

Public consultation of NEMOs and TSOs on the Co-optimisation R0 Report

Eurelectric consultation response

Eurelectric represents the interests of the electricity industry in Europe. Our work covers all major issues affecting our sector. Our members represent the electricity industry in over 30 European countries.

We cover the entire industry from electricity generation and markets to distribution networks and customer issues. We also have affiliates active on several other continents and business associates from a wide variety of sectors with a direct interest in the electricity industry.

We stand for

The vision of the European power sector is to enable and sustain:

- A vibrant competitive European economy, reliably powered by clean, carbon-neutral energy
- A smart, energy efficient and truly sustainable society for all citizens of Europe

We are committed to lead a cost-effective energy transition by:

investing in clean power generation and transition-enabling solutions, to reduce emissions and actively pursue efforts to become carbon-neutral well before mid-century, taking into account different starting points and commercial availability of key transition technologies;

transforming the energy system to make it more responsive, resilient and efficient. This includes increased use of renewable energy, digitalisation, demand side response and reinforcement of grids so they can function as platforms and enablers for customers, cities and communities;

accelerating the energy transition in other economic sectors by offering competitive electricity as a transformation tool for transport, heating and industry;

embedding sustainability in all parts of our value chain and take measures to support the transformation of existing assets towards a zero carbon society;

innovating to discover the cutting-edge business models and develop the breakthrough technologies that are indispensable to allow our industry to lead this transition.

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NEMO and TSO R0 report on co-optimisation R&D

A Eurelectric consultation response

July 2025

KEY MESSAGES/EXECUTIVE SUMMARY

- **Eurelectric thanks the Market Coupling Steering Committee** for consulting stakeholders on the R0 report about co-optimisation and looks forward to the continuous involvement of market participants in the R&D process.
- **The current electricity market design, based on decentralised dispatch and portfolio-based bidding, has enabled large welfare gains** over the past decade and needs to be preserved regardless of the solution chosen for the cross-zonal exchange of balancing capacities.
- **Market participants need to remain free to choose which energy and balancing capacity markets they participate in and how they reflect costs** other than the SDAC opportunity cost in their bidding.
- We recall that **the additional computational complexity that co-optimisation would generate must not be compensated by limiting the diversity of bidding products** available to market participants. Any such development would undermine the effective representation of portfolio constraints in market participants' bidding and reduce the overall social welfare.
- **The R&D on co-optimisation should consider overall welfare impacts**, assessing the potential benefits under realistic market assumptions and highlighting the costs involved with the collateral impacts on balancing capacity and wholesale markets.
- As regards the different aspects developed in the N-Side report, we would like to emphasise the following:
 - **Implicit vs. explicit bidding:** further investigation is needed before a final choice can be made between implicit and explicit bidding. We acknowledge that implicit bidding theoretically relieves market participants from forecasting day-ahead prices. However, the length of that advantage is not so clear at this stage (cf. question 8) and Eurelectric believes that the pricing method should be one that demonstrates greater efficiency, allows portfolio bidding, guarantees bidding freedom and ensures readable price signals. Furthermore, Eurelectric underlines that under implicit pricing, it is crucial that MPs remain free to choose all aspects of their bidding apart from the SDAC opportunity cost in the form of a premium.
 - **Linked vs. combined bids:** we welcome the proposal to enable both linked bids and combined bids in a co-optimised setting. This goes in the direction of enriching the product offering in order to allow representing both advanced trading strategies and the characteristics of specific assets or asset-classes, and to provide

more choices to market participants. It should be noted however that further enrichment may be required (e.g. combined block bids) and that specific bid structures must not lead to unit-based bidding.

- **Paradoxically accepted bids (PABs):** we support the current design choice to exclude PABs, since their inclusion may impact market transparency. The impact of this choice on algorithmic performance needs to be closely monitored and the final choice on such rule needs to be weighed against such performances.

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Bidding products related questions

8. Section 3.1.2 of the report identifies several issues with “explicit bidding” and, on this background, clearly concludes in favour of “implicit bidding”. Do you have comments on these issues, the conclusion to further develop implicit bidding or on possible advantages of co-optimisation with explicit bidding compared to implicit bidding with a possibility of an explicit ‘premium’? For further detailed information, please refer to sections 2.2 - 2.4 of Appendix A: N-Side Report.

