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

14 February 2017

All NEMOs, taking into account the following:

Whereas

Background

(1) This document is a common proposal developed by all Nominated Electricity Market Operators (hereafter referred to as "NEMOs") for the price coupling algorithm and for the continuous trading matching algorithm (hereafter referred to as the "Algorithm Proposal") in accordance with Article 37(5) of the Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (hereafter referred to as the "CACM Regulation"). It incorporates as an annex a common set of requirements proposed by NEMOs and TSOs for the price coupling algorithm and the continuous trading matching algorithm (hereinafter referred to as "DA Algorithm Requirements" and "ID Algorithm Requirements" respectively) in accordance with Article 37 of the CACM Regulation.

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

(3) When both proposals are prepared, all NEMOs and all TSOs shall cooperate to finalise the sets of the TSOs' and NEMOs' DA and ID Algorithm Requirements. Subsequently, "*all NEMOs shall develop a proposal for the algorithm in accordance with these requirements. This proposal shall indicate the time limit for the submission of received orders by NEMOs required to perform the MCO functions in accordance with Article 7(1)(b).*"

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

(5) In accordance with Article 37(4) "*The proposals referred to in paragraphs 1 and 2 shall be subject to consultation in accordance with Article 12*". The consultation on all proposals - i.e., the TSOs' and NEMOs' DA and ID Algorithm Requirements and the NEMOs' proposal for the Algorithm Proposal - shall be prepared in cooperation between all TSOs and all NEMOs and be consulted upon together to ensure efficient assessment of their content by market participants.

(6) The all NEMOs' proposal for the Algorithm Proposal incorporating the TSOs' and NEMOs' DA and ID Algorithm Requirements and taking into account the comments from the consultation shall be submitted to the regulatory authorities for approval no later than 18 months after the entry into force of the CACM Regulation - i.e., 14 February 2017.

(7) In accordance with the Whereas (14) of the CACM Regulation, the DA and ID Algorithm Requirements are based on the current coupling solutions, either implemented or under development and updated or amended where seen appropriate.

(8) Future evolution of capacity calculation methodologies in accordance with the CACM regulation may require additional input parameters. In this case, all TSOs shall send a request for amendments of the algorithm to the NEMOs and later on for all NRAs' approval. An assessment of the additional algorithm functionalities shall take place at the latest when the proposal for the capacity calculation methodology in every capacity calculation region (CCR) in accordance with the CACM Regulation is being developed by the TSOs. All TSOs and all NEMOs shall cooperate to propose any amendments if

deemed necessary when the above proposals for the capacity calculation methodology is submitted for approval to the national regulatory authorities (ten months after the approval of the all TSOs CCR Proposal).

(9) NEMOs shall establish, consistent with the MCO plan, through a NEMO Cooperation Agreement entered into by all NEMOs, a NEMO Committee and associated governance arrangements compliant with the CACM Regulation. Joint NEMO decisions and responsibilities regarding this Algorithm Proposal shall be coordinated via the NEMO Committee and associated governance arrangements. Decisions of the NEMO Committee in this proposal refers to decisions of All NEMOs coordinated via the NEMO Committee.

Impact on the objectives of CACM Regulation

(10) The proposed Algorithm Proposal takes into account the general objectives of capacity allocation and congestion management cooperation described in Article 3 of the CACM Regulation. The DA and ID Algorithm Requirements aim in particular at ensuring optimal use of the transmission infrastructure (optimizing the calculation and allocation of cross - zonal capacity) and promoting effective competition in the generation, trading and supply of electricity while respecting the need for a fair and orderly market and fair and orderly price formation (encouraging the development of market liquidity).

(11) The procedures for maintaining the algorithms aim at ensuring fair and non-discriminatory treatment of TSOs, NEMOs, market participants, NRAs and ACER. The DA and ID Algorithm Requirements support trading with multiple NEMOs while facilitating a level playing field for NEMOs. The algorithms also allow participation by more than one TSO on one or both sides of a bidding zone border.

(12) Further, the Algorithm Proposal ensures and enhances transparency and reliability of information through the provision of suitable algorithm documentation, performance reporting to all involved stakeholders and a transparent process (including consultation where relevant) to manage changes to the algorithms.

(13) The Proposal establishes that the DA and ID Algorithm's operational performance and compliance will be managed in accordance with principles that:

a) Provide an objective basis to monitor and communicate operational performance;
b) Provide assurance that the Algorithm Performance (DA and ID) is at an acceptable level. In particular, that the DA Algorithm is for all days able to find a compliant solution to the market coupling problem in the permitted time;
c) Support stakeholders' understanding of the DA and ID Algorithm.

