CACM Scalability Report 2024







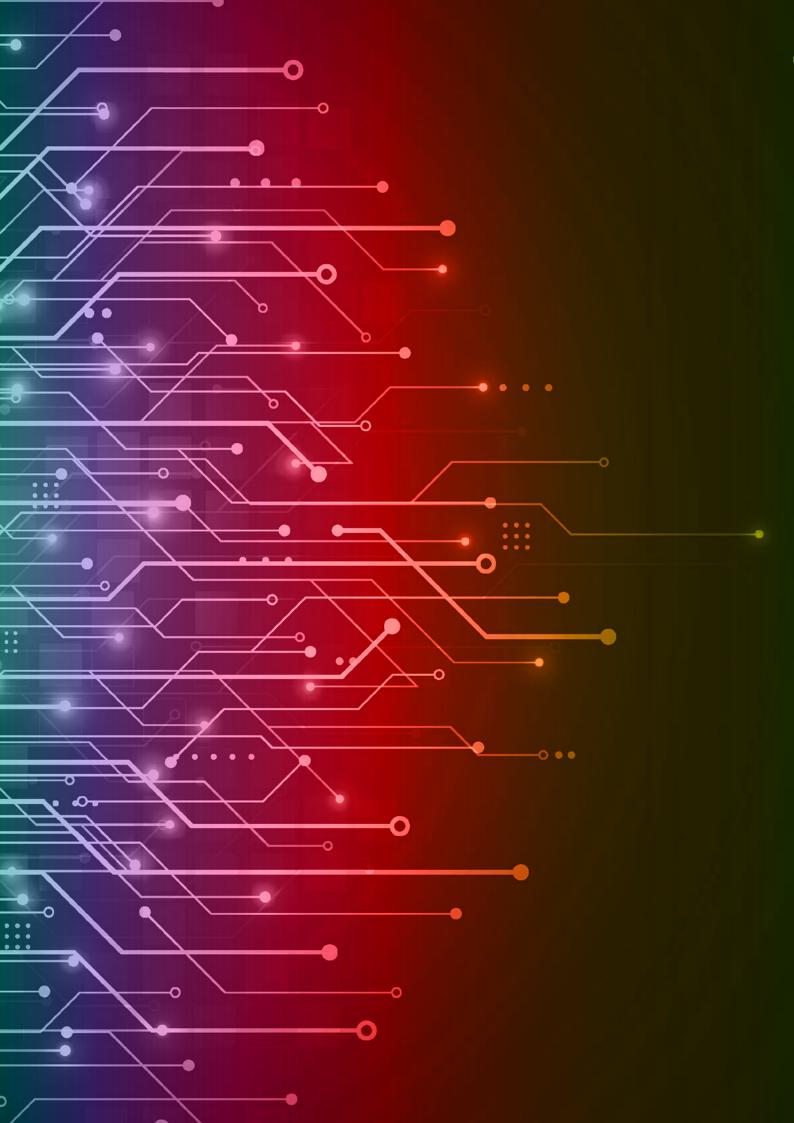
ALL NEMO

CACM Scalability Report 2024



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Executive summary



Single Day-Ahead Coupling

The Scalability Assessment for 2026–2028 shows that, both the simulated scenarios are compliant with the scalability thresholds. Thanks to the accomplished R&D, the future go-lives expected in SDAC result to be supported by the coupling algorithm with a good performance.



Single Intraday Coupling

The scalability studies include assessments of the scalability of the SIDC Continuous Trading (XBID) as well as for the SIDC IDAs.

Regarding the Continuous Trading, provided the expected trend is confirmed, the year 2026 is outside of the technical limits of the XBID system, the scalability of the SIDC XBID platform will then be improved via implementation of the Performance Optimisation Measures (POMs), scheduled in the period 2025 – 2027.

Regarding IDAs, the future scenarios result to be supported by the price algorithm. Since the IDAs are still evolving, the extracted growth figures may have been exaggerated. This is expected to self correct in future Scalability reports.

SDAC Scalability report

In this section, the scalability of the SDAC is assessed, simulating the performance of the scalability indicator in relation to the expected evolution of foreseen requests for change (RfCs) included in the roadmap, as well as to the projected growth in usage of the requirements. This exercise is carried out for the 2026–28 period, as understood at the end of 2024, and using the latest available version of the SDAC Algorithm (Euphemia 11.4).

The main changes included in the Roadmap starting from 2026 are the go-live of Core Advanced Hybrid Coupling (AHC) and several geographical expansions of NEMOs activities such as EPEX to the Baltics, EXAA to the Netherlands, Belgium, and France, as well as ETPA's accession in DA with their entry in NL and DE. Beyond 2026, the main changes foreseen in SDAC include the merging of the Core and Italy North Capacity Calculation Regions into the Central Europe Capacity Calculation Region, integration of the Single Electricity Market (SEM) into SDAC upon go-live of the Celtic Interconnector, as well as the accession of EnC countries.

Euphemia finds solutions for most of the simulation sessions, always within a reasonable time, complying with the scalability thresholds. Only 3 outliers were observed (1 session in the sample in 2026 and 2 session in the sample in 2028). The Algorithm Provider identified mitigations able to manage the issues.

"Thanks to the accomplished R&D, the future go-lives expected in SDAC result to be supported by the coupling algorithm with a good performance"

Roadmap

The Roadmap anticipates the impact of RfCs expected to go-live in the next three years. Based on this, two scenarios have been tested for 2026 (Y+1) and 2028 (Y+3) following the relevant provisions of the Algorithm Methodology.

- Scenario 1: including the anticipated usage of existing products and requirements in 2026. This includes changes such as Core Advanced Hybrid Coupling and several NEMO extensions (EPEX in Baltics, EXAA in NL, BE, FR, ETPA in NL, DE).
- Scenario 2: including the anticipated usage of existing products and requirements in 2028. This includes the Single Energy Market's integration of EnC BZs into SDAC and the go-live of the Celtic Interconnector.

Anticipated usage

The expected usage of products and requirements reflects the actual usage recorded in 2024 and projected to 2026–2028 by applying the historical usage growth of each product/requirement projected into the future. The assumptions followed for EnC BZs inclusion for 2028 scenario have been reported in the Scope RfCs table and further details are illustrated on the anticipated usage table.

In general, the large increase of the usage values reflects not only the multi-year growth rate but also the fourfold increase in the size of the problem due to the shift to 15 minutes. Since Euphemia supports cross-product matching, we reflect an assumption that 80% of Curve orders will become 15-minute orders, i.e. quadrupling their number. The remaining 20% will stay as 60-minute orders. Finally Scalable MIC/MP and Load Gradient orders follow the time resolution of their bidding zone (15 minutes in Spain and Portugal, but 30 minutes in Republic of Ireland and Northern Ireland).

Network data are also quadrupled when switching to 15 minutes.

Finally, only for multi-hourly products (block orders) a conservative assumption was made and only the multi-year growth rate and the expected RfCs were applied, with a consequent potential underestimation of the impact on performance.