Eurelectric acknowledges some of the concerns associated with explicit bidding but **cannot share at this stage the proposal to discard this option and focus only on implicit bidding**. Errors related to day-ahead price forecasts may reduce overall welfare and result in suboptimal or even negative profits for market participants. By comparison, implicit bidding as presented in the report may provide greater benefits and offers superior properties. Eurelectric underlines, however, that implicit bidding may also require forecasts, leading at least to moderate this perceived theoretical superiority. One should also note that prices specific to balancing capacity, and notably representing its technical constraints, are necessary to address price signals for long-term investments into flexible assets.

In this regard, Eurelectric would like to address two important elements:

First, **we understand that implicit bidding as defined in the N-Side report only refers to the absence of explicit accounting of the opportunity cost of related SDAC bids**. Eurelectric rejects any interpretation of implicit bidding that would lead to unit-based bidding. Market participants should thus remain able to freely choose all remaining aspects of their bidding, including the choice of participation in the different balancing capacity markets and the reflection of the rest of their costs.

Second, the R0 report states that market participants do not need to rely on forecasting the SDAC price in their bidding because this is accounted for through the optimisation. However, this assumption is not necessarily correct, since the cost structure between the balancing capacity markets and the day-ahead market is non-linear. **Balancing capacity bids will be dependent on the energy price (SDAC), technical capabilities of assets, the energy price for balancing activation (BA), and the likelihood of being activated with the corresponding energy bids (SDAC and BA)**. As far as we can see, this is not reflected in the co-optimisation model, and the expected revenue will be different for each market participant, which means a common cost structure cannot be modelled in the algorithm. It is important that TSOs and NEMOs evaluate and address the weaknesses of this assumption.

Additionally, given the expected complexity of the bidding process, market participants may still need to rely on price forecasts for day-ahead and intraday markets when constructing their bids. As a result, even with implicit bidding, the outcome may still depend on anticipating the most economical dispatch, and any deviation from it would thus rely on the quality of price forecasts for all co-optimised products. Finally, we underline that the implicit approach requires the ability to compute the opportunity costs for highly constrained assets/portfolios with interdependencies between dispatch decisions.

Thus, before choosing definitively between explicit and implicit bidding, it is crucial to thoroughly evaluate how energy and capacity products are modeled and how the bidding design allows market participants to reflect their constraints in their bids, and what impact on price formation and market dynamics are to be expected. Specifically, Eurelectric would welcome a clarification as to how implicit bidding can maintain clear and understandable price signals.

- 9. With implicit bidding, opportunity costs of balancing capacity that occur in SDAC will be automatically taken into account in the optimisation and at least recovered by each market participant. However, there may be other costs related to offering balancing capacity that are not captured within the SDAC optimisation. Section 3.1.3 of the report suggests the possibility of a premium for balancing capacity to be able to cover such costs. Do you agree with the need to have a premium for balancing capacity? If no, please explain why you disagree.**

Yes, strongly agree. The premium allows market participants to reflect all costs other than the opportunity cost. This can be for example (without being limited to) additional costs related to the provision of balancing capacity compared to energy (on top of the opportunity cost), or technical costs or loss of intraday opportunity that could not be reflected in the bidding structure. Moreover, depending on the technical characteristics of the plant/asset (e.g., storage capacity) different strategies may be chosen regarding balancing energy price and the likelihood of activation.

In addition, one should note that an insufficient bidding language would poorly reflect on welfare. Specifically, in case some technical constraints cannot be reflected via bids, they would have to be reflected in the premium. This may lead to a sub-optimal solution given the technical and economic reality of the system but also in relation to the solution offered by the current sequential market. Eurelectric thus insists on the necessity to develop a bidding framework that enables market participants to reflect their constraints in their bids.

- 10. The R0 report mentions some specific costs that can be reflected by means of a premium. Which costs would you consider relevant to be reflected by such a premium?**

No answer by Eurelectric.

11. Do you have any additional suggestions for this premium (e.g. potential restrictions, maximum, etc.)?

Market parties should be free to define the premium in function of their bidding strategy and portfolio. Eurelectric emphasizes that there should be no predefined list of acceptable cost components for inclusion in the premium and that negative premiums should also be possible.

Bid design related questions

12. Section 3.2.2 of the report proposes both “linked bids” and “combined bids” to be used in a potential future co-optimised SDAC market. For more detailed information on linked and combined bids, please refer to sections 3.1 and 3.2 of Appendix A: N-Side Report. Do you see the need to enable both types of bids, combined and linked?

