TSOs by the time set out in paragraph 5.

Article 17

Request for change - assessment

1. All NEMOs in cooperation with all TSOs shall evaluate any request for change in an objective and non-discriminatory manner and shall issue an assessment report for each submitted request for change.

2. In case of a request for change related to a development of the SDAC and/or SIDC algorithm, it is possible to reject the requests for change in case of unfeasibility or to request amendments in order to include additional amendments for solving interferences with other existing legal and/or regulatory requirements.

3. All NEMOs in cooperation with all TSOs shall, directly or in coordination with other bodies under the relevant operational contracts, assess for each request for change:

    a) correct indication of the purpose and type of the request for change, according Article 14(1) and (2);
    b) the originator of the request for change and impacted parties;
    c) potential prioritization criteria to be applied according to this Article below;
    d) impact assessment on the SDAC and/or SIDC algorithm performance as set out in Article 18.
    e) whether or not any development is required in the algorithm for the request for change, in accordance with paragraph 13;
    f) assignment of the go-live window according to timings set out in Article 16 and of the timeline to be followed during the assessment; and
    g) whether it fulfils the objectives of Article 3 of the CACM Regulation.

4. In case the assessment in paragraph 3(a) proves that categorization of the request for change is not correct, the all NEMOs in cooperation with all TSOs shall:

    a) assign the correct categorization of the request for change according to Article 14(2);
    b) apply the relevant assessment process in terms of timing and actions according to the relevant DA or ID change control procedure; and
    c) timely inform the originator of the modification.

5. The impact assessment of the requests for change with expected go-live dates within the same go-live window shall first be considered in combination.

6. In case the outcome of the combined impact assessment breaches the acceptance criteria described in Article 18, the assessment body shall carry out a second assessment based on individual impact assessments enclosed to the original request for change.

7. In case multiple requests for change have been received with the expected go-live dates within the same go-live window, the following prioritization shall apply:

    i.   type II change;
    ii. requests for change in accordance with Article 14(2)
    iii. requests for change from the roadmap, received in accordance with Article 10; and
    iv. other requests for change.

8. In case several requests for change have the same priority according to the previous paragraph 7, the following sub-prioritization shall apply:

    i.   requests for change extending the SDAC and SIDC to all bidding zones, improving the SDAC and SIDC between existing bidding zones also through the implementation of flow-based capacity calculation, the modification of interconnections, amending TSOs configurations and extending the SDAC and SIDC to all NEMOs eligible to participate in the SDAC and SIDC;
    ii. requests for change modifying the parameters for the usage of products or requirements used in the algorithm, including among others the modification of the usage range, the modification of the topology of bidding zones, scheduling areas or NEMO trading hubs different from those reported in point iii, the modification of the number of PTDFs;
    iii. requests for change extending the set of products or requirements used in one or more bidding zones, scheduling areas or NEMO trading hubs;
    iv. requests for change modifying the requirements included in this Algorithm methodology and/or the products included in the Terms and conditions on SDAC and/or SIDC products; and
    v.   requests for change from previous go-live windows postponed by the originator not received according to Article 10.

9. In case several requests for change have the same priority according to previous paragraph (8), the following sub-prioritization shall apply:

    a) requests for change from previous go-live windows, which were postponed;
    b) requests for change assessed in a preliminary impact assessment with a positive outcome according to Article 16(7); and

c) other requests for change.

10. The costs for assessment of requests for change shall be borne in shares, according to CACM Regulation's sharing keys.

11. In case the request for change involves simultaneously more than one of the principles referred to in paragraphs 7, 8 or 9 above, the requests for change shall be assessed on a case-by-case basis depending on the specific nature of the request. Once the assessment process is concluded, all NEMOs in cooperation with all TSOs shall take the final decision on the request for change according to the outcome of consultation and, if needed, to a new technical assessment.

12. The outcomes of the assessment of requests for change shall be included in an assessment report, containing all the relevant information on the process followed, including at least the following information:

    a) description of the requests for change, including all information from Article 15(2);
    b) proposal of prioritization of the requests for change with arguments when requests for change submitted for combined impact assessment breach the performance criteria referred to in paragraph 6; and
    c) results of the individual impact assessment, in case of the situation of paragraph b) occurs.

13. In case the request for change requires developments to be done under previous paragraph 3(e), all NEMOs in cooperation with all TSOs shall in derogation to Article 16:

    a) evaluate the go-live date of the request for change, taking into account the time necessary for the estimated development required for the request for change;
    b) amend, postpone or reject the start of the development upon consideration of resource constraints;
    c) coordinate the follow-up of the developments required for the request for change with all NEMOs to ensure a correct and timely implementation by the foreseen go-live window; and
    d) perform an impact assessment of the request for change within the respective go-live window (combined with the impact assessments of other requests for change for such go-live window) once the developments have been completed, after which the request for change will follow the normal process of this Algorithm methodology.