(14) The Proposal establishes that changes to the DA and ID Algorithm will be managed in accordance with principles that:

a) Provide an open, transparent, non-discriminatory way to manage change requests, including stakeholder input where relevant;
b) Provide assurance that the Algorithm Performance shall be maintained at acceptable levels now and over a reasonable period of time in the future, assuming plausible market growth and development;
c) Enable individual NEMO or TSO requests to be supported where this does not harm others or includes measures to mitigate any harm;
d) Establish a fair and efficient process that supports timely market development.

Implementation timeline

(15) The NEMOs shall implement the Algorithm Proposal in a Bidding Zone with respect to the implementation of the SDAC/SIDC immediately after the approval by the NRAs of the Algorithm Proposal, and with respect to the amendment and operation of the SDAC/SIDC immediately after:

a) the common grid model methodology developed in accordance with Article 17 of the CACM Regulation, the capacity calculation methodology developed in accordance with Article 20 of the CACM Regulation, and the relevant coordinated capacity calculator have been set up in accordance with Article 27 of the CACM Regulation on the borders of the relevant Capacity Calculation Region, and

b) the MCO function has been implemented in accordance with Article 7(3)) of the CACM Regulation, and the arrangements to accomodate multiple NEMOs developed in accordance with Article 57, are implemented in all the Bidding Zones where there are multiple NEMOs.

SUBMIT THE FOLLOWING ALGORITHM PROPOSAL TO ALL REGULATORY AUTHORITIES:

TITLE 1

GENERAL PROVISIONS

Article 1

Subject matter and scope

1. The Algorithm Proposal in this Proposal shall be considered as the common proposal of all NEMOs in accordance with Article 37 of the CACM Regulation.
2. The annexed DA and ID Algorithm Requirements shall be considered as the common proposal of all NEMOs and all TSOs, in accordance with Article 37 of the CACM Regulation.
3. The reference language for this proposal shall be English. For the avoidance of doubt, where NEMOs need to translate this proposal into their national language(s), in the event of inconsistencies between the English version published by the NEMOs in accordance with Article 9(14) of the CACM Guideline and any version in another language, the relevant NEMOs shall be obliged to dispel any inconsistencies by providing a revised translation of this proposal to their relevant national regulatory authorities

Article 2

Definitions

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

In addition, the following definitions shall apply:

1. Algorithm Performance: means the ability of the DA or ID Algorithm to provide in the timeframe allowed in production reliable and valid quality results plus any other performance indicators established by the NEMO Committee in coordination with TSOs.
2. Anticipated Usage: means a reasonable expected Effective Usage of a Functionality by each individual Party. For new Functionality the Anticipated Usage is indicated by the same Party in the submitted Change Request. For existing Functionalities, the Anticipated Usage will be derived from the Effective Usage

according to a formula commonly defined amongst NEMOs. Anticipated Usage will be used for the purpose of testing the impact of Change Requests at a time horizon set by the NEMO Committee (typically 1 year).

3. Change Request: means a formal request by one or more Parties for any modification to be made to the DA or ID Algorithm or to its usage in production.
4. DA Algorithm: means the price coupling algorithm in the single day-ahead coupling MCO function computing prices and net positions and providing necessary input to shipping and clearing processes.
5. Effective Usage: means the observed relevant historic usage of a Functionality in production by each individual Party.
6. Functionality: means any market or network feature or design element embodied in the systems, communications and procedures that support the DA or ID Algorithm in accordance with the Algorithm Requirements.
7. Future Requirements: means DA or ID Algorithm requirements proposed according to Article 37 which the DA or ID Algorithm will comply with after the initial start of the single day-ahead or intraday coupling, where necessary subject to clarification of the requirements and technical assessment of the impact on Algorithm Performance.
8. ID Algorithm: means the continuous trading matching algorithm in the single intraday coupling MCO function computing order display, matching orders and providing necessary input to shipping and clearing processes.
9. Initial Requirements: means DA or ID Algorithm Requirements proposed according to Article 37 which the DA or ID Algorithm will comply with from the start of operation of the single day-ahead or intraday coupling (as further defined in the MCO Plan).
10. Local contract: contract not defined in XBID/the ID algorithm. Orders on local contracts can only be matched by the NEMO that configured these contracts in their trading system and only inside the bidding zone they were entered in.
11. Owners: means the Parties (all TSOs and/or all NEMOs) proposing an Algorithm Requirement according to CACM Article 37. The Owners are responsible for defining the Algorithm Requirement, agreeing to any modification to such Algorithm Requirement and for verifying that the DA or ID Algorithm Functionalities meet the Algorithm Requirement.
12. Party: means any NEMO or TSO unless specified otherwise.
13. Usage Limit: means the maximum usage of any Functionality which can significantly impact Algorithm Performance allowed in production by an individual Party. The Usage Limit is based on the Anticipated Usage, modified by a growth factor defined according to principles agreed in the NC, in coordination with TSOs.

