Algorithm monitoring procedure, according to Algorithm methodology defined in ACER decision 04/2020

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Version	Date	Name	Function	Signature

Previous versions

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0.1	18/05/2020	Álvaro Turégano	Initial draft
0.2	30/06/2020	Álvaro Turégano	Update
0.3	30/06/2020	OTE	Update inclusion of CACM Report tables
0.4	13/07/2020	MSD TSO co-Chair	Review + inclusion of part on the monitoring of operations
0.5	17/07/2020	M. Hilpert	Inclusion of part anticipated usage and RfC impact assessment
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0.9	07/06/2021	Camilla Vedeler Matin Bagherpour Álvaro Turégano	Including information after alignment discussions with CCP

Table of contents

Table of contents

1 Introduction

This procedure describes the process of assessing the performance of the SDAC algorithm for the day-ahead Market Timeframe and the process of determining and calculating the algorithm monitoring indicators allowing to assess and monitor the operations of the SDAC.

The **Algorithm Monitoring Procedure (AMP) for the Day-Ahead market** implements the provisions written in the Algorithm Methodology (**AM**), and Algorithm monitoring methodology for single day-ahead coupling", (**AMM**), as defined by ACER decision 04/2020, in annexes I ("Algorithm Methodology") and IV ("Annex 3 of the Algorithm Methodology), respectively. The AM article 20 (7)d sets the publication of the AMP on the 1st September 2020.

According to the AM Article 2.3 b),
This Algorithm Monitoring procedure describes:

- **the process of assessing the performance of the SDAC algorithm** for the day-ahead Market Timeframe
- **the process of determining and calculating the algorithm monitoring indicators** allowing to assess and monitor the operations of the SDAC.

The outcome of the monitoring and assessment is approved by the respective SCs and then published by 1st July of every year jointly by the NEMOs and TSOs in the CACM Annual report.

Upon request **NEMOs and TSOs** shall provide ACER with the data used for the reporting. There is a separate AMP for the SIDC algorithm. The CACM report contains data for both SDAC and SIDC.

This procedure describes the processes mentioned above, in addition to describing:

- **the process linked to the preparation of the CACM Annual report**
- **the information about the Operations report on a quarterly basis**
- **it defines the thresholds, as stipulated in the AMM, art. 9.2.**

The procedure is structured as follows:

- Legal framing
- Process
    - data gathering and aggregation
    - indicators extraction and aggregation

- CACM annual report preparation and publication
- Performing assessments pursuant to AMM
- Quarterly report
- Thresholds
- Transitory provisions

2 Legal documents & definitions

Documents

- **Algorithm Methodology – AM**: Annex 1 of ACER Decision 04/2020 on Algorithm methodology.
- **Algorithm monitoring methodology for single day ahead coupling – DA AMM**: Annex 3 to the Algorithm methodology, published on the 3rd February 2020 as Annex IV of the ACER Decision 04-2020 on Algorithm methodology
- Single Day-Ahead Coupling Operations Agreement – DAOA from 14th February 2019

Definitions

- **AM: Algorithm Methodology**
- **AMM: Algorithm monitoring methodology**
- **AMP: Algorithm monitoring Procedure**
- **Dump**: binary file containing data from a database, used for transferring big volumes of data between databases.
- **Historical data set:** data set containing the data from historical sessions. Depending on the purpose to be used, it may contain results or not.
- **HMMCP**: Decision of the Agency for the Cooperation of Energy Regulators No 04/2017 of 14 November 2017 on the Nominated Electricity Market Operators' Proposal for Harmonised Maximum and Minimum Clearing Prices for Single Day-Ahead Coupling.
- **RfC**: Request for change, as defined in AM article 14
- **Scenario**: set of data used for a specific purpose. It should be noted that the same set of data may be used for several purposes. For instance, the historical set of data may be used for extraction monitoring data or running the optimality study.

3 Process:

3.1 Data to gather and aggregate.

3.1.1 Data gathering and aggregation.

Each day, after the DA market coupling session, the coordinator **extracts the dump file** and stores them in an FTP. The dump file contains the input data and the results that were calculated and distributed by the coordinator to all NEMOs. This dump file contains all tables used by the price coupling algorithm.

The extraction of the dump files shall be an activity carried out by all NEMOs under MCO function.

As the **"session_id"** field in **Sessions** table that identifies the session is following a local sequence and it is different in all the NEMOs instances, its value shall be changed to the delivery date when

the dump file is generated, reporting the delivery date in the format YYYYMMDD, where YYYY is the year, MM is the month and DD is the day. This ensures that no problem will exist when the dump files are aggregated.
It should be noted that in the development of the algorithm there exist some hashes used as last criterion to solve tie-break cases in orders' acceptance. These hash calculations for the tie-breaks do not consider the session_id field, and as a result consistency of the input data is assured when the "session_id" value is changed.

Dump files from the coordinator are aggregated into a historical data set, which is used for monitoring and reporting purposes and will serve also as starting point for the preparation of other scenarios:

- modifying the time horizon of the data (e.g. rolling, recent historical set and whole year historical data sets);
- or altered by adding the anticipated usage of RfCs and the organic growth projected towards the future (e.g. to include a projected growth etc. for the near future /distant future set).

The aggregation of dump files into historical data sets is an activity that shall be done by PCR MSD-ALG.

To be noticed: The dump files for the shadow calculations made by the non-coordinator NEMOs shall also be generated. These dump files shall not be used for any monitoring procedures defined in the AM or its annexes. These shall be only used for providing additional information to be evaluated for the cases in which coordinator experienced difficulties in the calculation of the results, as defined in the operational procedures.

3.1.2 Creation of the scenarios

The data for individual delivery dates are collected and merged in data sets.
Starting point is the creation of the historical data sets.
Once the historical data sets are created, the other scenarios will be created by applying alteration scripts. Depending on the purpose of the scenario, the alterations may emulate the organic growth of orders based on historical growth trends, add new data provided directly by the RfC or by copying similar orders from the same or adjacent sessions and applying modifications in order to match the orders with the requirements from the RfC.
An RfC that requires the need of specifying anticipated usage may require the application of several alterations to create a scenario that considers all the effects of that RfC.
The indicators shall be calculated with a daily granularity over different temporal sets of delivery days (see AMM, art.2).

In order to validate the creation of scenarios, every time a new alteration is created, the correct functioning of this alteration shall be validated following the four-eyes principle.

Input data indicators defined in DA AMM Title 4 shall be used to validate that the application of alterations changes is properly applied in the scenarios.