Eurelectric reiterates its **strong opposition to any reduction in the diversity of energy products or bidding flexibility within the SDAC**, as this could expose market participant to risks and result in reduced efficiency and welfare in the SDAC. **Furthermore, if the purpose of such restrictions is to accommodate the algorithmic complexity of co-optimisation in Euphemia**, we believe this would be a clear example of why co-optimisation may only be superior in theory.

To accurately reflect all relevant costs and technical constraints, a highly granular market structure is essential—one that enables cost representation at each time step and for every feasible generation schedule of each power plant unit. Capturing the interdependencies between balancing capacity and wholesale energy products also requires effective bid linkage.

In this context, Eurelectric welcomes the two approaches outlined in the R0 report—linked bids and combined bids— as valuable options to capture the diversity of assets and the variety of associated costs and constraints. As highlighted in the R0 report, **linked bids are particularly effective for representing advanced trading strategies within portfolio-based bidding, whereas combined bids are better suited to reflect the specific characteristics of individual assets.**

That said, Eurelectric remains concerned about the algorithmic complexity these bidding formats may introduce. **Eurelectric strongly emphasizes that any solution to manage this complexity must not compromise the core principles of the European market design, which is fundamentally grounded in decentralised dispatch and portfolio-based bidding** – as underlined in the report. The algorithmic performance should therefore not be dependent on a restriction of the bidding diversity to a limited number of specific products, such as combined bids.

13. Do you agree with the proposals referred to in Question 12 and/or do you have further suggestions for the design of linked bids and combined bids, for example, what kind of linking should be possible or what kind of combined bids should be provided?

As far as Eurelectric understands, while providing further flexibility, combined bids illustrated in section 3.2.2 of the report do not allow to express “block” constraints. Bids offered under these conditions would need to be fully divisible between the min and max for both day-ahead power and balancing capacity without the possibility of a temporal link. This wouldn’t allow to reflect all the limitations of a given asset.

We therefore believe that:

- i. the use of **linked combined bids** seems specifically appropriate to represent either the technical constraints of an asset that cannot be translated into costs or the strategies of market participants; and
- ii. **combined block bids** seem like a more promising option than simple combined bids, though further descriptions of the concept would be needed.

14. Are there special characteristics in your portfolio or your country that are not adequately addressed in the proposed bid structures? What are your suggestions for additional features that may be needed? You may also consult Appendix B of R0 report to review which already provided input might be particularly important for you.

This question does not concern directly an association such as Eurelectric, but we would like to underline as a minimum that co-optimisation should also take into consideration system integration of electricity and heat markets.

Should co-optimisation only optimize electricity markets, taking heating markets for granted, inefficiencies may arise, as units serving both markets could end up being subject to suboptimal dispatch. We question whether such a move would increase social welfare or rather lead to market inefficiencies.

15. Specifically, to what extent do the proposed bid designs address portfolio bidding?

Theoretically, the proposed bid structure may allow to reflect the different capabilities and limitations of a given portfolio. The feasibility remains doubtful when considering the high combination, notably in terms of bid linking. This doubt stands both on market participants’ side (will market participants be able to build all combinations to reflect those capabilities and limitations) and on the algorithm side (should MPs manage this complexity, will the algorithm be able to handle an adequate number of bids and links).

Eurelectric notes that, even though it is stated that combined bids do not imply unit-based bidding, **more specific bid structures seem to bear a tendency towards unit-based bidding.** Eurelectric would like to remind that portfolio bidding has repeatedly proven its efficiency and

its value to the European market. **The inability to maintain portfolio bidding would lead to inefficiencies and must be avoided.**

16. If you consider that portfolio bidding is not sufficiently supported, what kind of additions or improvements would you suggest?

Eurelectric underlines that bid types offered should allow to closely reflect all types of portfolios on the market. Eurelectric has stressed several times in the past that the diversity of bids accessible to market participants should not be subject to any market regression. **The level of diversity of this bid offer should be maintained within a co-optimized market.** Any divergence from this objective would lead to a loss of efficiency and welfare. In this spirit, linked bids, combined bids, linked combined bids, and combined block bids seem necessary to achieve the objective to reflect all portfolios on the market.

Eurelectric is however concerned by the increased bidding complexity, which may not be manageable. Market participants could then need to resort to simplified bidding structures that would not reflect the full potential of their portfolios' capabilities, resulting in higher system costs.

In particular, such bidding complexity could lead to an artificial split of offers between spot and balancing capacity markets. This would have detrimental market impacts, e.g., reduce market liquidity, and would lead to inefficiencies at a significant social cost which could outweigh any theoretical benefits of co-optimisation.