Article 3

Algorithm Requirements

1. The DA Algorithm Requirements are set out in annex 1 and the ID Algorithm Requirements in annex 2, in order to guarantee efficient capacity allocation, facilitate efficient price formation, respect approved cross-zonal capacity and allocation constraints provided by TSOs, respects the requirements for the delivery of results, be repeatable and scalable in line with CACM requirements under article 37.1.a), 38.1, 51.1.
2. The Algorithm Requirements comprise a common set of Requirements proposed by TSOs, a common set of Requirements proposed by NEMOs and a common set of Requirements jointly proposed by both TSOs and NEMOs.
3. Any modification to Functionality, including modifications needed to meet Future Requirements, shall be implemented according to a Change Request, including assessment of feasibility and algorithm performance impact.

4. The NEMO Committee shall maintain the DA and ID Algorithm Functionalities to be compliant with the Initial Requirements plus Future Requirements (following their implementation).

Article 4

DA Algorithm

1. The price coupling algorithm shall be based on the PCR Euphemia algorithm initially developed and operational in the MRC and 4MMC regions.
2. The price coupling algorithm shall utilise an optimiser in combination with heuristic rules that seek to maximise overall economic welfare based on the input orders and transmission network data together with the network and market matching constraints.
3. The price coupling algorithm shall first aim to find a solution that complies with the inputs and solution constraints. It shall then seek to find solutions with higher economic welfare within the operational time allowed.
4. Orders shall be anonymous – i.e., there shall be no identification of the originating market participant.
5. A single instance of the price coupling algorithm operated by the coordinator shall calculate the results for all coupled NEMO Trading hubs, where a NEMO Trading hub represents the orders submitted on one particular NEMO in one bidding zone.
6. The input data shall be available to any authorised operator, who is entitled to perform the price coupling calculation in parallel.
7. The results from the price coupling algorithm shall comprise the following:
   a) per bidding zone and PUN region: prices for each relevant market time unit,
   b) per NEMO Trading hub: net volumes, aggregate matched orders for each relevant market time unit, matched complex, block, merit and PUN orders
8. The NEMO Committee shall establish the operational procedures and timings, including both normal procedures and back-up procedures, consistent with operational requirements under CACM. NEMOs shall be required to comply with these procedures.
9. Under normal operations, NEMOs shall submit orders to the MCO Function by 12.10 or else backup procedures shall apply.

Article 5

ID Algorithm

1. The continuous trading matching algorithm shall be based on the XBID solution initially developed in the NWE+ group of countries.
2. The continuous trading matching algorithm shall comprise a shared order book (SOB) module and a capacity management module (CMM). The SOB module shall manage order entry, order management and order matching, while the capacity management module shall manage transmission capacity management and allocation.
3. The continuous trading matching algorithm enables multiple NEMOs to connect to the central SOB module. Orders are entered in the local trading solutions; all valid orders entered in time in the local trading solution are automatically entered into the SOB (not orders on local contracts); market participants are not entitled to access the shared order book directly.
4. Matching of contracts shall be performed in the SOB module, irrespectively of the delivery areas the orders were entered (including from the same area). NEMOs are entitled to match other local contracts themselves. The SOB module maintains a consolidated order book for all contracts (not being local contracts) based on available transmission capacity and allocation constraints between market areas.

5. The CMM shall provide the current capacity availability information. When cross border trades are performed, the required cross border capacity shall be implicitly allocated in the CMM.
6. Explicit participants shall directly access the CMM to perform explicit capacity reservations.
7. The SOB module shall determine the local view of all orders that can be executed in the selected delivery area – i.e., local orders plus orders from connected delivery areas where there is available transmission capacity.
8. The SOB shall apply deterministic matching procedures. Contracts shall be executed in the SOB on the price-time-priority principle:
    a) Price: orders shall be executed at the best price. The best buy order shall be executed against the best sell order first (the best price for buy orders is the highest price, for sell orders it is the lowest price).
    b) Time: when an order is entered into the SOB, it shall be assigned a timestamp. This timestamp is used to prioritize orders with the same price limit. Orders with earlier timestamps shall be executed with a higher priority than orders with a later timestamp.
9. The clearing price for a newly entered order that is matched shall be the order price of the best order which is already in the SOB:
    a) If a newly entered buy order is matched against an existing sell order, the limit price of the sell order becomes the trade execution price.
    b) If a newly entered sell order is matched against an existing buy order, the limit price of the buy order becomes the trade execution price.
10. Where a cross-zonal trade is identified in the SOB, a request for the associated cross-zonal capacity shall be made to the CMM. Requests for implicit capacity shall be queued along with explicit capacity requests and treated in time sequence. If the necessary cross-zonal capacity is not available, the cross-zonal trade is not matched.
11. There shall be no discrimination between the matching of single-time-unit orders, the matching of multiple-time-unit (i.e. block) orders and granting explicit capacity requests. These requests shall all be treated on a first-come-first served basis.