3.1.3 Data sets defined by AM and AMM and their application

Data sets	Scenarios data set might be used for (according to AMM, art.3)
[DA AMM Art 2 a)] **The recent historical set** shall comprise the delivery days of the previous K (K<13) months, starting from the Kth month ('M') before the assessment (M-K) up to the previous month (M-1)	**Monitoring purposes: usage range, performance (TTFS), output indicators.** • Results obtained will be measured against the usage range of the algorithm.

and may exclude for practical reasons the days on which a daylight-saving time change occurs and/or any days on which a partial/total decoupling occurs. The K value shall be defined in the operational procedures	• In case the effective usage is beyond the usage range, a warning will be issued by PCR MSD-ALG towards SDAC OPSCOM and SDAC SC • In case the effective usage is beyond the usage range and problems appear in production, then corrective measures shall be initiated, accordingly to AM
[DA AMM Art 2 b)] **The rolling historical set** shall comprise the previous year's delivery days, starting from the 13th month before the assessment (M-13) up to the previous month (M-1) and may exclude for practical reasons the days on which a Daylight-Saving Time change occurs and/or any days on which a partial/total decoupling occurs	**Historical scenario: calculate indicators** All indicators from Title 3, 4 and 5 of AMM (performance, usage, output). An average of values may be applied in order to extract the conclusions regarding the monitoring. **Historical scenarios comparison with recent historical data set: assess indicators** **Economic surplus indicator (AMM, art 7) and repeatability indicator (AMM, art. 8)**: Compare values of the recent historical set and the rolling historical set (AMM, art. 3.3)
[DA AMM Art 2 c)] **The whole year historical set** will comprise the previous full years' delivery days, counting only complete years, and may exclude for practical reasons the days on which a Daylight-Saving Time change occurs and/or any day on which a partial/total decoupling occurs	**Calculate the monitoring indicators for the annual report:** effective usage, performance, optimality, output indicators **Scalability study:** reference batch. **Individual impact of products study:** historical data set will be used as reference and the other scenarios will be created by replacing some of the products by the remaining ones. **Optimality study:** the historical data set with the results will be used as reference. The same input data will be run ex-post with additional calculation time. **Repeatability study:** all the ex-post simulations will use the whole year historical data set as input data. Repeatability indicators from AMM art. 8 will be used. When there exist several "clouds", understood as separated capacity calculation regions (CCR), a whole year historical data set shall be created for each one and one additional historical data set will be created by merging all the capacity calculation regions with the appropriate border interconnections.
[DA AMM Art 2 d)] **The near future set** for the indicator calculation shall be defined by reference to the projected growth of the whole year historical set for the following year (Y+1) and taking into account all the forward-looking system information expected at the time of evaluation	**Assessment of RfCs:** the growth of the orders observed in the past shall be projected to the near future (Y+1) and the anticipated usage of the RfCs for the GLW under assessment shall be incorporated to the scenarios.

	Additional scenarios may be created for the preliminary assessment of the RfCs in GLWs following the GLW currently under assessment. **Scalability study:** near future assessment [redacted] **Anticipated usage** Defined by AM, art. 7.4, it represents the expected effective usage of a functionality observed in a near future set. According to AM Article 7(4), the anticipated usage is based on the following principles: -The **near future set** shall be the same for all functionalities and should be wide enough to avoid the influence of seasonal effects. -The anticipated usage shall be derived from the effective usage according to AM Article 7(3), in case existing functionalities are already used in bidding zones or on the borders subject to assessment. -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, **the originator of the request for change** shall communicate the anticipated usage. **Usage range** 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**.
[DA AMM Art 2 e)] **The distant future set** for the indicator calculation shall be defined by reference to the projected growth for of the whole year historical set for the following three years (Y+3) and taking into [redacted]	[redacted]

3.1.4 Other scenarios

Depending on the needs, other additional scenarios may be created, taking as starting point the data sets defined in the AM and DA AMM and applying the required alterations.

3.2 Process: Indicators to extract and aggregate

3.2.1 Extraction of indicators

The tool for extracting the indicators from data is run in order to extract the desired indicators from the scenarios.
The output of the indicators' extraction will be done in a format commonly used for data analysis and may be changed depending on the necessity and evolution of the tools commonly used in the field.

3.2.2 Aggregation of indicators

The extracted indicators are aggregated when the granularity is more detailed than the one required for the purpose of the study.
In order to assure the confidentiality of the data, the granularity to be used in public reports shall not provide data with the session and bidding zone id level of detail at the same time.
In most cases, for the public reports, the data shall be aggregated at session level. For the specific cases in which the bidding zone information should be reported (e.g. high-level data) then the bidding zone data will aggregate the sessions of a month or a full year.

The indicators are aggregated in order to extract the maximum, the minimum and the average values when the study requires it.

Some of the indicators shall be assessed against specific **thresholds**: these are defined in a dedicated section below.

4 CACM annual report

The CACM Annual report shall be published on July 1st after the content has been approved by the respective Steering Committees (SDAC SC, SIDC SC and NEMO-Committee).

The report will have the following structure for SDAC content:

Chapter	Content	Regulatory framework
Executive summary	High level market data brief summary	
	Operations report brief summary	
	Performance monitoring report brief summary	
	Scalability report brief summary	
	R&D report brief summary	
High level market data	Topology	
	Traded volumes and welfare	
	Clearing prices	
Operations report	Incidents: number, causes, severity	AM art.4(17) and 5(17)
	Requests for Change implemented	AM art.19(11), 17 (12)
	Corrective measures applied	AM art.12(13)

Performance monitoring report	Usage indicators	AM art.8(3), list of indicators in AMM art.10, 11, 12
	Performance: economic surplus, repeatability, scalability	AM art.8(3), list of indicators in AMM art.7, 8, 9
	Output indicators	AM art.8(3), list of indicators in AMM art.13, 14, 15
	Usage of each product and its impact on algorithm performance	AM art.8.3a)
Scalability report	Roadmap: impact of RfC expected to go-live within 3 years, allowing to included additional scenarios	AM art.9, 10, AMM art.4,5
	Anticipated usage: usage indicators, calculated for scenarios mentioned above	AM art.7, 9, AMM art.4,5
	Scalability: TTFs	AM art.9, AMM art. 4,5, 9
R&D report	R&D plan, outcomes	AM art.11.8, AMM art.6

4.1 High level market data

Chapter	Content	Regulatory framework
High level market data	Topology	
	Traded volumes and welfare	
	Clearing prices	

The information shall be provided by PCR MSD-ALG.

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Topology
The topology indicates the number of countries, bidding zones, TSOs and NEMOs involved in SDAC.
Traded volumes and welfare
The economic dimension is presented, through the traded volume within the coupling (in TWh), and the welfare managed by session (average value per session in €).
Traded volumes, measured in TWh: annual total, daily average, daily minimum, daily maximum of the reporting year Y
Monthly traded volumes in TWh: box plot of the daily traded volumes, aggregated in one box for each month.

Clearing prices
The average prices are indicated for each bidding zone, mentioning the overall hourly maximum and minimum in the year in €/MWh.

4.2 Operations report

Chapter	Content	Regulatory framework
Operations report	Incidents: number, causes, severity	AM art.4(17) and 5(17)
	Requests for Change implemented	AM art.19(11), 17 (12)

	Corrective measures applied	AM art.12(13)

The information shall be provided by OPSCOM, after approval of the content by the respective SC.