17. Specifically, if you operate storage facilities, do the proposed combined and/or linked bids cover your needs?

No answer by Eurelectric.

18. In your opinion, what additional benefits could result from the ability to also include linking of combined bids? For additional information, please refer to section 6.3 of Appendix A: N-Side Report.

As stated in our reply to question 13, combined bids would need to be fully divisible between the min and max for both day-ahead power and balancing capacity without the possibility of a temporal link. This wouldn't allow to reflect all the limitations of a given asset.

Therefore, we believe that

- i. the association of combined bids and linked bids seems necessary; and
- ii. combined block bids seem like a more promising option than simple combined bids, though further descriptions of the concept would be needed.

19. If you own or operate any of the following asset types, please identify which type of bid format (combined bid, linked bid, linking of combined bids, all of them) would address your technical and economic constraints in the best possible way and why: Biomass; Demand response; Solar; Battery storage; Pumped hydro; Thermal generators; Wind; Other (please specify). If none of the proposed bid formats are suitable for your asset types, please explain which needs are not properly addressed and why. Disclaimer: NEMOs and TSOs are aware that portfolio bidding is the current practice in most European countries. This question could still help discover additional requirements.

No answer by Eurelectric.

20. What kind of challenges do you foresee for your own company related to the proposed new bid designs (linked and combined bids)?

No answer by Eurelectric.

Pricing related questions

21. The report (Chapter 3) considers non-convexities as a major challenge for co-optimisation, caused by the technical characteristics/constraints of production assets (primarily thermal generators and their startup costs, minimum generation levels, minimum up/down times and other modelling options). What other sources of non-convexities do you see that have not been considered (e.g. in hydro fleets)?

No answer by Eurelectric.

22. Do you have comments on the proposed pricing approach with a preference for a solution where Paradoxically Accepted Bids (No PAB) are removed from the solution? For more detailed information on the No PAB design, please refer to section 5.4.1 of Appendix A: N-Side Report.

For reasons of market transparency and ease of market outcome understanding, **Eurelectric supports the current design choice to not include Paradoxically Accepted Bids**. However, Eurelectric also understands that this choice affects algorithmic performance. It is important to stress that in case trade-offs need to be done because of limitations in algorithmic

performance – like limiting the type or amount of products made available to market participants – this choice to exclude PABs may need to be revisited.

Besides, the assessment of the impact on market liquidity and the capacity of all TSOs to meet their balancing needs is not yet comprehensive enough to draw a definitive conclusion.

Eurelectric thus shares NEMOs and TSOs' point of view that further qualitative and quantitative analysis is necessary to decide on that question.

23. What are your reflections on other alternative pricing options outlined in the report and its annexes?

As explained in the answer to the previous question, Eurelectric has in the past opposed alternative pricing schemes for SDAC like Non-Uniform Pricing because of market transparency and ease of market outcome understanding.

24. What is your view on the substitutability rule for aFRR and mFRR, or do you have suggestions to modify or improve it? For more information on the substitutability rule, please also refer to section 6.1 of Appendix A: N-Side Report.

From a frequency restoration standpoint, aFRR and mFRR can serve similar roles. Generally, aFRR is considered higher-value as it can respond more quickly to activation signals. However, mFRR offers flexibility:

- It can be used for system constraints, unlike aFRR.
- Its manual activation allows for anticipatory use in case of expected imbalances.
- Its looser technical requirements may enable larger and more varied offers.

Eurelectric underlines that aFRR-only bids need to be possible, and bids that offer aFRR and mFRR for the same capacity should be explicitly declared and priced. Delivery of either aFRR or mFRR is not solely a pricing matter. The provision of aFRR and mFRR are different and technical constraints may mean that some assets can provide aFRR and not mFRR.

With regard to the substitution of mFRR demand of TSOs by aFRR capacity in case the aFRR capacity is lower priced or if this substitution results in an overall lower cost, Eurelectric considers that this is mainly a TSO matter given their operational responsibility and system-wide perspective. **The criteria used by TSOs to choose either aFRR or mFRR bids need to be discussed with MPs and disclosed by TSOs in advance.** However, price-sensitive demand for balancing capacity should not be expressed at the detriment of system security.

General questions

25. Are there any issues regarding bidding products, bid design and pricing that have not or not sufficiently been addressed in the report? If yes, please explain.