Scalability indicator

This year's scalability indicator shows the Algorithm meets the scalability thresholds:

- Scenario 1: requires on average 8 minutes and 46 seconds to find a solution. 0.3% of sessions required > 30 minutes, but never more than 32 minutes (1 session over 362 run in less than 32 minutes).
 - i.e. the scalability thresholds for Scenario 1 (97% < 30 minutes, and 100% < 54 minutes) are respected;
- Scenario 2: requires on average 11 minutes and 4 seconds to find a solution, 0.6 % of sessions required > 30 minutes, but never more than 34 minutes (2 sessions over 362 run in less than 34 minutes).
 - i.e. the scalability thresholds for Scenario 2 (97% < 30 minutes, and 100% < 54 minutes) are respected.

Roadmap of RfCs

The following tables list the different requests for change as captured by the roadmap.

Some of the RfCs present in the Roadmap have not been taken into account in the simulated scenarios due to missing information/non-implemented functionalities in the algorithm/irrelevance in relation with the timeline of the simulations.

Requirement	Name	Go-live Date	Reason	Initiator/Owner
Capacity Calculation	Advanced hybrid coupling (Core)	2026 Q1	CORE Capacity Calculation Methodology	Core TSOs
Product Usage	CROPEX implementation of 30' MTU products	2025 Q3	To expand product offering.	CROPEX
Product Usage	EPEX-Additional Usage CO4 and CO2	2025 Q4	To expand product offering.	EPEX
Geographical extension	EXAA extension to FR, NL and BE in Day-ahead	2026 Q1	Expansion of commercial activity.	EXAA
Network topology	Celtic Interconnector	2027 Q1	Integration of SEM into SDAC	Eirgrid, RTE
Network topology	Hansa CCR Phase 2	2026 Q1	Hansa Capacity Calculation Methodology	Hansa TSOs
Extension	Energy community integration 1 st wave	2028 Q1	Integration of energy community countries into SDAC	EnC NEMOs/ TSOs
System Release	Euphemia 11.4 & PMB13.1	2025 Q1	Improved performance and added functionalities	NEMOs/TSOs
Network requirement	QPRE for FennoSkan (SE3-FI)	2025 Q3	Protect operation of interconnectors	SvK, Fingrid
Product Usage	Discontinuation of COs and introduction of new products in OMIE	2025 Q1	Replacement of obsolete products	OMIE
Product Usage	Introduction of Exclusive groups and Spread blocks for IBEX	2025 Q4	IBEX would like to introduce "Spread Blocks" (also known as "Looped Blocks") and Exclusive Groups for block orders in the Bulgarian market	IBEX
Product Usage	Parent block of a linked family part of an exclusive group in EMCO trading system	2025 Q3	Extension of the product offering.	NEMO

D 4.7.	0	Table 01
Details	Scenario 1	Scenario 2
	2026 (Y+1)	2028 (Y+3)
It would cover external FB area borders (HVDC and AC borders through Virtual hubs).	8	8
This RfC/notification is to introduce 30-minute products (curve and blocks) on the CROPEX Day Ahead Market with SDAC 15-min. MTU go-live, currently planned for September 2025.	8	8
EPEX wants to offer its members modified configuration for CO2 blocks that are linked directly or indirectly to CO4 blocks: CO2 blocks that are linked directly or indirectly to CO4 blocks can span over several periods. The total max limitation of number of CO2s remains the same.	8	8
The integration of EXAA in the new countries/markets as a NEMO in the Day Ahead will require a change in the CORE NEMO and post-coupling topology as well as adjustments in the pre-coupling, coupling and post-coupling procedures, both at SDAC and regional level (CORE, IBWT and SWE).	8	8
New interconnection between France-Ireland	8	8
Implementation of capacity submission role for TSCNET and extension of capacity submission role for Nordic RCC for the Day ahead timeframe (SDAC). Change of Control & Incident Management procedures to formally allow third party participation.	0	0
Extend topology to EnC countries (Albania, Bosnia and Herzegovina, Georgia, Kosovo*, Moldova, Montenegro, North Macedonia, Serbia, Ukraine and their NEMOs.).	0	8
Implementation of changes in EUPHEMIA version E11.4 into production together with the corresponding PMB 13.1 version.	8	8
Fluctuation of the border flows is expected to increase with 15-min. MTU on the interconnectors. This may increase the number of polarity reversals to the level that would be technically unfeasible and endanger operation of the interconnectors (considering mid/long term period). Potential trading in the opposite direction in the intraday market may not sufficiently solve the issue. Therefore, a limitation on the ramping has to be put in place to ensure the operational security of the cables when introducing 15-min. MTU.	⊗	8
Replacement of current Complex Orders (COs) with Scalable Complex Orders (SCOs).		
Introduction of products type classic block orders (CO1) and exclusive block orders (CO4).	\otimes	8
The Spread Block orders are already available within the EUPHEMIA algorithm as Linked Blocks, and Linked Blocks are already in use in Bulgaria. Spread Blocks are added to the MO10 file by linking two blocks to each other and setting the order type to CO2. Spread Block is an order type using linked blocks where a pair of blocks are mutually linked. It differs from a linked block setup where the child only gets accepted if the parent has been accepted, in a Spread Block both blocks are either accepted or rejected.		
Maximum amount of all block orders (regular, linked, profile, spread) does not change and the number of expected block orders does not change.	⊗	⊗
An Exclusive Group is a set of block orders for which the sum of the accepted ratios cannot exceed 1. In the case of blocks that have a minimum acceptance ratio of > 0,5 it means that at most one of the blocks of the exclusive group can be accepted. Between the different valid combinations of accepted blocks, the algorithm chooses the one which maximises the optimisation criterion.		
Implementation of usage of the parent block of a linked family be part of an exclusive group in EMCO trading system.	8	8

Requirement	Name	Go-live Date	Reason	Initiator/Owner
Product Usage	Discontinuation of PUN MOs and introduction of new products in GME	2025 Q1	Change of the product offering.	NEMO
Product Usage	Introduction of stepwise curves in GME's bidding areas	2025 Q1	Change of the product offering.	NEMO
Geographical extension	ETPA accession to DA in DE and NL	2026 Q3	Expansion of commercial activity.	ETPA
Network requirement	Net-position and ramping constraint in Italy North bidding zone	2027 Q3	Implementation of CE CCR	Terna
Functionality Usage	Activation of Curtailment Sharing in Italian bidding zones	2025 Q1	To equalise curtailment ratios between BZs that are to be curtailed.	Terna
Functionality Usage	15-min. MTU implementation in SDAC	2025 Q3	REGULATION (EU) 2019/943 on the internal market for electricity	NEMOs/TSOs
Product Usage	Flexi orders to be activated in TGE's order book	2025 Q4	To allow Polish MPs to place flexi orders in TGE's order book.	TGE
Product Usage	Modification of Linked Block Orders in TGE's order book.	2025 Q4	Modification of Linked Block Orders in TGE's order book, so that it is possible to submit more Linked Block Orders per family.	TGE
Network requirement	Quarterly Polar Reversal Elimination (QPRE) solution for KontiSkan (SE3 – DK1) and SwePol Link (SE4 – PL)	2025 Q3	To reduce physical wear of the cables due to polarity reversals	SvK, ENDK, PSE
CACM requirement	Introduction of CE CCR	2027 Q3	Implementation of Central Europe (CE) CCR.	CE TSOs
System update	E12.0 & PMB14.0	2026 Q1	To improve performance of the algorithm, introduce SIDC IDA related functionalities and improve the Best Welfare selection process.	NEMO/TSOs
Network requirement	Change of rounded prices in Bidding Area – Greece Mainland with EIC 10YGR-HTSOY in SCF	2025 Q3	In order to harmonise the methodology for Settlement of Cross Border Schedules with the Italian CCP, we would like to adjust the Price Precision in Bidding Area – Greece Mainland in the PMB's SCF.	HENEX