Article 6

Algorithm Management Principles

The DA and ID Algorithm's operational performance and compliance shall be managed in accordance with the Algorithm Management Principles set out below.

1. Performance shall be controlled and measured by the NEMO Committee, in coordination with all TSOs, according to a specific Algorithm Monitoring Procedure, in line with CACM article 10..
2. The Algorithm Monitoring procedure recalled under article 6.1 shall include at least, for the DA and for the ID algorithm:
    a) the relevant definition of performance;
    b) the relevant indicators to monitor algorithm performance and compliance with implemented Algorithm Requirements, which shall include at least:
        i. for the DA algorithm: the level of welfare, indicator(s) of the optimality of the welfare achieved, the time spent by the algorithm to reach a first solution, the number of PRBs and PRMICs, plus any further metric which shall be developed along the time;
        ii. for the ID algorithm: the time needed to process an order, the time needed to process a trade, the time needed to produce post-coupling output, plus any further metric which shall be developed along the time;
    c) the relevant thresholds to identify performance deteriorations or potential non-compliance with implemented Algorithm Requirements;

d) the frequency and process for the different reporting of the outcome of the monitoring activity towards the Nemo Committee, all TSOs, all NRAs and the relevant stakeholder forums organised in accordance with Article 11 of CACM Regulation;
e) the process to be followed to restore performance and compliance in case needed, in coordination with all TSOs and informing all NRAs;
f) the relevant information to be disclosed to third parties and the relative channels.

3. In particular, according to article 6.2 letter e), whenever performance deterioration or non-compliance with an implemented Algorithm Requirement is detected according to the procedures under previous article 6.1, the NEMO Committee shall:
   a) promptly inform all TSOs and all NRAs;
   b) investigate and to the fullest extent possible share its findings with relevant stakeholder forums organised in accordance with Article 11 of CACM Guideline;
   c) evaluate any potential improvement of the algorithm, to be introduced following a change request;
   d) communicate to all TSOs and all NRAs the solution identified, supported by relevant documentation;
   e) eventually initiate the Change Request process described under article 7.

4. The Algorithm Monitoring Procedure recalled under article 6.2 is approved by the Nemo Committee, in coordination with all TSOs and after public consultation. The Procedure shall be maintained according to article 9 provisions.

Article 7

Change Management Principles

The NEMO Committee shall manage changes to the DA and ID Algorithm Functionality and usage according to the principles in this Article 7. The principles shall be incorporated by the NEMO Committee into more detailed change management procedures.

Moderation and control

1. Any Change Request shall induce only a proportionate, controlled impact on the Algorithm Performance - and no significant harm to any other Functionality already included in the DA or ID Algorithm and shall be compatible with the Initial Requirements plus Future Requirements (following their implementation).
2. Algorithm Performance shall be measured against criteria as specified in Article 6.1.
3. Any impact on the performance of related MCO function systems and processes shall also be taken into account.

Fair and Non-Discriminatory Treatment of Change Requests

4. All Parties have the right in principle to use any Functionality subject to approval of a Change Request.
5. Any new Functionality is available to be used by all Parties that initially contributed to its development plus any other Party that is willing to share the historical cost of this new Functionality. Usage by a party of the Functionality shall be subject to a corresponding Change Request. The associated costs shall be shared according to sharing rules in compliance with CACM.
6. Change Requests to the DA or ID Algorithm requested by any Party(ies) shall be handled in an objective and non-discriminatory manner. The criteria to manage the Change Requests shall be set out in the relevant

Change Control Procedure, approved by the Nemo Committee in coordination with all TSOs and after public consultation. The Procedure shall be maintained updated according to article 9 provisions.