4.2.1 Incidents

According to article 4(17) of the AM, the report needs to include a list of incidents that have occurred when operating the algorithm, and the use of back-up and fallback procedures. This list will not be included in the annual report but will be published in the operations report, as a separate deliverable. In the annual report it shall be provided the graphs with the classification of incidents regarding their severity and their causes, grouped per month and per year. For the yearly aggregation, at least the previous two years data (Y-1, Y-2) shall be provided too.
Each cloud/capacity calculation region (MRC or 4MMC) will be plotted in a different graph.

An investigation report of the incidents with severity 1 has to be provided by SDAC and published in Nemo Committee webpage, including, among other information, the description of the problem, the causes, the impact, the lessons learnt, and the measures taken to avoid or mitigate the impact in the future. The annual report will contain a summary of the whole report and the link to the complete report.

4.2.2 Requests for Change (RfC) implemented

According to article 19(11) of the AM, the report indicates the decision for each Request for Change, the criteria and the principles behind such decision, as well as the assessment report as required under article 17(12) of the AM.

Column titles of the reporting table	*Definition/content*	*Values*
Requirement	Type of requirement	Other Flow based Geographical extension MNA implementation Network topology Products extension System Release
Name	Name or brief description of the RfC	
Go-live Date	Expected Go Live Date	
Reason	Purpose(s) of the RfCs according to the list provided in AM article 14.1.	Letter(s) from a) to i) or "other" (if it is an expectional case).
Initiator/Owner		NEMOs TSOs NEMOs/TSOs
Details	Very short field, with the purpose of providing small details or clarifications.	

In addition to the table with the list of RfCs implemented, in the annual report it shall be provided the graph with the classification of RfCs regarding their type of requirement, grouped per month and per year. For the yearly aggregation, at least the previous two years data (Y-1, Y-2) shall be provided too.
Each cloud/capacity calculation region (MRC or 4MMC) will be plotted in a different graph.

4.2.3 Corrective measures application

According to article 12(13) of the AM, the report needs to include the corrective measure applied, the reasons for applying it and provide additional information on plans for future measures to address these problems.

In case all NEMOs detect an unanticipated degradation of the DA algorithm performance below the thresholds defined in the algorithm methodology due to an overall effective usage higher than the usage range, 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 algorithm. Corrective measures shall be applied also in cases when the algorithm performance is expected to be degraded by a request for change, which cannot be rejected or postponed.

4.3 Performance monitoring report

According to article 8(3) of the AM, it contains the items listed in Annex 3 to the AM, all cases of performance deterioration or non-compliance with an implemented functionality, an analysis on the usage of each product and its impact on algorithm performance (for SDAC only), a description of the reasons for these occurrences and remedies or future improvements (as referred to in article 5 of Annex 3 to the AM) and a presentation of the conclusions made in cooperation with the relevant stakeholder fora.

Chapter	Content	Regulatory framework
Performance monitoring report	Usage indicators	AM art.8(3), list of indicators in AMM art.10, 11, 12
	Performance: economic surplus, repeatability, scalability	AM art.8(3), list of indicators in AMM art.7, 8, 9
	Output indicators	AM art.8(3), list of indicators in AMM art.13, 14, 15
	Usage of each product and its impact on algorithm performance is assessed in the individual impact of products study.	AM art.8.3a)

4.3.1 Usage indicators

According to the AMM, title 4, the algorithm usage indicators divide into 3 groups, related to the usage of SDAC products, the geographical extension of the SDAC and the network constraints.

The table below contains the exhaustive list, with a detail on definition, related set of data (whole year historical set is used as the reporting has annual scope), source and responsible body.

In the report, the data presented are those of the year being reported (Y), and the three previous years (Y-1, Y-2, Y-3). For the year being reported, the minimum, average and maximum value is displayed. For the previous years, only average values are displayed.

For the usage of products, monthly results are also represented in a graph, for the 4 years period as mentioned above.

Indicators on SDAC algorithm USAGE - AMM Title 4				
	Title	**Definition**	**Source**	**Responsible body**
1	**AMM, art.10** **Indicators to describe the usage of SDAC products**			
	Description of calculation / data set / scenario	Monitoring: Compare the effective usage of each functionality in the recent historical set against the usage range of the same functionality (usage range shall be calculated as the maximum usage of the functionalities supported by the SDAC algorithm resulting from the distant future set, see also AMM art. 5.3) Reporting: rolling historical set. Average of values may be applied		
	Total number of steps at bidding zone level	This indicator counts the total number of steps in the aggregated price-per-volume-curves for each bidding zone and MTU from all orders of all NEMO Trading Hubs. A step is a segment made of two consecutive curve points of the price-per-volume-curve with different quantities. One single value is provided per delivery day.		-
	Total number of block orders	This indicator counts the total number of block orders per delivery day and bidding zone.		-
	Total number of block order exclusive groups	This indicator counts the total number of exclusive groups existing for the block orders per delivery day.		-
	Total number of linked families	This indicator counts the total number of families of linked block orders per delivery day.		-
	Total number of complex orders	This indicator counts the total number of complex orders per delivery day and bidding zone.		-
	Total number of demand merit orders	This indicator counts the total number of demand merit orders per delivery day and bidding zone. These merit orders are not the PUN orders.		-
	Total number of supply merit orders	This indicator counts the total number of supply merit orders per delivery day and bidding zone.		-
	Total number of PUN orders	This indicator counts the total number of PUN orders per delivery day and bidding zone. That means the number of unique PUN prices regarding the input data.		-
2	**AMM, art. 11** **Indicators to describe the geographical extension of the SDAC**			
	Description of calculation / data set / scenario	Monitoring: Compare the effective usage of each functionality in the recent historical set against the usage range of the same functionality (usage range shall be calculated as the maximum usage of the functionalities supported by the SDAC algorithm resulting from the distant future set, see also AMM art. 5.3) Reporting: rolling historical set. Average of values may be applied		
	Number of bidding zones	Total number of bidding zones. This indicator is obtained by counting all the bidding zones existing per delivery day.		-

	Total number of flow-based bidding zones	This indicator counts the total number of bidding zones in which there is flow based topology. This indicator is calculated by counting the number of PTDF matrices that exist per delivery day.		-
	Number of scheduling areas	Total number of scheduling areas. This indicator is obtained by counting all the scheduling areas existing per delivery day		-
	Number of NEMO Trading Hubs	Total number of NEMO Trading Hubs per delivery day.		-
	Number of NEMOs	Total number of different NEMOs in the delivery day. One NEMO may be operating several NEMO Trading Hubs, each one in a different bidding zone and scheduling area.		-
3	**AMM, art. 12 Indicators to describe the network constraints**			
	Description of calculation / data set / scenario	Monitoring: Compare the effective usage of each functionality in the recent historical set against the usage range of the same functionality (usage range shall be calculated as the maximum usage of the functionalities supported by the SDAC algorithm resulting from the distant future set, see also AMM art. 5.3) Reporting: rolling historical set. Average of values may be applied		
	Total number of bidding zone lines	This indicator counts the total number of lines between bidding zones.		-
	Total number of flow-based PTDF constraints	This indicator counts the total number of PTDF constraints existing for all the flow-based bidding zones per delivery day. It is the same as the number of rows in the PTDF matrixes.		-
	Total number of scheduling area lines	This indicator counts the total number of lines between scheduling areas.		-
	Total number of NEMO Trading Hub lines	This indicator counts the total number of lines between NEMO Trading Hubs.		-

4.3.2 Performance indicators

According to the AMM, title 3, the algorithm performance indicators are divided into 3 groups, related to the economic surplus, repeatability, and scalability. In the performance indicators section of the report, the economic surplus indicators (article 7) and repeatability indicators (article 8) are represented. Scalability indicators are represented also in the Scalability report section.