		Table 01
Details	Scenario 1	Scenario 2
	2026 (Y+1)	2028 (Y+3)
Abandonment of PUN MOs and introduction of CO1 block orders in GME perimeter	8	8
Replacement of current Merit Orders (MOs) with Stepwise curves and introduction of multiple time resolution since 15' go-live	8	8
While ETPA will operate its own PMB instance and exchange files directly with the PMB Cloud application, it will not host or operate any instance of the Euphemia algorithm. Consequently, ETPA will not take on the role of PCR Coordinator, at least in the initial phase.	8	8
The proposed solution would be to set, during the allocation process, a net position constraint applied to Italy North (NORD) bidding zone, that considers only the flows between IT – FR, IT – AT, IT – SI border.	0	0
Activation of the Curtailment sharing in order to equalise the curtailment ratios between BZs that are to be curtailed, upon 15-min. MTU go-live (and the discontinuation of PUN)	8	8
Change of market time unit to 15 mins, in line with the required imbalance settlement period	8	8
TGE's market participants will be allowed to define and submit flexi orders via TGE trading platform. Flexi orders will be included in TGE's order book.	0	0
Current configuration: 1 parent \rightarrow 1 child.		
New configuration: 1 parent \rightarrow 5 child's \rightarrow 5 grandchild's	0	0
Introduction of method to only allow ramping on every $4^{\rm th}$ MTU, called Quarterly Polarity Reversals Elimination (QPRE). This will allow the cables to transition to 15 -min. MTU in the day ahead time frame, while still respecting the operational limits of the interconnectors.	8	8
The new CE DA CCM is based on the existing Core DA capacity calculation methodology and as far as possible, the same tools will be used as in the Core region. The Go Live is currently planned for September 2027 with an external parallel run of at least six months (legal obligation) and a foreseen 6 month internal parallel run prior is preferred by all TSOs. As the CE DA CCM is not yet finally approved by NRAs and since the specification of the necessary tool changes is only planned to be finished by Q2 2025, not all details are known at this point in time.	0	0
"E12.0 contains only technical changes related to a change of the Euphemia solver from Cplex to Xpress. This change was initially proposed by N-Side and aims to guarantee better performances on harder batches, making N-Side more confident towards day-ahead tomorrow's changes, despite tending to be less effective on easier batches (e. g. SIDC IDA), although this does not endanger production sessions. The version will also introduce compatibility with PMB of the Euphemia objective value (Best Welfare process), information already available, where Euphemia will now write it to a new column in data base.	0	0
PMB14.0 includes several technical changes: improvements of security and a technological transition from jBPM to PMB custom dedicated process management solution for PMB processes. It will also contain two functional changes requested by SIDC IDA parties to handle partial decoupling scenarios automatically in case of cross-check issues for Network data and also allow an automatic resolution of the Network Data phase without Operator intervention. There will be an additional change to the Best Welfare selection process: curtailment penalty term has to be newly considered during the result selection process."		
The proposal is to adjust the following Bidding Area in the SCF – Greece Mainland		
Price Precision: currently 3, proposed change to 2		
The change consists of: Updating the Shared configuration above mentioned parameters in PMB	8	8

Requirement	Name	Go-live Date	Reason	Initiator/Owner
Network requirement	Lowering of the SE4 – DE (Baltic Cable) ramping limit to 300 MW	2025 Q3	Amended Nordic LFC block methodology for ramping restrictions for active power output in accordance with Article 137(3) and (4) of the Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation.	Svk, BCAB, TTG
Network requirement	Quarterly Polar Reversal Elimination (QPRE) solution for KontiSkan (SE3 – DK1) and SwePol Link (SE4 – PL)	2025 Q3	Fluctuation of the border flows is expected to increase with 15-min. MTU on the interconnectors. This may increase the number of polarity reversals to the level that would be technically unfeasible and endanger operation of the interconnectors (considering mid/long term period). Potential trading in the opposite direction in the intraday market may not sufficiently solve the issue. Therefore, a limitation on the ramping has to be put in place to ensure the operational security of the cables when introducing 15-min. MTU.	SvK, ENDK, PSE
Geographical extension	EPEX SPOT extension to the Baltics region	2026 Q2	EPEX SPOT would like to include the future order books of its participants in the Baltic region in the SDAC coupling process.	EPEX
Network topology	Parent block of a linked family part of an exclusive group in EMCO trading system	2025 Q3	Following the implementation of the Euphemia/PMB functionality, EMCO intends to allow the combination of exclusive group (CO4) to be parent of a linked block order (CO2).	EMCO

	Table 01
Scenario 1 2026 (Y+1)	Scenario 2 2028 (Y+3)
8	8
8	8
8	8
8	8
	2026 (Y+1) ⊗

Scope of scalability scenario 2026 (Scenario 1: Y+1) [1/2]

		Table 02
Requirement	Name	Details
Capacity Calculation	Advanced hybrid coupling (Core)	
Product Usage	CROPEX implementation of 30' MTU products	
Product Usage	EPEX-Additional Usage CO4 and CO2	
Geographical extension	EXAA extension to FR, NL and BE in Day-ahead	
Network topology	Celtic Interconnector	Mind this change has been postponed to 2027, so technically is out of scope for this scenario. At the time of the data preparation this change was still scheduled for 2026, hence included in our simulation scope.
System Release	Euphemia 11.4 & PMB13.1	
Network requirement	QPRE for FennoSkan (SE3-FI)	
Product Usage	Discontinuation of COs and introduction of new products in OMIE	
Product Usage	Introduction of Exclusive groups and Spread blocks for IBEX	
Product Usage	Parent block of a linked family part of an exclusive group in EMCO trading system	
Product Usage	Discontinuation of PUN MOs and introduction of new products in GME	
Product Usage	Introduction of stepwise curves in GME's bidding areas	
Geographical extension	ETPA accession to DA in DE and NL	

Scope of scalability scenario 2026 (Scenario 1: Y+1) [2/2]

			Table 03
Requirement	Name	Details	
Functionality Usage	Activation of Curtailment Sharing in Italian bidding zones		
Functionality Usage	15-min. MTU implementation in SDAC		
Network requirement	Quarterly Polar Reversal Elimination (QPRE) solution for KontiSkan (SE3-DK1) and SwePol Link (SE4-PL)		
Network requirement	Change of rounded prices in Bidding Area – Greece Mainland with EIC 10YGR-HTSOY in SCF		
Network requirement	Lowering of the SE4-DE (Baltic Cable) ramping limit to 300 MW		
Network requirement	Quarterly Polar Reversal Elimination (QPRE) solution for KontiSkan (SE3-DK1) and SwePol Link (SE4-PL)		
Geographical extension	EPEX SPOT extension to the Baltics region		
Network topology	Parent block of a linked family part of an exclusive group in EMCO trading system		