14. For the decision to allow the go-live of requests for change, all assessments for requests for change and the version of the respective algorithm that shall be used in the assessment process shall be the same like the one that is expected to be used in the implementation of the request for change.

Article 18

Request for change – impact assessment

1. The impact of a request for change on the performance of the SDAC and IDA algorithms, (respectively, continuous trading matching algorithm) in isolation or in combination, shall be assessed by monitoring the scalability indicator under Article 9 of Annex 3 (respectively, Article 7 of Annex 4) before and after the change.

2. To be accepted, a request for change shall fulfil the thresholds defined in Article 4(2) of Annex 3 (respectively, Article 4(2) of Annex 4).

3. The impact on the algorithms' performance shall comprise at least two scenarios: the historical scenario, according to Article 4(2)(a) of Annex 3 (respectively, Article 4(2)(a) of Annex 4), and the near future scenario, described under Article 4(2)(b) of Annex 3 (respectively, Article 4(2)(b) of Annex 4).

4. To reflect accurately the operational conditions of the algorithms, tests shall be performed using the algorithm version that will be in production at the date the request for change is expected to go live. Shall

the go-live date of the change be delayed, a new performance assessment may be required if the new expected go-live date occurs in a different go-live window.

Article 19

Decision-making and implementation of requests for change

1. The decisions by all NEMOs in cooperation with all TSOs shall be justified in the assessment report referred to in Article 17(12) and the objectives set out in Articles 3 and 37 of the CACM Regulation.

2. All NEMOs in cooperation with all TSOs shall decide on the request for change and shall issue for each assessed request for change one of the following possible decisions:

   a) Accepted: the request for change is ready to be used in production and the request for change shall be implemented within six months;
   b) Rejected: the implementation of the request for change is not compatible with the security of operation, adequate performance criteria, resource constraints or does not fulfil the objectives of the CACM Regulation;
   c) Postponed: the implementation of the request for change could be compatible to security of operation and adequate performance criteria, but it is necessary to postpone the go-live date or due to resources constraints; or
   d) Amended: the request for change as submitted is not fully compliant with security of operation and/or adequate performance criteria or demands disproportionate resources compared to its benefits, but could be compliant and accepted if appropriate amendments of it are carried out.

   Requests for change in accordance with Article 14(2) shall not be rejected or postponed beyond the legally binding deadlines. If necessary, to allow the acceptance of such request for change, the NEMOs in cooperation with TSOs shall apply corrective measures in accordance with Article 12.

3. All NEMOs in cooperation with all TSOs shall approve and implement type I changes within 30 days.

4. In case of a type III change, and provided that the combined impact assessment in accordance with Article 17(3) of all the requests for change within a particular go-live window has a positive outcome, all requests for change in such go-live window shall be approved. All NEMOs in cooperation with all TSOs might, nevertheless, decide to carry out a case-by case qualitative assessment on individual requests for change considered in the combined impact assessment in case they collectively induce an excessive variation on the algorithm performance, even though it is below the combined acceptance criteria.

5. In case of a type III change, if the combined impact assessment of all the requests for change in accordance with Article 17(5) has a negative outcome, depending on the assessment of algorithm performance with respect to the individual request for change, all NEMOs in cooperation with all TSOs can:

   i.   request the originator to amend the request for change;
   ii. postpone its anticipated go-live under the conditions set out in paragraph 2(c) above and 2(d) above;
   iii. propose an update of the criteria to assess the market performance under Article 18, in case they are deemed no longer suited to properly assess algorithm performance. In such a case all NEMOs in cooperation with all TSOs shall issue a revised proposal in accordance with Article 9(13) of the CACM Regulation within 30 days; or
   iv. trigger an escalation according to the relevant operational contract.

6. In case the actions taken by all NEMOs in cooperation with all TSOs pursuant to paragraph (5) are not sufficient to change the combined impact assessment of all the requests for change under Article 17(5), all NEMOs in cooperation with all TSOs shall approve only those requests for change with individual positive impact assessment outcomes, in order of priority according to Article 17(7). If such an approval cannot not be achieved, an escalation according to the relevant operational contract shall be triggered.

7. All NEMOs in cooperation with all TSOs may decide to consult a preliminary decision on a type III change prior to taking a final decision. Such consultation shall be carried out only in exceptional cases, such as, but not limited to, significant changes on the market design, or if the request for change triggers an amendment of a methodology under Article 5(2) of Regulation (EU) 2019/942. Once the consultation process is concluded, all NEMOs in cooperation with all TSOs shall consider the outcome of such process in order to express the final decision on the requests for change.