The table below contains the exhaustive list, with a detail on definition, related set of data (whole year historical set is used as the reporting has annual scope), source and responsible body.

In the report, the data presented are those of the year being reported (Y), and the three previous years (Y-1, Y-2, Y-3). For the year being reported, the minimum, average and maximum value is displayed. For the previous years, only average values are displayed.

For the ability to maximize the economic surplus, and the 2 repeatability indicators, monthly results are also represented in a graph, for the Y and the previous years.

If the data from previous years is not available, then this point will be indicated in the report.

Optimality: The data set is the whole year historical data with results. The input data of the whole year historical data is run again with a time limit increased by 10 minutes with a production-

like machine. The results of the run with extended time are compared with historical/production results based on the indicators defined in DA AMM:
Indicators on algorithm's ability to maximize economic surplus

- Increment of economic surplus with respect to the first OK solution: this indicator measures the gain of economic surplus obtained between the first OK solution and the last (and best) solution in the historical data scenario with results from production. The extraction of this indicator does not require any ex-post calculation as the data is extracted directly from the monitoring data.
- Economic surplus gain after increasing calculation time in X minutes: this indicator measures de gain of economic surplus that exist between the last (and best) solution found in historical data scenario with results from production and the last and best solution found in a production-like machine that is run with the time limit is increased in 10 minutes. The extraction of this indicator requires one ex-post calculation, in which the time limit is increased.

Repeatability:

A session is repeatable if Euphemia returns, for each iteration, the same value for all the relevant variables in both runs when comparing solutions with the same solution id. Potential differences are calculated using the same inputs, configuration of hardware and software and at the and comparing the last common solutions in both runs.

DA AMM, art. 8 defines the indicators on price coupling algorithm repeatability:
"The indicators to monitor algorithm repeatability reflect the differences of clearing prices and accepted quantities for different orders over the relevant MTUs and bidding zones between two runs of the SDAC algorithm. Potential differences shall be calculated while using the same inputs, configuration of hardware and software and at the same number of iterations and comparing the last common solutions in both runs."

For the assessment of repeatability, the same input data of a whole year of historical input data is run twice on the same machine. This requires several ex-post calculations.
For the annual report scalability study, the same version of the Euphemia algorithm is used for the whole year of historical input data. As in the year of historical data several versions of the algorithm may have been used and the input data structure may be different, for the scalability study, only most recent of algorithm version used in production on that data set shall be used for all the sessions of the whole year of historical input data.

Comparison is done on the latest common solution over two consecutive runs of production input data in a production like machine.
The machine used for the repeatability study is a production-like machine, that fulfils the minimum requirements set for machines used in production.

Two indicators are used for the assessment of repeatability:

- "Repeatability frequency" indicator measures what is the proportion of the values equal with respect the total number of indicators, as a percentage of the number of equal values over total values for the relevant results. Bigger value is better in terms of repeatability.
- "Repeatability impact of differences" measures the average impact on the relevant results when differences exist, as a percentage impact of the average of the contributions of the sums of absolute values of differences over the sum of the absolute values, for all the relevant results (%). Lower value is better in terms of repeatability.

As the calculations are done by algorithm with limited precision data type, comparisons are done considering 6 decimal places precision (1e-6 tolerance). Any comparison that results in an absolute difference smaller than the tolerance will consider that the values obtained are the same.

In the case that algorithm version does support repeatability requirement through mechanisms that are parametrizable, but this parameter is not activated in production, then two studies shall be required to assess repeatability: one shall assess repeatability using the same configuration than in production (parameter deactivated) and the other shall assess repeatability activating the parameter that enable the usage of repeatable mechanisms.

Scalability: Operational data for the year is analysed, focusing on yearly average and monthly data. The indicator to monitor the algorithm scalability is the **Time to first solution (AMM, art. 9).** Note this indicator only measures the performance on historical data only and should not be confused with the outcome of the scalability study.

Indicators of SDAC algorithm PERFORMANCE - AMM Title 3				
	Title	**Definition**		
1	**AMM, art. 7: Indicators on algorithm's ability to maximize economic surplus**			
	Description of calculation / data set / scenario	Monitoring: compare the values (input data, performance, output data) of the recent historical set against the values of the rolling historical set Reporting: rolling historical set average of values may be applied		
	Economic surplus gain with respect to the first solution	This indicator is the difference between the economic surplus of the accepted solution and the economic surplus of the first solution found. This indicator is not valid for comparing two different versions of the SDAC algorithm. It should be used only as an indicative of the improvements of the solutions after first one is found.		-
	Economic surplus gain after increasing the calculation time by T minutes	This indicator measures the gain in the economic surplus if the same delivery day is run again in a similar machine than the used for published results (production-like machine), giving the price coupling algorithm T minutes more. This indicator needs to be calculated ex post price coupling algorithm calculation, in a different process.		-
2	**AMM, art. 8: Indicators on SDAC algorithm repeatability**			
	Description of calculation / data set / scenario	Monitoring: assess the values of the recent historical set against the values of the rolling historical set Reporting: rolling historical set average of values may be applied		
	Repeatability	The indicators to monitor algorithm repeatability reflect the differences of clearing prices and accepted quantities for different orders over the relevant MTUs and bidding zones between two runs of the SDAC algorithm. Potential differences shall be calculated and reported while using the same inputs, configuration of hardware and software and at the same number of iterations and comparing the last common solutions in both runs.		-
3	**AMM, art. 9** **Indicators on SDAC algorithm scalability**			

	Description of calculation / data set / scenario	Reporting: rolling historical set. Average of values may be applied The values of the recent historical set pursuant to AMM Art. 2(a) shall be assessed against the thresholds of the scalability indicator pursuant to AMM Art. 9(2) y... threshold to be set in the AMP		
	Time to first solution - minimum time - average time - maximum time	This indicator measures the time spent since the algorithm starts until the first solution is found. It considers the time required for reading input data from database, the creation of the model for the optimization problems and the resolution until the first solution has been found.		-
	Time to first solution: in x% of the cases the indicator shall be lower than y minutes	[This is a threshold, not an indicator]		-
	Time to first solution: its average value shall be smaller than z minutes	[This is a threshold, not an indicator]		-

4.3.3 Output indicators

According to the AMM, title 5, the algorithm output indicators are divided into 3 groups, related to the output of maximization of economic surplus, status of orders, and the IT calculation process.