Scope of scalability scenario 2028 (Scenario 2: Y+3) [1/2]

	1	Table 04
Requirement	Name	Details
Capacity Calculation	Advanced hybrid coupling (Core)	Mind that in 2028 Core should be succeeded by the new Central Europe CCR and this Core AHC changes become obsolete. However, as no network test data for CE CCR existed at the time test data was being compiled, instead the Core AHC test data was re-used also in the Y+3 scenario.
Product Usage	CROPEX implementation of 30'MTU products	
Product Usage	EPEX-Additional Usage CO4 and CO2	
Geographical extension	EXAA extension to FR, NL and BE in Day-ahead	
Network topology	Celtic Interconnector	
Extension	Energy community integration 1st wave	Historical order data from SDAC markets was sourced to populate order data for the EnC bidding zones using the mapping: AL→LV, BA→SI, GE→HR, MD→LV, ME→LV, MK→LV, RS→BG, UA→PL, XK*→LV Where the same SDAC market was used, different historical days were sourced from. Please mind that since Georgia is not connected to either the EnC or SDAC topology, this created problems due to too limited liquidity. To unblock the simulations, ultimately the isolated Georgia was removed from the simulation scope.
System Release	Euphemia 11.4 & PMB13.1	
Network requirement	QPRE for FennoSkan (SE3-FI)	
Product Usage	Discontinuation of COs and introduction of new products in OMIE	
Product Usage	Introduction of Exclusive groups and Spread blocks for IBEX	
Product Usage	Parent block of a linked family part of an exclusive group in EMCO trading system	
Product Usage	Discontinuation of PUN MOs and introduction of new products in GME	
Product Usage	Introduction of stepwise curves in GME's bidding areas	
Geographical extension	ETPA accession to DA in DE and NL	

Scope of scalability scenario 2028 (Scenario 2: Y+3) [2/2]

		Table 05
Requirement	Name	Details
Functionality Usage	Activation of Curtailment Sharing in Italian bidding zones	
Functionality Usage	15-min. MTU implementation in SDAC	
Network requirement	Quarterly Polar Reversal Elimination (QPRE) solution for KontiSkan (SE3-DK1) and SwePol Link (SE4-PL)	
Network requirement	Change of rounded prices in Bidding Area – Greece Mainland with EIC 10YGR-HTSOY in SCF	
Network requirement	Lowering of the SE4-DE (Baltic Cable) ramping limit to 300 MW	
Network requirement	Quarterly Polar Reversal Elimination (QPRE) solution for KontiSkan (SE3-DK1) and SwePol Link (SE4-PL)	
Geographical extension	EPEX SPOT extension to the Baltics region	
Network topology	Parent block of a linked family part of an exclusive group in EMCO trading system	

Anticipated usage

				Table 06
Usage indicators		Years		
		historical	Scenario 1	Scenario 2
		2024	2026 (Y+1)	2028 (Y+3)
1) Indicators to	Total number of steps at bidding zone level	226 542	1 045 316	1 423 976
describe the Usage of SDAC	Total number of block orders	4818	30 102	36 577
products	Total number of block order exclusive groups	171	221	268
(Annex 3 of AM Article 10)	Total number of linked families	52	67	81
	Total number of complex orders	52	0	0
	Total number of scalable complex orders	21	78	83
2) Indicators	Number of bidding zones	64	80	88
to describe geographical	Total number of flow-based bidding zones	19	54	54
extension of the	Number of scheduling areas	67	83	91
SDAC (Annex 3 of AM Article 11)	Number of NEMO Trading Hubs	103	158	166
	Number of NEMOs	15	17	24
3) Indicators	Total number of bidding zone lines	91	109	136
to describe the network constraints	Total number of flow-based PTDF constraints	3 404	30 453	30 453
	Total number of scheduling area lines	102	120	147
(Annex 3 of AM Article 12)	Total number of NEMO Trading Hub lines	233	369	396

Performance indicators^[1]

Condition of the simulations

2026

- Euphemia successfully found solutions for all 362 sessions (we discarded DST days and partial decoupling days).
- For 361/362 sessions a solution was found within 30 minutes. Only 1 (0.3%) exceed this (it needed 31m28s)

2027

- Euphemia successfully found solutions for all 362 sessions (we discarded DST days and partial decoupling days).
- For 360/362 sessions a solution was found within 30 minutes. Only 2 (0.6%) exceeded this (the maximum time to first solution was 33m57s)

Scalability assessment - duration curves

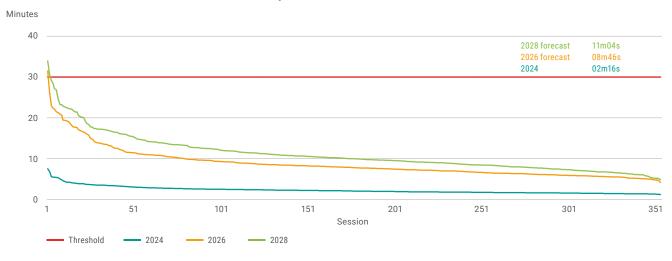
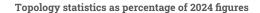
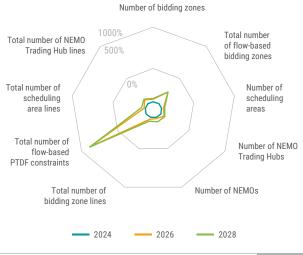


Figure 0

Scalability assessment - duration curves





Usage as percentage of 2024 usage

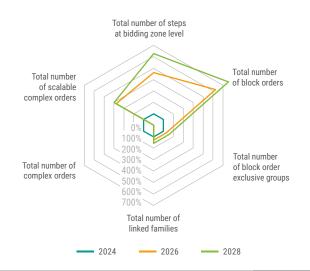


Figure 02

Figure 03

Algorithm scalability

Like last year's study the most notable increase in topology data relates to FB constraints:

- Nordic FB went live in October 2024, so it was not accounted for during all of 2024. Both scalability scenarios do consider Nordic FB.
- Both scalability scenarios considered Core FB test data to reflect the anticipated Core AHC change.
- Finally, the 15-minute MTU change introduces $4\times$ as many network constraints.
- Both scalability scenarios reflect the phase out of merit orders (PUN/Demand/Supply) as well as Complex orders (replaced by Scalable complex orders).
- The number of (curve) steps increase due to the 15-minute implementation as well as due to the replacement of the merit orders.
- Finally, the number of blocks increased beyond the organic market growth due to a number of Product Usage related roadmap changes.

