

Storage Orders in SDAC

Eurelectric consultation response paper

KEY MESSAGES

- **Eurelectric welcomes the initiative to introduce a storage order in the Single Day-Ahead Coupling (SDAC).** An enriched set of bidding products improves market efficiency by allowing market participants (MPs) to adequately represent their asset portfolios. By allowing MPs to submit bids without defining a detailed execution profile, the storage order reduces exposure to price forecast errors, while improving allocation across market time units.
- **The storage order should be seen as an additional, voluntary option for MPs and should not result in the restriction of any other order types.** If implemented, NEMOs should coordinate their approach to preserve a level playing field.
- **We regret the lack of information shared by the all-NEMO Committee about the algorithmic performance impacts of the envisaged storage order.** Transparency about the implications of different storage order types should be ensured to rule out knock-on effects on the availability of complex products.
- Eurelectric underlines that **the current design of the storage order is suited only to battery energy storage systems, as it does not adequately reflect the operational constraints of pumped hydropower storage systems**, and specifically their inability to rapidly switch between consumption and production.
- More generally, **some product parameters would benefit from refinement to reflect storage assets' real operational behaviour** (non-linear ramping, efficiency losses), and to enhance opportunities for multi-market optimisation (declaring asset availability on 15-minute basis). Such changes should be balanced against the risk of algorithmic performance degradation.
- **Eurelectric can accept a minimum size threshold of 5 MW for storage bids if needed to preserve algorithmic performance**, while reiterating that performance impacts on EUPHEMIA in relation to the different thresholds should have been made transparent.

Note: Eurelectric is an association of European market participants, representing a diverse number of market participants active in the European wholesale electricity markets. Eurelectric does not trade wholesale products and does not comment on individual strategies and specificities.

Storage Orders usage

Question 4: would you use storage orders?

Yes / No / Other

Storage Orders appear to be a promising and innovative product that could facilitate the participation of storage assets in the day-ahead market and improve their ability to capture market value, while ensuring optimal dispatch. However, their use cannot be assumed, and market participants must retain the freedom to choose the products that best suit their operational and commercial needs. If the storage order is implemented, NEMOs should coordinate their approach to preserve a level playing field.

Storage assets can already be optimized through existing market products, such as exclusive links. The development and improvement of these products should therefore continue as planned and should not be replaced by Storage Orders. The introduction of Storage Orders must be seen as a complement to, rather than a substitute for, existing solutions.

More broadly, the implementation of Storage Orders should not be used as a justification by NEMOs or TSOs to deprioritize, delay, or discontinue the development of existing products and functionalities that market participants rely on. Preserving a diversity of products remains essential to accommodate different trading strategies, storage technologies, and market needs.

Question 5: which types of storage systems would you intend to represent by the storage order? Note: Simulations that have been done so far considered parameters representing only battery and hydro pump storage systems.

Battery storage systems / Hydro pump storage systems / Other

Eurelectric welcomes the initiative to introduce a new type of voluntary order dedicated to storage systems and supports the representation of battery and pumped hydro storage systems through storage orders.

It would allow market participants to submit bids without defining a detailed execution profile, thereby avoiding the risk of price forecast errors, while benefitting from improved allocation across market time units by the EUPHEMIA algorithm.

Considering the proposed features, the current proposal seems to have been designed specifically for BESS assets. In theory, such a product would also be interesting for hydro pump storage systems, requiring however some adaptations to ensure such use case, notably with regard to dynamic constraints of hydro assets.

In general, asset commitment across market time units (MTUs) may be constrained by technical asset specificities, prior commitments or operational maintenance. This applies particularly to pumped hydro storage systems, which are unable to switch between generation and consumption across adjacent 15-minute MTUs. It is therefore necessary to adapt the design of storage orders to accommodate both batteries and pumped hydro storage systems.

Storage Orders design

Question 10: Do the storage order input parameters, both “required” and “optional parameters”, meet your needs to define a storage order? If not, please explain.

Yes / **Other**

While the currently identified parameters are broadly positive, they do not fully address certain operational constraints and should be refined further.

For example, the use of a default efficiency value fixed at a 100% is misleading and potentially distortive, as it overestimates the profitability of storage operations. In reality, storage technologies exhibit non-negligible losses, which must be reflected to ensure economically sound outcomes and avoid biased market signals.

Other additional parameters should also be considered to ensure that the new product can be effectively used by all targeted storage technologies (see response question 11).

However, this needs to be balanced against implementation constraint. A higher level of technical detail and asset granularity is likely to increase computational complexity for the EUPHEMIA algorithm, particularly given the intertemporal optimisation embedded in storage orders. It is essential that such impacts are made transparent.

Question 11: Do you find any other input parameter that should be available for the storage orders apart from the input parameters defined in the document?

Additional parameters are needed to adequately reflect the operational characteristics of both battery energy storage systems (BESS) and pumped-storage hydropower (PSHP) units. It should also be recognized that the product cannot be used for some pumped hydro assets in particular, where there may be restrictions to rapid transitions from generation to consumption mode between two consecutive market time units..