The table below contains the exhaustive list, with a detail on definition, related set of data (whole year historical set is used as the reporting has annual scope), source, and responsible body.

In the report, the data presented are those of the year being reported (Y), and the three previous years (Y-1, Y-2, Y-3). For the year being reported, the minimum, average and maximum value is displayed. For the previous years, only average values are displayed.

For the ability to maximize the economic surplus, and the 2 repeatability indicators, monthly results are also represented in a graph, for the Y and the previous years.

Indicators on SDAC algorithm OUTPUT - AMM Title 5				
	Title	**Definition**		
1	**AMM, art.13** **Indicators to describe the output of maximization of economic surplus**			
	Description of calculation / data set / scenario	Reporting: rolling historical set average of values may be applied		
	Economic surplus of the first solution found	Is the market surplus, calculated for the first solution that satisfies all requirements and tolerances with adequate quality level. Due to SDAC algorithm works with floating-point format numbers, the precision of the calculations is limited. Quality of the solution is the quality in term of tolerances, using as value the worst level of tolerance achieved among all the checks applied to the constraints.		-
	Economic surplus of the final solution	This indicator is obtained as provided by the SDAC algorithm, querying the utility of the solution that the SDAC algorithm classifies as the accepted solution per delivery day		-

2	**AMM, art. 14** **Indicators to describe the status of orders** **Indicators on the evolution of number of matched orders and paradoxically rejected orders of each product type over time, and the corresponding total volume**			
	Description of calculation / data set / scenario	Reporting: rolling historical set average of values may be applied		
	Total number of matched blocks	This indicator counts the total number of matched blocks per delivery day and bidding zone. This indicator includes too the blocks that have fractional minimum acceptance ration and are partially matched.		-
	Total number of matched complex orders	This indicator counts the total number of matched complex orders per delivery day and bidding zone.		-
	Total number of matched non-PUN merit orders	This indicator counts the total number of matched merit orders (non-PUN merit orders) per delivery day and bidding zone. It will be calculated as the count of non-PUN merit orders whose matching quantity is greater than 0		-
	Total number of matched PUN orders	This indicator counts the total number of matched PUN orders per delivery day and bidding zone. That means the number of unique PUN prices regarding the input data. It will be calculated as the count of PUN orders whose matching quantity is greater than 0.		-
	Total matched volume from curves	This indicator aggregates the total matched volume from supply and demand curves. It will be calculated as the sum of all "market time unit"-weighted unrounded volume matched at each relevant MTU and bidding zones for supply and demand curves.		-
	Total matched volume from blocks	This indicator aggregates the total matched volume from blocks. It will be calculated as sum of all "market time unit"-weighted unrounded volume matched at each relevant MTU and bidding zones from blocks.		-
	Total matched volume from complex orders	This indicator aggregated the total matched volume from complex orders. It will be calculated as sum of all unrounded volume matched at each relevant MTU and bidding zones from complex orders		-
	Total matched volume from (non-PUN) merit orders	This indicator aggregates the total matched volume from (non-PUN) merit orders. It will be calculated as sum of all unrounded volume matched at each relevant MTU and bidding zones from (non-PUN) merit orders.		-
	Total matched volume from PUN orders	This indicator aggregates the total matched volume from PUN orders. It will be calculated as sum of all unrounded volume matched at each relevant MTU and bidding zones from PUN orders		-
	Indicators on paradoxically rejected orders			
	Number of PRBs in the final solution	This indicator counts the total number of Paradoxically Rejected Blocks (PRBs) in the accepted solution per delivery day and bidding zone.		-
	Number of PRMICs in the final solution	This indicator counts the total number of Paradoxically Rejected MICs (PRMICs) in the accepted solution per delivery day and bidding zone.		-
	Maximum Delta P in the final solution	This indicator reports the maximum delta P of the blocks for the accepted solution per delivery day.		-
	Maximum Delta MIC in the final solution	This indicator reports the maximum Delta MIC of the complex orders for the accepted solution per delivery day.		-
	PRB utility loss in the final solution	This indicator reports the utility (economic surplus) loss due to paradoxically rejected blocks per delivery day.		-

	PRMIC utility loss in the final solution	This indicator reports the utility (economic surplus) loss due to paradoxically rejected MICs and MPCs per delivery day		-
	Volume of PRBs in the final solution	This indicator sums the volume of all the Paradoxically Rejected Blocks (PRBs) in the accepted solution per delivery day and bidding zone		-
	Volume of PRMICs in the final solution	This indicator sums the volume of all the Paradoxically Rejected MICs (PRMICs) in the accepted solution per delivery day and bidding zone.		-
	Indicators on the evolution of the use of network constraints along the time			
	Description of calculation / data set / scenario	Reporting: rolling historical set Average of values may be applied		
	Number of periods for ATC/DC lines with flows at full capacity	Total number of periods for which ATC/DC lines are utilized at full capacity in one of their directions. We consider a line fully utilized when the energy flow is equal to capacity. For this indicator the bidding zone borders are being considered.		-
3	**AMM, art. 15** **Indicators to describe the IT calculation process**			
	Description of calculation / data set / scenario	Reporting: rolling historical set Average of values may be applied		
	Input data reading time	This indicator measures the time the SDAC algorithm requires in order to read all the data needed for a delivery day from the SQL database.		-
	Input data delivery day creation	This indicator measures the amount of time the SDAC algorithm requires in order to create a delivery day from the data read from the database.		-
	Time to solve the root node for the master computer	This indicator measures the amount of time to solve the root node for the master tree.		-
	Time to solve the root node for the job that found first solution	This indicator measures the amount of time to solve the first node of the job that led to the first OK solution found. This time will not include the time to read the input data and create the solver models. It will neither include the time spent in the master computer's root node.		-
	Number of successive improvements of the solution in the given timeframe	This indicator measures the number of OK solutions that improve a previously found solution during the optimization process limited by the amount of time available for running the SDAC algorithm.		-
	Total number of nodes in the master branch and bound tree	This indicator measures the number of nodes processed in the master branch and bound tree.		-

4.3.4 Usage of each product and its impact on algorithm performance

The assessment of the individual impact on performance of each product complies with article 8.3.a) of the AM.

The analysis is performed for the all the products included in the DA product methodology, with the exception of the mandatory products for the single day-ahead coupling, as defined in the Day-Ahead Product Methodology.

The analysis is performed against the last quarter Q4 of the year being reported.
The study requires ex-post calculations and in order to reduce the time for running the simulations, these will be limited to find the first solution only, as the indicator to be reported are performance indicators (TTFS).