SIDC Scalability report

SIDC CT [2]

SIDC monitors operational data related to the agreed Service Level Agreement (SLA) regarding time and indicators on a monthly basis. These are used for the prediction of the future load of the system for a period of one year, as well as for future usage of products/requirements. However, to better understand real technical limitations, the new "stress test" approach focusing on system limits was adopted in 2024. The new approach is labelled as Enhanced Performance Testing (EPT). EPT is based on two key principles:

- Identification of the technical limits of the XBID system used for Continuous Trading
- Definition of the remedies to mitigate the technical limits

The challenge of SIDC/CT is the uneven distribution of the activities related to Orders, such as submission, activation, deactivation, deletion (technically referred to as Order Transactions). The processing of Order Transactions results in different trading peak situations which shape (e.g. duration, number of orders) differs depending on the market situation. The simulation of various peak situations, as well as the simulation of baseload trading, helped to identify system components which need to be improved to further improve the scalability of the SIDC XBID platform. The improvement is achieved via implementation of the Performance Optimisation Measures (POMs).

Due to the complexity of some POMs (e.g. synchronous implementation of the changes on central and local level), they are scheduled for delivery in the period of 2025–2027 (first POMs are already in operation).

The EPT approach, in combination with the market predictions (product portfolio, market growth and consideration of the geographical extension), form the basis of the scalability report.

The significant increase of robot trading in combination with the change of the product portfolio (transition from an hourly product to a 15' product) may lead to the application of corrective measures prior further POMs are implemented.

"First set of Performance Optimisation Measures is in operation since June 2025"

The initial EPT was performed using the version R4.1 of the SIDC/CT algorithm, while the 2^{nd} round of EPT was performed using the latest available SIDC/CT version R4.1.50 (which has been in operation since June 2025).

The focus of R4.1.50 of SIDC/CT algorithm POMs was mainly on the post trading parts of the algorithm to ensure that the processing of the trading results can cope with the increased trading. This proved to be of significant importance in relation to the 15' MTU introduction.

It has been proven by the results of EPT of the SIDC/CT algorithm (R4.1 and R4.1.50) in combination with the market development, that further POMs must be implemented in the SIDC/CT algorithm as soon as possible to comply with the steady increase in the number of orders and trades.

The next set of POMs, which are the result of the EPT results' analysis, are already in the testing phase with expected delivery into production in the 2nd quarter of 2026. These POMs are mainly focused on tackling the issue related to database reading (introduction of Event Streaming) and subsequent protocol messaging (upgrade of RabbitMQ queuing) in the SIDC/CT algorithm which requires thorough and complex testing of the SIDC/CT algorithm, as the technical approach changes substantially.

These POMs are not only needed to comply with the constant market growth but also for the further geographical extension of SIDC cooperation by Ireland, Energy Community Countries on the one hand and increase of the participation/competition in the SIDC market on the other hand.

The design of the SIDC/CT XBID Solution handles high peak situations by queuing up the incoming orders which may lead to the extension of the time needed for execution of an order. Under extreme system overload, the queue can become too big to be processed in a reasonable time. To avoid such a situation the corrective measures could be applied prior to the next POMs are delivered.

The time needed for the execution of an order is measured and evaluated on a regular basis. As stated in the performance part of the annual report, the time for execution of an order for 2024 decreased in comparison with the year 2023 roughly by 10 percent (and almost by 35 percent in comparison to 2022) even though the average number of the **orders almost doubled** in comparison to 2024 while number of trades increased by **38 percent.** While in 2021 the average percentage of trade/order ratio was 6.6, in 2024 it dropped to 3.95 percent. This is a significant aspect for the scalability consideration as the performance improvements of the SIDC/CT algorithm may not be used in the most efficient way.

The roadmap provides an indication of the intended go-live period for the listed RfCs. The go-live period may be subject to revisions reflecting the SIDC prioritisation process which considers the regulatory, technical and commercial aspects of RfCs and hence demands a certain planning flexibility.

Roadmap of RfCs*

								Table 07	
Requirement	Name	Go-live Date	Reason	Ref. AM article 14.1	Initiator/ Owner	Details	Outcome	Included in scalability study – yes/no	
Flow based Allocation	Flow based support in SIDC Continuous trading and XBID platform	2027+	CACM - Regulatory require- ments implemen- tation	а	NEMOs/ TSOs	R&D Under preparation	New design is subject of definition.	No	
Products extension	15 minutes resolution and products for Greece – wave 6 (cross zonal)	30-Sep-25	IDCZGOT prerequisite	а	Affected TSOs and NEMOs	Configuration update	Approved	Yes	
	15 minutes resolution and products – wave 5 (cross zonal)	18-Mar-25	IDCZGOT prerequisite	а	Affected TSOs and NEMOs	Configuration update	Approved	Yes	
	15 minutes resolution and products – wave 4b (cross zonal)	23-Jan-25	IDCZGOT prerequisite	а	Affected TSOs and NEMOs	Configuration update	Approved	Yes	
Configuration changes	EPEX activation in the Baltic region – Continuous Trading	25-Nov-25	geographical extension	g	NEMOs	CCP extension	Approved. No topology change, limited impact on performance, no impact on the scalability	Yes	
	EMCO activation in Slovenia – CT	Q2 2026	geographical extension	g	NEMOs	CCP extension	Included to assessment, No topology change, limited impact on performance, no impact on the scalability	Yes	
	Baltic Cable participation in SIDC Contiguous (XBID) and SIDC Intraday Auctions (IDAs)	Q4 2026	geographical extension	g	TSOs	Configuration update	Included to assessment, No topology change, limited impact on performance, no impact on the scalability	Yes	
	SEM participation in SIDC Contiguous (XBID) and SIDC Intraday Auctions (IDAs) Following Celtic Interconnector Implementation	Q4 2026	geographical extension	g	NEMO/ TSOs	Configuration update	Included to assessment. Impact on performance due to increased number or orders and change of topology. It will be included in the next round of the testing of CT performance which is scheduled for September/ October 2025.	No	

	_							Table 07	
Requirement	Name	Go-live Date	Reason	Ref. AM article 14.1	Initiator/ Owner	Details	Outcome	Included in scalability study – yes/no	
	Geographical extension in EnC region	2027+	geographical extension	0.0	NEMOs	CCP extension	Included to assessment. Impact on performance due to increased number or orders and change of topology. It will be included in the next round of the testing of CT performance which is scheduled for September/October 2025	No	
Configuration update	Phase2 role of HANSA CCR (Integration of TSCnet and NRCC)	2025	IDCZGOT prerequisite	а	NEMOs/ TSOs	Configuration update	Included to assessment	No	
System releases	4.1 TSO Password reset functionality, Mass Trade Cancellation, Support for mix of capacity (contract) resolution on VDA connected interconnectors, XBID Market admin, Adjustment of outbound files processing by CMI	14-Jan-25	Improve usability/ robustness	е	TSOs	System development, R&D Completed	Approved	Yes	
	4.1.50 Quick intermediate performance improvement	23-Jun-25	Improve usability/ performance	d	NEMOs/ TSOs	System development, R&D Completed	Approved	Yes	
	5.0 SM – Allocation situational overview, CMM Process Execution after System failure, Scheduled Service Halt, Multi Contract Modification, ECP Improvements, Perfor- mance improvements	Q2 2026	Improve usability/ performance	d	NEMOs/ TSOs	System development, R&D Ongoing	Approved	No	
	5.1 Identification of Initiator and Aggressor, Autopublish after GOT, Optimisation of CMM FTCs creation for 2 channels – Primary and secondary channel for FTCs in CMI, Shipping module handover enduring solution improve- ment, Performance improvements (2nd batch – binary API), TSO admin GUI	2026+	Improve usability/ performance	d	NEMOs/ TSOs	System development, R&D Ongoing	Approved	No	