7. Change Requests that aim to improve Algorithm Performance are deemed to be of benefit to all NEMOs, and shall be decided upon by the NEMO Committee and the costs proposed to be treated as Common Costs according to CACM. Similarly, the NEMO Committee is entitled to decide that any Change Request is considered a common proposal of all NEMOs.
8. Change Requests shall be accepted by the NEMO Committee provided the requesting Party(ies) bears the associated costs in accordance with CACM and such Implementation in particular complies with Article 7.1.
9. Any Party is entitled to join another Parties' Change Request provided that (i) the additional Party(ies) is entitled to request modifications to the Change Request and which the original requesting Party(ies) shall consider in good faith and not unreasonably reject, and that (ii) the original requesting Party(ies) and any additional Parties shall, as long as Article 7.7 is not deemed by the NEMO Committee to apply, bear the associated costs (where any cost sharing shall be in accordance with CACM).

Usage Limits

10. The use in production by any Party of any Functionality impacting the Algorithm Performance is subject to controlled Usage Limits .
11. After a Functionality is available in production, the Effective Usage and the Anticipated Usage of the Functionality shall serve as the basis for future assumptions related to the impact on Algorithm Performance of this Functionality (including the testing of other Change Requests).
12. The agreed Usage Limit does not grant a reserved allowance to a Party for DA or ID Algorithm Performance degradation to be redeployed for future use or any other purpose.
13. The Party shall implement measures to prevent violation of the agreed Usage Limits. Such measures shall be included in the Change Request. In case any Party breaches the Usage Limits and fails to take timely measures, including for example gaining approval of a CR for increasing the Usage Limits, the other Parties may report it to all NRAs.
14. Parties are responsible to ensure that the conditions expressed in the approved Change Request are respected in production. In particular, if a Party anticipates that the Effective Usage of a Functionality will exceed the Usage Limit for this Functionality, the Party shall issue a Change Request for increasing the Usage Limit.

Change Request Process

15. The Party(ies) proposing a Change Request is responsible for fully specifying their requirement, including the requested Anticipated Usage and any subsequent effect on processes or other systems.
16. The impact on Algorithm Performance, existing Functionalities, adjacent systems and processes shall be assessed based on Anticipated Usage of the new Functionality together with Anticipated Usage of existing Functionalities.
17. The assessment of Change Requests related to the same implementation timeframe shall first be considered in combination. Where such combination breaches the acceptance criteria, a second assessment based on individual impact can be done.

Decision-making

18. Change Requests must be approved by the NEMO Committee based on an objective evaluation report.
19. Approved and rejected Change Requests are made publicly available, with the relevant motivation, in order to ensure the objective and non-discriminatory treatment of change requests, unless such Change Request include commercial sensitive information.

20. All impacted Parties are entitled to receive all relevant information regarding the status of a Change Request.
21. Where a decision in accordance with this Algorithm Proposal impacts the Algorithm Requirements proposed by all TSOs (or by all TSOs and all NEMOs jointly), the NEMO Committee shall coordinate with TSOs.
22. Any decisions required by the NEMO Committee in accordance with this Algorithm Proposal shall be motivated by reference to the objectives set out in Articles 3 and 37 of CACM.
23. The NEMO Committee is entitled to decide to refer a decision in accordance with this Algorithm Proposal to an independent arbitral tribunal to be established by NEMOs, in coordination with all TSOs, for a binding decision.
24. Any Party is entitled to challenge a decision taken by the NEMO Committee in accordance with this Algorithm Proposal by requesting a referral to the independent arbitral tribunal.
25. Referrals under 7(35) and 7(36) shall be according to procedures established by the NEMO Committee, in coordination with TSOs consistent with 7(33).

Article 8

Stakeholders involvement

1. In order to promote market transparency and proper level of stakeholder involvement, and to ensure that the algorithm is managed and developed in an objective and non-discriminatory manner, the following provisions apply.
2. The Nemo Committee shall maintain a public description, to be formally updated on a periodic basis and consulted with the relevant stakeholder forums organised in accordance with Article 11 of CACM Regulation, of the following documents:
   a) the DA and ID Algorithm under article 4 and 5;
   b) the Algorithm Monitoring Procedure, referred to under article 6;
   c) the Change Control Procedure, referred to under article 7;
   d) the appointment of the independent arbitral tribunal, referred to under articles 7.28 and 7.29
3. The Nemo Committee shall maintain an updated public record of:
   a) approved and rejected change requests referred to under article 7, with the relevant motivation;
   b) applied Usage Limits, referred to under article 7.
   c) the performance results of the algorithm, measured accordingly to the criteria referred to in the Procedure under article 9.2.b);
   d) reporting of any incident visible to market parties, and the application of back up and fallback procedures.

ANNEX 1 – DA Algorithm Requirements

ANNEX 2 – ID Algorithm Requirements