In order to assess the individual impact on performance of one kind of product, this kind of product is converted into the remaining products. In this conversion, the products are replaced by the most similar alternative product, following specific conversion rules that will be explained in the annual report.

In case there are new products aiming to enhance or replace existing ones, the individual impact of product may include in the study scenarios in which the existing product may be replaced by the new product that is designed to replace it.

Due to the nature of the requirements these conversion rules are not able to convert all the requirements from the original product into requirements from remaining products.
The conversions done in this study may not reflect a realistic behaviour of market participants in case one product is replaced by another one. For instance, one stepwise order may be split in several stepwise orders by a market participant in order to reflect their needs.
It should be noted that such approach is overestimating the impact on performance, as the conversion eliminates not only the individual impact of each product but also the combined effect linked to the interaction with the remaining products. For such a reason, it should also be noted that the estimated impact of the different scenarios cannot be accumulated.

4.4 Scalability report

Chapter	Content	Regulatory framework
Scalability report	Roadmap: impact of RfC expected to go-live within 3 years, allowing to make up different scenarios	AM art.9, 10, AMM art.4,5
	Anticipated usage: usage indicators, calculated for scenarios mentioned above	AM art.7, 9, AMM art.4,5
	Scalability: TTFs	AM art.9, AMM art. 4,5, 9

The Roadmap anticipates the impact of RfCs expected to go-live in the next three years. Based on this, several scenarios are prepared and tested: they include (a part of) future requirements and **the anticipated usage of existing products**.
The expected usage of products and requirements reflects the usage recorded for the year Y (year being reported in the Report) and projected usage for 3 next years by applying the historical growth of each product/requirement usage projected into the future. Once the scenarios are tested, the **scalability indicator - time to first solution TTFS** – will be evaluated.

Annual growth rates shall be reported in the scalability study. This annual growth rate is the projection to the future of the growth observed in the previous years. The methodology used to calculate this growth rates shall be based on the previous historical data sets.

NRAs understand that Y represents the current year of drafting of the report, and not the past year from which other reports show past data. For the sake of clarity, for the report drafted in the year 2021, the Y+1 simulations shall represent 2022 and Y+3 simulations shall represent 2024

This interpretation is different than the one proposed by NEMOs in the AM and AMM, in which the year Y is the year for which the data is being reported, to be published in Y+1. In NEMOs terminology, the NRAs interpretation corresponds to scenarios for years Y+2 and Y+4.
Starting from 2020 annual report, to be drafted in the year 2021, NEMOs will follow NRAs interpretation and the content of DA AMM Art. 2 (d) and (e) shall be further amended and detailed in the next revision of the document

The near and distant future scenarios should include the impact of previous RfCs in production that span for a few months in the full year historical scenario. This includes the impact of RfCs added during the year of the report and those added during the preparation of the annual report.

The Roadmap of Requests for Change is represented within a table with different categories:

Column titles of the reporting table	*Definition/content*	*Values*
Requirement	Type of requirement	Network topology System release MNA implementation Other
Name	Name or brief description of the RfC	
Go-live Date	Expected Go Live Date	
Reason	Purpose(s) of the RfCs according to the list provided in AM article 14.1.	Letter(s) from a) to i) or "other" (if it is an exceptional case).
Initiator/Owner		NEMOs TSOs NEMOs/TSOs
Details	Very short field, with the purpose of providing small details or clarifications.	
Y+1	Checkbox. Is the RfC anticipated usage included in the impact of the near future Y+1 scenario?	Yes/No (tick symbol/check mark)
Y+3	Checkbox. Is the RfC anticipated usage included in the impact of the near future Y+3 scenario?	Yes/No (tick symbol/check mark)

Additional columns may be added to report what RfCs are considered for each one of the extra scenarios that are created for the near or distant future scenarios variants.

The scalability is assessed via the indicator of the Time to First Solution (TTFS) and compared with the thresholds for scalability.

Indicators on SDAC algorithm PERFORMANCE - AMM Title 3

	Title	Definition	Source	Responsible body
3	**AMM, art. 9** **Indicators on SDAC algorithm scalability**			
	Description of calculation / data set / scenario	Reporting: rolling historical set. Average of values may be applied The values of the recent historical set pursuant to AMM Art. 2(a) shall be assessed against the thresholds of the scalability indicator pursuant to AMM Art. 9(2) threshold to be set in the AMP		
	Time to first solution - minimum time - average time - maximum time	This indicator measures the time spent since the algorithm starts until the first solution is found. It considers the time required for reading input data from database, the creation of the model for the optimization problems and the resolution until the first solution has been found.		-
	Time to first solution: in x% of the cases the indicator shall be lower than y minutes	[This is a threshold, not an indicator]		
	Time to first solution: its average value shall be smaller than z minutes	[This is a threshold, not an indicator]		

4.5 R&D report

Chapter	Content	Regulatory framework
R&D report	R&D plan, outcomes	AM art.11.8, AMM art.6

The R&D report presents the status of the research and development activities, including the outcomes, and the planning of the future research, including an estimation of workload and associated budget.

Column titles of the reporting table	*Definition/content*	*Values*
R&D topic	Topic of the research activity	
Description	Main characteristics of the R&D activity	
Iteration #	The work within Euphemia Lab being structured into iterations of 6 month	
Share of Iteration workload and budget	Share of the workload and budget in percentage of the effort done in the iteration the R&D topic belongs to.	
Share of 12 months workload and budget	Share of the workload and budget in percentage of the effort done in the yearly budget for R&D actions.	

CACM compliance	When the R&D action is triggered by a regulatory need, this field shall detail what is the source of this R&D action.	"Scalability" "Optimality" "Repeatability" "ACER decision #" "CACM article #" "EBGL article #"
Outcome and impact on CACM compliance	Information on gains (e.g. improvement of scalability, etc.) or explanation of an early dismissal reasons.	
Implementation in production (forecast)	Forecast of the implementation in production. This forecast may be linked with one specific Euphemia release or the go-live of a RfC, In case it is not implemented it may be either discarded or investigated under different assumptions.	Date Euphemia relase Link with the implementation of other RfCs "To drop: no promising results" "To be further investigated"

5 Performing assessments pursuant to AMM

The performance of the algorithm shall be evaluated under different situations and purposes that are detailed below.

5.1 Request for Change impact assessment (AMM, art.4)

A historical scenario, according to DA AMM Article 4(2)(a) and a near future scenario, according to DA AMM Article 4(2)(b). To reflect the operational conditions of the algorithm, tests shall be performed under the algorithm version that will be in production at the date where the request for change goes live. Is the go-live date delayed, a new performance assessment may be required.