Development of key system boundaries

Order Transactions Extrapolation

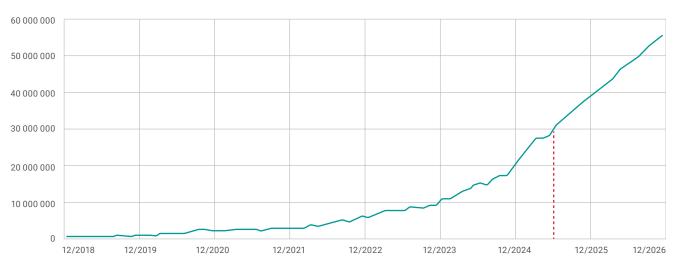


Figure 04

Trades Extrapolation

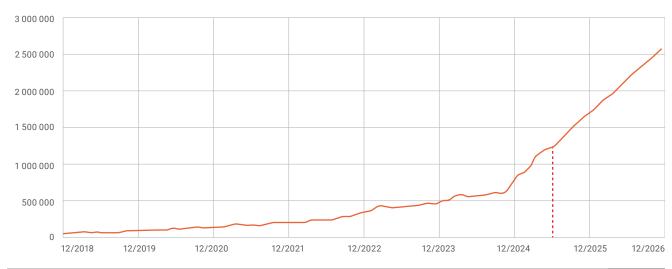


Figure 05

Growth prediction based on technical time series analysis:

- The plots are based on regular assessment of SLA^[3] reports available monthly. Linear extrapolation was used for predictions on the anticipated usage for Orders and Trades on SIDC/CT. Apart from 2024 usage ranges, the prediction takes into consideration production data till June 2025, and the extrapolation is applied till and of 2026.
- Peak load situations are evaluated monthly as a part of the SLA Performance reports analysis.

Summary: The charts indicate that, with the application of above-mentioned assumptions in combination with the prediction based on technical time series, the latest system boundaries, contractually agreed in the SLA since 2024 (10 million for order transaction; 600 thousand trades) are breached for both order transactions and trades. As mentioned in previous pages the impact shall be mitigated by the implementation of POMs scheduled with priority for multiple upcoming releases. It was expected that the introduction of IDAs will have an impact on the trends in the continuous market, however, this seems not to be the case, rather the contrary.

Synthetic chart showing growth prediction, and technical limits via triangular chart:

- Unlike in the previous years, in the 2024 scalability report we focus for the 1st time on the technical limits of the XBID Solution. This is feasible due to the new testing approach labeled as Enhanced Performance Testing (EPT).
- EPT is a type of stress test which identifies weak components of XBID Solution. This is achieved via two types of tests:
 - Long run tests the XBID solution is put under the stress and monitored for 30 hours with predefined shape of peak situation for each test (in total 4 tests with each of them using 1-second and 5-second peaks).
 - > Short run tests the XBID solution is put under stress and monitored for one hour with peak situations which are more challenging than those used in log run test (2 tests with each of them using 1-second and 5-second peaks and 2 tests with each of them using 1-second and 3-second peaks).
- Usually, the technical limits of XBID Solution mean that the solution is put under such stress that the order transactions cannot be processed in 'a reasonable time' for which indicators are defined as solution boundaries. It is important to understand that in the operations each peak situation may have different shape in terms of duration and number of processed order transactions within 1, 3 or 5 seconds.

Predicted: Average Usage as percentage of 2024

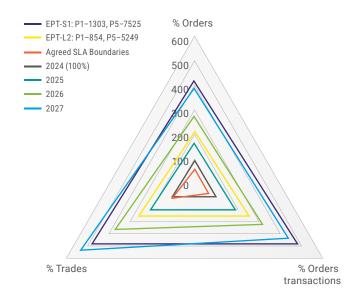


Figure 06

- The test results used for the scalability study were executed on the XBID Solution version R4.1.50 which has been in operation since June 2025.
- For the purpose of the scalability study, the following two EPT tests (depicted in the figure as EPT (EPT-L2 & EPT-S1) blue triangles) are presented in comparison to 2024 data (100% – grey triangle). Furthermore, predictions for the period 2025 – 2027 are represented by the green triangles. The orange triangle represents the currently agreed service boundaries.
 - ➤ Long run test 2 (EPT-L2: P1-854, P5-5 249) with the following key parameters:
 - Total number of order transactions simulated per day – 37 million
 - Peak 1 (600 peaks per hour) with duration of
 1 second and the number of order transactions –
 854 per second
 - Peak 2 (3 peaks per hour) with duration of 5 seconds and the number of order transactions – 5 249 per second
 - > Short run test 1 (EPT-S1: P1-1303, P5-7525) with the following key parameters:
 - Total number of order transactions simulated per hour – 2.9 million (for the purpose of presenting in one chart it is recalculated to 24 hours)
 - Peak 1 (600 peaks per hour) with duration of 1 second and the number of order transactions – 1303 per second
 - Peak 2 (3 peaks per hour) with duration of 5 seconds and the number of order transactions – 7 525 per second
 - > The number of trades for both runs is derived from the ratio of trades / order transactions from 2024 operational data (= 0.04, i. e. 4% of order transactions are matched into trades).

Summary:

- Already in 2024, the operation of XBID Solution is outside of SLAs for orders, trades and order transactions.
- Provided the expected trend is confirmed, the year 2026 is already outside the technical limits of the solution represented by Long run test 2 (EPT-L2).

SIDC IDAs

In the following pages, the scalability of the SIDC IDAs is assessed, simulating the performance of the scalability indicator in relation to the expected evolution of foreseen requests for change. This exercise is carried out on top of production data from the period 1 July 2024 until 30 June 2025. This allowed for the compilation of 1 year of data, despite IDAs only being live since June 2024. The scope was limited to IDA1, which should be similar or more complex compared to the other IDAs. Simulations were run using the production release of the SDAC Algorithm available in the time of tests (Euphemia 11.4).

Roadmap

The Roadmap anticipates the impact of RfCs expected to go live in the next three years. Based on this two scenarios have been tested for 2026 (Y+1) and 2028 (Y+3) following the relevant provisions of the Algorithm Methodology.

- **Scenario 1:** including the anticipated usage of existing products and requirements in 2026.
- **Scenario 2:** including the anticipated usage of existing products and requirements in 2028.

Anticipated Usage

The expected usage of products and requirements reflects the actual usage recorded between the last half of 2024 and the first half of 2025 and projected to 2026–2028 by applying the historical usage growth of each product/requirement projected into the future. Further details are illustrated on the anticipated usage table.

Since the IDAs are still evolving, the extracted growth figures may have been exaggerated. This is expected to self correct in future Scalability reports.

Scalability Indicator

This year's scalability indicator shows the Algorithm meets the scalability thresholds:

- Scenario 1: requires on average 1 minutes and 53 seconds to find a solution, but never more than 6 minutes and 39 seconds, i. e. the scalability thresholds for scenario 1 (97% < 7 minutes, and 100 % < 16 minutes) are respected;
- Scenario 2: requires on average 2 minutes and 54 seconds to find a solution, but never more than 7 minutes and 56 seconds. These results did require the usage of special algorithm configurations for 5 sessions. The scalability thresholds for scenario 2 (97% < 7 minutes, and 100% < 16 minutes) are respected;

Roadmap of RfCs

The following tables list the different requests for change as captured by the roadmap.