In co-optimisation, the allocation of cross-zonal capacity (CZC) will be performed according to an integrated welfare calculation as part of the Euphemia target function. The market-based methodology is doing a similar calculation when determining the value of CZC. **While the CZC available for balancing capacity in the market-based methodology is restricted to 10%, it is not limited for co-optimisation. With the price-insensitive demand and generally steeper offer curves, it is possible that this will result in a preference for balancing capacity when allocating CZC.** Such a potential bias needs to be evaluated and properly communicated, as a risk of increased SDAC spreads and reduced levels of price convergence are of high general interest to various stakeholders.

In the case of aFRR and mFRR, the R0 report does not sufficiently clarify how co-optimisation will incorporate different components of balancing capacity prices and other factors such as the likelihood of activation. It should be noted that the likelihood of activation changes over time and is influenced by different factors (e.g. renewable infeed, weather forecasts, ...).

26. For potential providers of balancing capacity: what conditions must be satisfied for you in a co-optimised market to bid at least as much balancing capacity as today and potentially more? Please be as specific as possible.

A full equivalence of bidding ability/freedom compared to today's sequential bidding should be maintained. **Any significant reduction in the type and amount of bids that market participants can submit will reduce their ability to correctly reflect the full technical abilities of an asset or portfolio of assets.** This remains, in the view of Eurelectric, one of the key challenges of a realistic implementation of the co-optimisation model, as the combined complexity of four different balancing capacity markets and the SDAC market may significantly exceed the algorithm's capacity, which we see already reaching its limitations in today's market context.

27. Please provide any other general comments to R0 report on Co-optimisation

Given the above considerations, we fully support the statement by NEMOs and TSOs: "NEMOs and TSOs **remain highly skeptical on the technical and market function feasibility of co-optimisation - especially with regard to the appropriate consideration of multiple constraints on the side of balancing service providers** in all kind of bidding regimes" (Executive Summary).

The following considerations are central to the further pursuit of co-optimisation R&D:

- **Technical feasibility:** although this is not the subject of this report, it would be judicious to establish a co-optimisation product design with regard to its technical feasibility. If the analysis finds that the product design needs to be downgraded in the face of future algorithmic challenges, it would have to be rejected. Co-optimisation should thus only be implemented if market participants are assured that they can maintain the flexibility and diversity of offers they currently have and if it is proven that co-optimisation leads to an improvement in economic surplus. However, these two conditions do not currently appear to be guaranteed, given the complexity of the methodology and the foreseeable algorithmic difficulties.

- **Transparent price formation:** the impact of the modification of price formation on the energy system needs to be considered. A transparent process of price formation is needed to provide straightforward price signals for SDAC and balancing capacity to ensure long-term investments into flexible assets. When assessing the benefits of different co-optimisation implementation variants, changes in bidding behaviour need to be considered. Simulations with historical or synthetical data can provide insights into computational aspects of the algorithm but will not provide a valid quantitative assessment of the potential benefits. Shortcomings of [studies](#) like the one conducted on behalf of ACER have been highlighted in previous [consultation responses](#).
- **Stakeholder input:** in the evaluation report of its public consultation on the amendment of the algorithm methodology and on the expected benefits of co-optimisation (ACER, September 2024, [Link](#), p.18), ACER acknowledged an increased complexity in bids due to intertemporal dependencies for storage units. Such dependencies were, however, not at all considered in the study because of a stated lack of public data on hydro assets, a statement which we do not understand. Feedback from market participants must be adequately considered for a proper qualitative assessment of the potential benefits and downsides of co-optimization.
- **Specificity of markets with decentralized dispatch:** The executive summary of the MCSC R0 report emphasises that other markets where co-optimisation is applied “have a very different fundamental structure, and do not serve as relevant examples.” For example, in some parts of the US, central dispatch and unit-based bidding are applied, and all subsequent timeframes are included. Energy trading and dispatch optimisation in EU energy markets is not a one-shot exercise formulated into a day-ahead bid but is continuously performed up to delivery. An accepted balancing capacity bid is an obligation that cannot be reversed like an accepted energy bid that just forms a trade position. Unlike in a central dispatch setting, market participants are bearing full responsibility for delivering the assigned balancing capacity and therefore need to have control over the offered and accepted capacity.
- **Standard product duration:** it is not clear which Standard Products for Balancing Capacity are envisaged in the study. Eurelectric underlines that the product may need to strike a balance between granularity and constraints over unit allocation.

Eurelectric pursues in all its activities the application of the following sustainable development values:

Economic Development

- Growth, added-value, efficiency

Environmental Leadership

- Commitment, innovation, pro-activeness

Social Responsibility

- Transparency, ethics, accountability



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