An individual assessment may be performed in case the joint testing of RfCs assessment does not pass the thresholds defined for RfC assessment present satisfying results, to identify the RfCs that are causing the performance problem and find the reasons the performance is deteriorating to the point of not passing the thresholds validation. PCR MSD-ALG, based on the individual assessment of RfCs and the provide and assess too the grouping of RfCs that, attending to their prioritization according to the AM rules, deliver adequate performance.
These thresholds shall be applied for RfCs of type I, II or II and will be part of the assessment for acceptance of RfCs planned for a Go-Live window.
For RfCs of type IV (R&D activities) these thresholds shall be evaluated in order to assess whether an R&D action or a set of them are able to guarantee an adequate performance in the future. Nevertheless, and in the context of R&D activities only, not being able to pass these thresholds it shall not mean they will be not accepted for industrialization, as they can be delivering a significant performance increase but it may not be good enough to assure the adequate performance in the future.

Goal of the assessment	Assess the impact **on scalability** by a Request for Change
Indicators	**Scalability indicator TTFS**, applying relevant thresholds (see below – CACM annual report)
Scenarios	**Historical scenario:** using as inputs the actual usage of all the existing functionalities as recorded over the whole year historical set under AMM Article 2(c) and the anticipated usage of all the functionalities under assessment calculated over the near future set under AMM Article

	2(d) and applying the relevant thresholds in accordance with AMM Article 9(2) **Near future set scenario:** using as inputs the anticipated usage of all the functionalities calculated on the near future set under Article 2(d) and using the relevant thresholds in accordance with Article 9(2).
Other	-

5.2 Scalability Assessment (AMM, art. 5)

Goal of the assessment	Assess the impact of the long-term anticipated growth on the SDAC algorithm scalability, considering the expected increase of usage of functionalities
Indicators	**Scalability indicator TTFS**, applying relevant thresholds (see above – CACM annual report)
Scenarios	**Near future set scenario**, including anticipated usage of all functionalities **Distant future set scenario**, including anticipated usage of all functionalities
Other	The **usage range** shall be calculated as the maximum usage of the functionalities supported by the SDAC algorithm resulting from AMM Art5, paragraph 2(b)

Scalability assessment will be part of new Euphemia releases testing. Therefore, it shall be reassessed only for go-live windows that have new Euphemia releases.
This scalability assessment will be in a dedicated section of the Euphemia release test report that is prepared for evaluating each new Euphemia release.

Usage range shall be calculated using the concept of an envelope of all available scenarios that are considered relevant by the SDAC MSD. In this approach, only near future and distant future scenarios can be considered and the ones selected by SDAC MSD shall be used to create a set of usage ranges. Each scenario that passes the thresholds for adequate scalability shall provide a tuple (ordered list or sequence of elements containing the values of the usage of the products), as defined in Article 10 of the DA AMM. The monitoring of the algorithm shall be assessed against the set of all tuples of the envelope.
According with AM article 12.1, when all NEMOs detect an unanticipated degradation of the algorithms' performance below the thresholds referred to in Article 3(4) of Annex 3, due to an overall effective usage higher than the usage range, in accordance with Article 3(2) of Annex 3, then corrective measures shall be triggered.
It shall be understood that usage range has been exceeded when for all tuples contained in the envelope (set of tuples from each scenario), no one is being respected by the tuple coming from the monitoring of the effective usage in production.

5.3 Research & Development assessment (AMM, art.6)

Goal of the assessment	For most cases, the goal is assessing the impact **on scalability** of the anticipated market growth and the extension of requirements.

	Other cases cover research and development of specific topics addressing changes aiming to improve repeatability or optimality.
Indicators	**Performance indicators** Usage range of all functionalities
Scenarios	**Whole year historical set** **Distant future set** - **Scalability indicator: assess against relevant thresholds (AMM, art.9.2)** - **Economic surplus: assess against the rolling historical set**
Other	-

The assessment of the R&D RfCs is led by the 3 key algorithm requirements, related to its performance:

- Scalability
- Repeatability
- Optimality

For this aim, **the indicators from DA AMM titles 3, 4 and 5** shall be used:

- In most cases the scalability indicator, (DA AMM article 9) shall be used, evaluating the impact in TTFS of each R&D RfC with respect the reference scenarios calculated with the current industrialized version of the algorithm.
- The indicators to be used will depend on the activity type we are evaluating (scalability, repeatability optimality) or the combination of them. As a result, one or more indicators shall be monitored.
- It should be noted that contrary to the other activities, an R&D activity (RfC type IV) may be accepted even in the case the acceptance thresholds for other activities such as the RfCs type I, II and III are not being respected.
- For RfCs of type IV (R&D activities) the thresholds for the acceptance of RfCs shall be evaluated in order to assess whether an R&D action or a set of them are able to guarantee an adequate performance in the future. Nevertheless, not being able to pass these thresholds it does not mean they will be not accepted for industrialization, as they can be delivering a significant performance increase but it may not be good enough to assure the adequate performance in the future

In addition to the assessment done using the quantitative indicators above, the R&D work shall be considered them jointly with other criteria, performing a qualitative analysis that will consider, among other the following indicators:

- Cost to implement the R&D activity.
- Pending cost to industrialize the R&D activity.
- Expected outcome: directly assessed
- Implementation times: time to include in the industrialized version of the algorithm, time to first usage in production.
- Dependency on other systems: PMB, TSOs systems, NEMO systems.

For the assessment of R&D RfCs.

6 Operations report - Quarterly report

The quarterly report should only be published once all the information is collected and after the content has been approved by the respective Steering Committees (SDAC SC, SIDC SC and NEMO-Committee).

The report will include information on SIDC and 4 MMC in addition to the information detailed on SDAC, detailed in this chapter.

The report needs to include the following data from the SDAC:

DATA TYPE	DATA DESCRIPTION
SDAC_MRC Inc List	Incidents Reported by SDAC MRC: incidents are classified according two criteria (severity and causes). Mitigating measures undertaken are also reported.
SDAC_MRC RfCs Implemented	Requests for Change implemented by SDAC MRC are reported classified per type of requirement.
SDAC_MRC CM	Corrective Measures triggered in SDAC MRC.

6.1 SDAC MRC Inc List

The incident data should be presented in a table with the following columns:

Column titles of the reporting table	*Definition/content*	*Values*
Trading date	Trading date of the session in which the incident happened	
Affected process	Phase in the process in which the incident happened	Late order book Network data Calculation Algorithm not terminating Receiving results and confirmation issues Second auction Preliminary confirmation Wrong publication Final confirmation […]

Incident summary	Headline description of incident.	
Cause	The cause of the incident needs to be classified into one of the following categories: • Other • Human error • Unusual process • Interface issue • System bug Configuration	
Severity	The incidents are classified in one the following severity categories: Severity 1: Incidents that led to decoupling Severity 2: Incidents where message of risk of decoupling was sent Severity 3: Incidents that were visible to market participants, but risk of partial decoupling message was not sent Severity 4: Incidents that were not visible to market participants	
Extended description	Description of the incident	
Mitigating measures	Brief description of the measures taken to reduce the risk and mitigate the effect of the incident	

An investigation report of the incidents with severity 1 has to be provided by SDAC and published in Nemo Committee webpage, including, among other information, the description of the problem, the causes, the impact, the lessons learnt, and the measures taken to avoid or mitigate the impact in the future. The operations report will contain the link to the complete report.