8. In case all NEMOs in cooperation with all TSOs activate the consultation process according to previous paragraph 7, timing on final decision indicated in Article 16 shall be considered only once the consultation is concluded.

9. The voting rules that apply for decisions on requests for change is defined in the relevant DA and ID operational contracts.

10. Any decision will be timely communicated by all NEMOs in cooperation with all TSOs to the originator.

11. After the decision on the request for change, all NEMOs in coordination with all TSOs shall issue a public report indicating the decision, the reason for the decision, the principles behind the decision and the assessment report as referred to in Article 17(12), in order to ensure transparency on the change request process.

12. In case of failure of the decision making process in this article, the escalation process shall be triggered according to the relevant provisions set forth in the operational contracts.

TITLE 5
Transparency and reporting

Article 20

Publications and reporting

1. All NEMOs shall publish and maintain a set of documents to be formally updated and consulted with the relevant stakeholder fora, organised in accordance with Article 11 of the CACM Regulation.

2. All NEMOs shall publish, continuously update and consult in the relevant stakeholder fora the following draft documents:

   a) the public description of the SDAC algorithm as referred to under Article 4(18);
   b) the public description of the continuous trading matching algorithm as referred to under Article 5(18); and
   c) the public description of the IDA algorithm as referred to under Article 6(16).

3. All NEMOs shall develop and publish with the relevant periodicity the following reports:

   a) the report on incidents in the operation of the SDAC and SIDC algorithms and on the application of back-up and fallback procedures in accordance with the Back-up methodology and Fallback methodology and in accordance with Article 4(17) and Article 5(17);
   b) the report on research and development activities in accordance with Article 11(8);
   c) the reports on the outcome of the monitoring of the algorithm performance in accordance with Article 8;
   d) the report on scalability in accordance with Article 9(4);
   e) the report on the application of corrective measures in accordance with Article 12(13); and
   f) the reports on the decisions on requests for change in accordance with Article 19(11).

4. All NEMOs shall publish and maintain a continuously updated record of the currently and historically applied corrective measures.

5. All NEMOs in coordination with all TSOs shall publish at least one month in advance the date of the yearly workshop with stakeholders and institutions on the requests for change Roadmap under Article 10.

6. All NEMOs shall publish, pursuant to Article 62(2) of the CACM Regulation:

   a) the aggregated volumes of all trades made per contract per bidding zone – two values are requested, sell volumes and buy volumes;
   b) the volume-weighted average intraday prices per contract and bidding zone[1]; and
   c) the volume-weighted average intraday prices per contract and bidding zone that took place during the last trading hour[2].

   The information shall be published no later than 12:00 on the day following the trading day.

7. By 1 September 2020, all NEMOs in coordination with TSOs shall publish and then continuously update the relevant parts of the following documents:

   a) operational contracts;
   b) operational procedures;
   c) change control procedures;
   d) monitoring procedures;

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[1] For the calculation of this indicator, all trades where either the seller, the buyer or both are located in the relevant bidding zone are to be considered and weighed equally.
[2] See footnote 1

e) fallback procedures; and

f) back-up procedures.

Whenever this Algorithm methodology refers to the 'relevant' procedures or contracts, it means the respective documents setting up any relationship among only NEMOs or among only TSOs or between NEMOs and TSOs, and shall cover either the DA or the ID timeframe.

Article 21

Access to data by regulatory authorities

1. The regulatory authorities or relevant authorities primarily responsible for monitoring NEMOs in accordance with Article 82(1) of the CACM Regulation shall have the power to request from the respective NEMOs all information and data used in the monitoring of the algorithm performance, historical input data used by the algorithms in calculating SDAC and SIDC results. They shall provide access to this information and data to other regulatory authorities and ACER.

2. NEMOs shall also make the source code of the algorithms auditable by third parties mandated by the regulatory authorities and/or ACER, subject to non-disclosure agreement and in coherence with contractual agreements with the relevant third parties.

3. The regulatory authorities responsible for monitoring NEMOs in accordance with Article 82(1) of the CACM Regulation can request from the respective NEMOs the simulation of the algorithm results, respecting adequate repeatability pursuant to Article 3(5)(b) and Article 3(6)(b)) of this methodology. They shall provide access to this possibility to other regulatory authorities and ACER.

TITLE 6
Final provisions

Article 22

Language

The reference language for this Algorithm methodology shall be English. For the avoidance of doubt, where NEMOs need to translate this Algorithm methodology into the national language(s) of a relevant national regulatory authority, 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 Algorithm methodology to the relevant national regulatory authorities.