To mitigate these risks and ensure that the new product can be effectively used by all targeted storage technologies, additional parameters should be considered. Eurelectric recommends introducing minimum duration requirements, including:

- A minimum number of consecutive market time units in generation or consumption mode, as well as a minimum number of consecutive MTUs with no injection or withdrawal to ensure sufficient transition time between modes (i.e. ramping constraints).
- The ability to model both ramp-up and ramp-down rates (in MW per minute) could be a useful alternative if the parameter above proves unsuitable for algorithmic reasons.

Several additional parameters should also be considered to better reflect technical and operational constraints applicable to both PSHPs and BESS:

- Regarding efficiency, a distinction should be made between charging and discharging efficiency. Efficiency should also be allowed to vary as a function of the State of Charge (SoC). This is particularly important for accurately representing the operating characteristics of pumped-storage hydropower plants;
- A minimum acceptance ratio should be introduced and applied to the energy to be injected and withdrawn over the day, or preferably at the level of each 15-minute MTU.
- Market participants should be allowed to declare asset availability on a 15-minute basis. This would improve the optimisation of storage resources both from a system perspective and for storage operators. One of the key values of storage lies in its ability to optimise participation across multiple markets. Requiring an asset to be fully available through Storage Orders on one day and completely unavailable on another would unnecessarily reduce this flexibility and prevent the system from capturing the full value that batteries can provide.
- A maximum number of cycles per day should be introduced in addition to the proposed cycling-cost parameter. Such a parameter is required both to represent limitations related to the cumulative charged and discharged energy compared with the asset's usable energy capacity and to allow asset owners to manage battery degradation by controlling cycling over the asset's lifetime.
- In addition, we recommend allowing market participants to specify a maximum number of cycles per day for the underlying asset, enabling asset owners to maintain control over cycling over the asset's lifetime (e.g. particularly relevant for battery storage systems).

Aggregation of storage orders

Question 23: Would it be acceptable for you that for a storage order a minimum size (power value in MW) would be imposed and only market participants could aggregate the storage systems themselves into a single storage order (i.e. only market participants' aggregation option would be available, not the NEMO aggregation with defining a storage order using baskets as defined above)?

Yes? please indicate which minimum power value (in MW) would be acceptable for you (currently considered options are 5 MW or 25 MW)

No? please explain

Other? please explain

Eurelectric considers it acceptable to introduce a minimum size for storage orders if required to avoid a degradation of algorithmic performance. We regret that this information has not been shared as part of the public consultation. Given that most batteries currently in operation fall below the lower proposed threshold, Eurelectric believes that a 5 MW threshold would be better suited.

Other points

Question 46: If you wish, please provide your further comments/considerations relevant to the storage orders:

Eurelectric thanks the NEMO-Committee for its work on introducing an optional storage order in the SDAC and for consulting market participants on its design. Eurelectric in general supports the storage order, which will contribute to an enriched product offer and improve MPs' ability to appropriately reflect their asset base. If the storage order is implemented, NEMOs should coordinate their approach to preserve a level playing field.

However, we regret the lack of transparency about the expected impact of this order on algorithmic performance. It is not evident from the information shared whether the storage order will ease pressure on the algorithm's functioning or increase calculation complexity. Results from simulations considering different minimum thresholds and product specificities should be shared transparently.

Eurelectric understands that this new product is proposed in addition to existing SDAC products. While a storage order may be useful, it should not replace other SDAC products. We consider that products such as linked, exclusive, and loop block orders remain necessary to accurately reflect the technical capabilities and constraints of assets and portfolios in day-ahead auctions. The all-NEMO Committee should provide

assurance that the introduction of the storage order will not lead to the removal of other order types on grounds of declining algorithmic performance or for other reasons.

In line with MPs' ability to aggregate and optimise their asset portfolio, some parameters should be further refined. In particular, MPs should be allowed to declare asset availability on a 15-minute basis. This would enhance multi-market optimization and unlock the full value that storage assets can provide for the system.

In addition, improvements are needed to better represent the diversity of storage assets and their actual characteristics. In particular, additional parameters are needed to accommodate the operational constraints of pumped hydropower storage assets.

More broadly, some parameters need to be defined in a way that is closer to real asset behaviour. Certain parameters, such as the "maximum power", cannot be considered static. In practice, battery performance is dynamic:

- Charging power decreases as the battery approaches full capacity.
- Discharging power decreases as the battery approaches empty capacity.

Introducing parameters that better capture these non-linear characteristics would make storage orders more representative and therefore more attractive to MPs.

Finally, considering the potential benefits of a storage order, Eurelectric wonders whether a similar product is envisaged in SIDC.

Question 47: Do you have any questions regarding the introduction of the storage orders (that could be answered during the planned webinar or also after the webinar during the next MCCG meeting (Market Coupling Consultative Group))?

- What are the implications of the storage order for EUPHEMIA's algorithmic performance?
- Do NEMOs intend to adjust the product offering if a SDAC storage order is introduced? The introduction of this new functionality should not negatively affect the existing product offer.
- Does the NEMO Committee envisage a similar product for the SIDC?

Eurelectric represents the interests of the electricity industry in Europe. Our work covers all major issues affecting our sector. Our members represent a total of +3500 companies 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.

WG Market Integration & Network Codes

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