6.2 SDAC_MRC RfCs Implemented

The implemented MRC RFCs should be presented in a table with the following columns:

Column titles of the reporting table	***Definition/content***	***Values***
Requirement	Type of requirement	Other Flow based Geographical extension MNA implementation Network topology Products extension System Release
Name	Name or brief description of the RfC	

Go-live Date	Expected Go Live Date	
Reason	Purpose(s) of the RfCs according to the list provided in AM article 14.1.	Letter(s) from a) to i) or "other" (if it is an expectional case).
Initiator/Owner		NEMOs TSOs NEMOs/TSOs
Details	Very short field, with the purpose of providing small details or clarifications.	

6.3 Corrective measures application

The report needs to include the corrective measure applied, the reasons for applying it and provide additional information on plans for future measures to address these problems.

When corrective measures are applied: In case all NEMOs detect an unanticipated degradation of the DA algorithm performance below the thresholds defined in the algorithm methodology due to an overall effective usage higher than the usage range, 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 algorithm. Corrective measures shall be applied also in cases when the algorithm performance is expected to be degraded by a request for change, which cannot be rejected or postponed.

7 Thresholds

7.1 Process to set the values for thresholds

The thresholds are set using the following criteria:

- Assurance of good performance of the algorithm.
- Proper management of outliers that rarely can appear.
- Experience obtained through the years.

The technical groups (MSD) shall propose the thresholds and they should be validated by the respective steering committees (SC).

7.2 Thresholds values to be used for scalability

There are two thresholds given in AMM, art.9:

- **Y: in x% of the cases the indicator shall be lower than Y minutes.**
- **Z: its average value shall be smaller than Z minutes.**

The x and the y are defined in the AMP and can be defined differently for different instances, definitions of the x and y can be found in this chapter below.

The thresholds for scalability are parametrized using the normal **running time (RT) of the algorithm** as reference, corresponding with the Euphemia external algorithm parameter "**TIMELIMIT**" that defines, in seconds, the maximum time to be used in normal calculation. In other words, RT = 'TIMELIMIT' parameter.

7.2.1 Acceptance of RfCs. Scalability thresholds.

The technical assessment of RfCs will be favorable if both the historical data set scenarios and the future scenarios pass the historical and future thresholds.

Historical thresholds are passed the performance validations **if all these conditions are satisfied**:

- Average TTFS shall be under **80% of RT**: Z< 80% of RT;
  AND
- 100% of sessions shall have TTFS below 100% of RT + delta (see conditions below), either by using default configuration, or any of the ACs available for incident management

  AND

- less than 5% of sessions may exceed RT

Delta value should be set in such a way that no decoupling may occur, as when Euphemia exceeds the TIMELIMIT, an incident is triggered, process governed by EXC05 procedure. In order to be able to provide some flexibility to deal with exceptional outlier values that may distort the outcome of the assessment, delta value is defined to allow one or two cases at most in a full year data scenario that may require a little extra time to find the first solution. For this reason, we define delta as 120 seconds. Delta is not to be used for more than 1.5% of the sessions of a whole year scenario. In practice, this limits the usage of delta exception to a maximum of 5 sessions in a complete year scenario.

Future thresholds are passed if all these conditions are satisfied:

- 97% of sessions < RT, and
- 100% of sessions < 180% of RT

For the future thresholds this is the criteria that shall trigger additional information to be forwarded to SC:

- More than 97% of sessions requiring TTFS > 90% of RT, or
- Any session requiring more than 180% of RT

7.2.2 Monitoring of operations and reporting. Scalability thresholds.

The performance shall be adequate if it passes the same thresholds defined for the acceptance of RfCs.

7.2.3 Usage range. Scalability thresholds.

The performance shall be adequate if it passes the same thresholds defined for the acceptance of RfCs.

7.2.4 Triggering of corrective measures

The performance shall be adequate if it passes the same thresholds defined for the acceptance of RfCs.

7.2.5 R&D. Scalability thresholds

The performance shall be adequate if it passes the same thresholds defined for the acceptance of RfCs.

Note that R&D RfCs (RfCs of type IV) may be accepted even when the performance is not adequate enough but it introduces a significant performance/optimality/repeatability improvement.

7.2.6 Thresholds for Indicators on Algorithm Scalability study

The performance shall be adequate if it passes the same thresholds defined for the acceptance of RfCs.

7.3 Thresholds values to be used for optimality

New R&D actions focused in improving optimality shall be triggered when the indicator defined in DA AMM Art. 7 (b) Economic surplus gain after increasing allowed calculation time by 10 minutes (%) is in average greater than 0.000126%.

7.4 Thresholds values to be used for repeatability

New R&D actions shall be triggered in order to improve repeatability if any the following situations happen:

- When any of the 2 following statements is true.
  - Repeatability frequency indicator, measured as number of equal values over total values for the relevant results (%) is, in average, below 99.3%.
  - Repeatability impact of differences indicator, measured as average of the contributions of the sums of absolute values of differences over the sum of the absolute values, for all the relevant results (%) is, in average, over 1.25%.
- When there exists the possibility of activating a parameter that uses mechanisms to assure to assure that the same decisions are taken in the same time sequence in two consecutive runs on the same input data on the same machine, the following thresholds shall apply when the parameter is activated.
  - Repeatability frequency indicator, measured as number of equal values over total values for the relevant results (%) is, in average, below 99.99%.
  - Repeatability impact of differences indicator, measured as average of the contributions of the sums of absolute values of differences over the sum of the absolute values, for all the relevant results (%) is, in average, over 0.01%.

7.5 Proposing changes to HMMP (Min-Max prices methodology)

The thresholds are defined in the article 4.1 (a) of HMMCP Methodology, in which the criteria and process for establishing and amending maximum price for SDAC are defined.

- *"the harmonised maximum clearing price for SDAC shall be increased by 1,000 EUR/MWh in the event that the clearing price exceeds a value of 60 percent of the harmonised maximum clearing price for SDAC in at least one market time unit in a day in an individual bidding zone or in multiple bidding zones"*

8 Other parameters

8.1 Recent historical data set K parameter

K parameter defined as K<13 is 3 months.

9 Transitory provisions

CACM annual reports are already aligned with the AM and the articles from this document.
For CACM annual report, all studies shall be done from 2020 reporting year. As the AM was approved in January 2020, year 2017 data shall only include monitoring indicators and shall not include any study that requires ex-post calculations. Year 2018 data annual report shall not include individual impact of products study.

Quarterly reports will be reported as defined in this document starting 2021Q2
Scenario creation will be created following this document starting at 1st January 2022
Application of RfC acceptance criteria thresholds will be in place since 1st July 2021