Some of the RfCs present in the Roadmap have not been taken into account in the simulated scenarios due to missing information/non-implemented functionalities in the algorithm/irrelevance in relation with the timeline of the simulations. In particular, FB in IDA is not included into the scope of the scalability scenario Y+3 as the overall implementation timeline of FB in IDA has been unclear until summer 2025 making it difficult to prepare appropriate data for corresponding simulations both from capacities and order data point of view. The planned evolutions of the FB capacity calculation in CORE and Nordic regions (especially reflecting practical experience after introduction of FB capacity calculation in Nordics at the end of 2024) would allow to perform more accurate simulations when preparing the scalability report 2025.

							Table 08
Requirement	Name	Go-live Date	Reason	Initiator/	Details	Scenario 1	Scenario 2
				Owner		2026 (Y+1)	2028 (Y+3)
Capacity Calculation	Flow Based in ID	2024 Q4	CACM/ Nordic CCR	TSOs	Introduction of Flow Based in ID	0	0
MNA – Multi-NEMO	Incorporation of BRM in Romania	2025 Q3	CACM	NEMOs		8	8
MNA – Multi-NEMO	Incorporation of ETPA	2026 Q1	CACM	NEMOs		0	0
MNA – Multi-NEMO	EPEX extension of services for Baltic region	2026	CACM	NEMOs		8	8
Capacity Calculation	Baltic Cable	2026 Q4		TSOs		8	8
Geographical extension	Inclusion of Ireland	2026 Q4	CACM	NEMOs/TSOs	Introduction of SEM to IDA topology	8	8
Capacity Calculation	Celtic Interconnector	2026 Q4	TSO	TSOs	New inter- connection between France- Ireland	8	8

Roadmap of SIDC/IDAs RfCs

							Table 09
Requirement	Name	Go-live Date	Reason	Initiator/ Owner	Details	Scenario 1 2026 (Y+1)	Scenario 2 2027 (Y+3)
Extension	Energy community integration 1 st wave	2025 Q3		NEMOs/TSOs	Extend topology to EnC countries (Albania, Bosnia and Herzegovina, Georgia, Kosovo*, Moldova, Montenegro, North Macedonia, Serbia, Ukraine and their NEMOs. For the simulations their order books were populated with order data from existing SDAC markets (from different days)	8	8
Extension	Energy community integration 2 nd wave	2027 Q4		NEMOs/TSOs		8	8
System Release	Euphemia 11.4 & PMB13.1	2025 Q2		NEMOs/TSOs	Implementation of changes in EUPHEMIA version E11.4 into production together with the corresponding PMB13.1 version	8	8

Scope of scalability scenario 2026 (Scenario 1: Y+1)

		Table 10			
Requirement	Name	Details			
MNA – Multi-NEMO	Incorporation of BRM in Romania				
MNA – Multi-NEMO	EPEX extension of services for Baltic region				
Capacity Calculation	Baltic Cable				
Extension	Inclusion of Ireland	Currently Ireland is not reflected in the SIDC IDAs. To populate			
Network topology	Celtic Interconnector	Irish order book, orders were taken from the existing local SEM IDA1 auction. Adding Ireland to the scope also allows to reflect the Celtic interconnector between Ireland and France.			
Extension	Energy community integration 1st wave	Historical order data from SIDC markets was sourced to populate order data for the EnC bidding zones using the mapping:			
Extension	Energy community integration 2^{nd} wave	AL \rightarrow LV, BA \rightarrow SI, GE \rightarrow HR, MD \rightarrow LV, ME \rightarrow LV, MK \rightarrow LV, RS \rightarrow BG, UA \rightarrow PL, XK* \rightarrow LV			
		Where the same SIDC market was used, different historical days were sourced from. Unlike SDAC, in SIDC dealing with an isolated Georgia did to give any problems, so Georgia could be maintained.			
System Release	Euphemia 11.4 & PMB13.1				

Scope of scalability scenario 2028 (Scenario 1: Y+3)

		Table 11
Requirement	Name	Details
MNA – Multi-NEMO	Incorporation of BRM in Romania	
MNA – Multi-NEMO	EPEX extension of services for Baltic region	
Capacity Calculation	Baltic Cable	
Extension	Inclusion of Ireland	Currently Ireland is not reflected in the SIDC IDAs. To populate
Network topology	Celtic Interconnector	Irish order book, orders were taken from the existing local SEMO IDA1 auction. Adding Ireland to the scope also allows to reflect the Celtic interconnector between Ireland and France.
Extension	Energy community integration 1st wave	Historical order data from SIDC markets was sourced to populate order data for the EnC bidding zones using the mapping:
Extension	Energy community integration 2 nd wave	AL \rightarrow LV, BA \rightarrow SI, GE \rightarrow HR, MD \rightarrow LV, ME \rightarrow LV, MK \rightarrow LV, RS \rightarrow BG, UA \rightarrow PL, XK* \rightarrow LV
		Where the same SIDC market was used, different historical days were sourced from. Unlike SDAC, in SIDC dealing with an isolated Georgia did to give any problems, so Georgia could be maintained.
System Release	Euphemia 11.4 & PMB13.1	

Usage indicators

				Table 12
Usage indicators			Years	
		historical	Scenario 1	Scenario 2
		2024	2026 (Y+1)	2028 (Y+3)
1)	Total number of steps at bidding zone level	139 447	520 999	801 769
Indicators to describe the Usage of SDAC	Total number of block orders	5 336	14 143	21 419
products (Annex 3 of	Total number of block order exclusive groups	16	23	23
AM Article 10)	Total number of linked families*	0	1 435	2 841
	Total number of complex orders	0	0	0
	Total number of scalable complex orders	0	5	5
2)	Number of bidding zones	51	61	61
Indicators to describe geographical extension	Total number of flow-based bidding zones	0	0	0
of the SDAC (Annex 3 of	Number of scheduling areas	54	64	64
AM Article 11)	Number of NEMO Trading Hubs	78	92	92
	Number of NEMOs	13	23	23
3)	Total number of bidding zone lines	75	105	105
Indicators to describe the network constraints	Total number of flow-based PTDF constraints	0	0	0
(Annex 3 of AM Article	Total number of scheduling area lines	81	111	111
12)	Total number of NEMO Trading Hub lines	154	195	195

• In 2024 very few linked blocks were used (on average ~0.4, so rounded to 0). For scenarios 1 and 2 the growth of products has been derived by comparing the two half years 2024 and 2025. Since some linked families were used in 2025 the resulting growth factor was relevant since the initial usage of the product was zero. This results in an overestimation of the growth, which will self-correct in the next year's report once usage levels stabilise.

Performance indicators^[1]

Condition of the simulations

2026

• All sessions found solutions within 7 minutes;

2028

- Euphemia found solutions for all sessions;
- For all but 5 sessions a solution was found within 7 minutes:
 - For these 5 outliers running Euphemia with a different configuration reduced the TTFS to at most 7 minutes and 56 seconds.

- For 3 of the 5 outliers the input data showed an unrealistic number of linked families:
 - The historical number of linked families between H2 2024 and H1 2025 grew by 2 300 %. This sounds impressive, but corresponds to an average use that went up from 1.25 family to 30.58 families.
 - > Towards the end of Q2 2025 usage increased to ~76 families. Projecting from 2024 to 2028 implies 4 years of growth, so 4 × 2300 % = 9200 % increase, i.e. 92 × the number of families, i.e. ~7000 linked families.
 - > The increase originated in Poland, which also was used to source UA data for the EnC change. I.e. this high number of linked families therefore doubled.
 - In the simulations 69 sessions have this unrealistically large number of linked families, yet only 3 outliers occurred, all below 30 minutes.
- Despite the overestimation of specific products, the simulations converge in the great majority of the sessions.

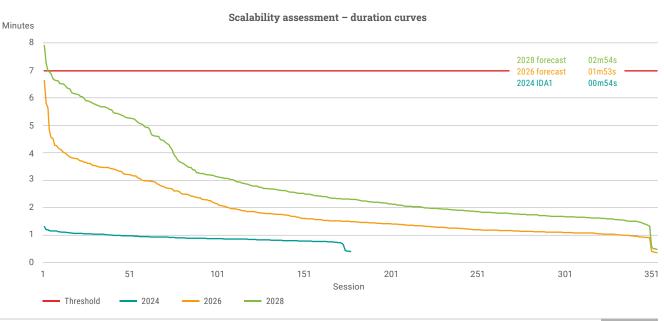
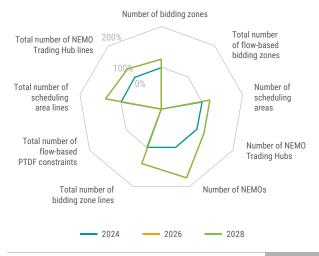
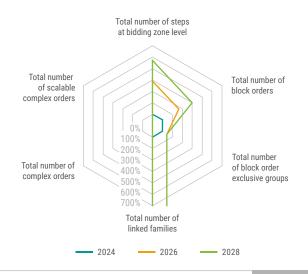


Figure 07

Topology statistics as percentage of 2024 figures



Usage as percentage of 2024 usage



Algorithm scalability

The main increases relate to the inclusion of the EnC countries, and the associated lines

- The increase in the different products likely is skewed due to the approach to obtain growth estimates for the IDAs: the last half of 2024 (i.e. period shortly after go-live) was compared with the first half of 2025;
- Resulting growth trends likely picked up the initial growth/evolution of the IDAs, which cannot be sustainably projected to 2026 and 2028. Such projected values are clearly an overestimation of the anticipated usage of the products, that will be self corrected in the future Scalability Report on the basis of a more stable historical scenario.





Annex 1: Parameters

SDAC parameters

	Table 14					
Indicator	Parameter	Description	Value	Purpose	Annex 3 of AM	
	K	Number of months which define the recent historical set	3	Definition of recent historical set	Art. 2(a)	
	Х%	Minimum percentage of cases which have to comply with the scalability indicator threshold	 97% of cases should be below Running time; 100% of cases should be below 180% of running time. 	Monitoring purpose RfC assessment for the past scenario RfC assessment for the future scenario Scalability assessment for the near future scenario Scalability assessment for distant future scenario Research and development	Art. 3(4) - Art. 4(2)(a) - Art. 4(2)(b) - Art. 5(2)(a) - Art. 5(2)(b) - Art. 6(2)(a)	
Scalability	У	Threshold for scalability indicator on the indicator values distribution	1. TBD accordingly for the SDAC Scalability Report	Monitoring purpose RfC assessment for the past scenario RfC assessment for the future scenario Scalability assessment for the near future scenario Scalability assessment for distant future scenario Research and development	Art. 3(4) - Art. 4(2)(a) - Art. 4(2)(b) - Art. 5(2)(a) - Art. 5(2)(b) - Art. 6(2)(a)	
	Z	Threshold for scalability indicator on the average value	00	Monitoring purpose RfC assessment for the past scenario Scalability assessment for the near future scenario Scalability assessment for distant future scenario Research and development	Art. 3(4) - Art. 4(2)(a) - Art. 5(2)(a) - Art. 5(2)(b) - Art. 6(2)(a)	

SIDC parameters

			Table 15		
Parameter	Value	Scope	Proposed Annex 4 of AM		
K	12	Number of months which define the recent historical set	Art. 2(a)		
t	n. a. ^[2]	Scalability threshold as defined in the service agreement with the service provider			
Х%	n.a. ^[2]	Minimum percentage of cases which have to comply with the scalability indicator threshold			

Annex 2: Notes

[1] Scalability Indicator

This indicator for SDAC applies the standard scalability indicator (TTFS) and relative thresholds currently applied to approve RfCs to future scenarios (the near future scenario representing Y+1, and distant future scenario representing Y+3), which includes anticipated growth of historical usages and anticipated Requests for Changes. Same approach is adopted starting from Scalability Report 2024 for the scalability assessment of IDAs.

[2] SIDC-CT

Technical operation of SIDC is fully regulated by the Master Service Agreement (MSA) between NEMOs and the XBID system vendor. MSA's contractual arrangements stipulate that the vendor is the sole party having access to the XBID technical components as e.g. XBID databases. Hence, the data which are included in this report are mainly based on the technical regular reports provided by vendor to SIDC parties. This also implies that all requests on the extension of the reporting obligation (including the existing reporting obligations which are not implemented yet), and which require extension of XBID source data provided by the vendor, are subject of the change management process and release management process stipulated with the vendor. It shall be also noted that the MSA sets out principles of confidentiality which, among others, apply to the provisions of the Service Level Agreement regulating e.g. availability and performance of the XBID system. Based on the confidentially principles, the details may be, and are, shared with SIDC stakeholders (NRAs, ACER, EC) but cannot be revealed to the general public and therefore they are not integrated within this report. Note that NRAs have full access to the MSA.

[3] SIDC Performance indicators & Performance monitoring

The evaluation of the performance indicators is carried out in SIDC on a monthly basis in line with the processes stipulated in the MSA. As a basis for the evaluation of the performance the Service Level Agreement (SLA) applies. The SLA represents contractually agreed parameters and in combination with agreed system boundaries it defines the performance of SIDC guaranteed by the vendor. The technical thresholds of SIDC are not defined (known) though it is assumed that they are well above the SLAs (which is also proven by the scalability report). Every month the vendor provides an evaluation of the performance indicators, based on the production data, in the form of a performance report. SIDC parties review the performance report and provide the vendor with anticipated changes of the processed data, as e.g. changes/growth in the number of implicit and explicit orders. The vendor analyses the provided data and in case the analysis indicates a risk or need of the optimisation measures the vendor provides a proposal for the SIDC Solution improvements which are jointly discussed.

Disclaimer

The data source of this report has been provided by SDAC and SIDC respectively.

The All NEMO Committee accepts no responsibility or liability for any consequences arising from the use of the data contained in this document.

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