Statnett

# Options to Support Power Price Hedging in the Norwegian Bidding Zones

A study commissioned by RME (Ref. 202401976-3)

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# Executive Summary

At the request of RME, Statnett has investigated potential measures by which Statnett can improve market actors' opportunities to hedge power price risk through the financial power market. This report sets out the results and conclusions of this investigation.

We conclude that the introduction of EPAD auctions, as described further below, represents the best mechanism by which Statnett can contribute to RME's intended policy objectives. Under the proposed auctions, which Statnett will begin piloting later this year, Statnett will gather bids and offers for EPAD contracts for the Norwegian bidding zones. Where bids and offers for EPADs can be matched across a bidding zone border, Statnett will buy or sell EPADs with the parties submitting the bids and offers that can be matched. In doing so, Statnett will connect EPAD market participants across bidding zone borders in a way that is not currently possible.

We recommend that, following a review of the results of the pilot to assess its costs and benefits, the pilot becomes an enduring measure to support hedging opportunities. The enduring solution would maintain the setup and volumes implemented in the pilot phase unless these prove insufficient to meet the regulatory requirement of ensuring sufficient hedging opportunities. If the pilot proves insufficient to meet the regulatory requirement, adjustments to the pilot, potentially including increased volumes, could be considered as part of the enduring solution. This reflects the need to expand Statnett's exposures cautiously in the face of both the intervention's potentially significant costs and considerable uncertainty regarding the pilot's costs and benefits.

The introduction of EPAD auctions will enable Statnett to add directly to the availability of the hedging products already used by market actors to hedge power prices. Similar auctions are already provided in Sweden by Statnett's Swedish counterpart, Svenska kraftnät, and we anticipate that the potential benefits of these auctions for the Norwegian market will be similar. Specifically, we anticipate that the EPAD auctions will:

- **Add to the total volume of EPADs traded**
  Based on experience to date in Sweden, the EPAD auctions will add to the total volume of trade in the set of contracts that are auctioned, thereby contributing liquidity to the Norwegian EPAD market.
- **Support the more accurate pricing of EPAD contacts**
  The auction's design should support the collection of more complete and accurate bids and offers from a variety of market participants. By providing market participants with a clearer picture of the market's collective expectations and willingness to pay, improved price formation may, in addition to being a benefit in its own right, help facilitate EPAD trades outside of the auction.
- **Reduce the difference in the buy and sell price (bid-ask spread) of the relevant contracts**
  Bid-ask spreads reflect the gap between the price at which buyers and sellers are willing to trade. Large bid-ask spreads tend to dissuade trade. The experience in Sweden suggests that the auctions may help to reduce bid-ask spreads, potentially reducing a barrier to trade.

Running the proposed auctions could entail potentially significant costs for Statnett. By far the most significant of these are Statnett's collateral costs. Under the proposed auction design, Statnett will be required to place collateral with a clearing house to cover potential liabilities arising from its position in EPADs. The interest earned on these deposits is expected to be significantly less than the interest rate that Statnett will need to pay for raising these funds. This difference between the interest that

Statnett must pay and the interest it receives on deposits with the clearing house is Statnett's collateral costs.

The size of Statnett's collateral costs will depend on the size of the EPAD positions (in MWs) that Statnett enters through the EPAD auctions. For an auction on the scale of Statnett's proposed pilot, Statnett's total costs are expected to be NOK 52m annually, of which NOK 42m are the estimated financial costs of collateral.

In addition to the costs of collateral, Statnett's costs from implementing EPAD auctions will include fees to a third party for developing and operating an auction platform, Statnett's staffing costs and various fees linked to clearing house membership and financial reporting requirements.

Provided that the size of Statnett's EPAD positions is kept under the scale of cross-zonal trade in electricity—as planned—Statnett's total income is expected to be less volatile as a result of the EPAD auctions. The power-price exposure Statnett acquires through its EPAD positions will tend to offset Statnett's exposure to power prices due to congestion income. Thus, when price movements cause Statnett to collect more congestion income, Statnett will likely have to pay out more money to settle its EPAD positions and vice versa. As a result, Statnett's total income remains uncertain, with price movements determining whether Statnett makes a total profit or loss compared to not running the auctions at all. The regulatory treatment of congestion income and EPAD cash flows should be considered further to ensure that there are no unintended consequences for network tariffs and Statnett's regulated revenue.

Several alternative interventions were considered in reaching the above recommendation, most notably the possible use of market making. A 'market maker' is obligated to post bids and offers for a specified contract and thereby ensures that there is always a party with which one can trade. As part of the work, we considered whether market-making could deliver against the intended aims of the policy.

Ultimately, we decided not to recommend efforts to introduce market-making. The decision not to recommend market-making reflects our belief that market-making would:

- Do less to improve hedging opportunities
  Market makers set prices to avoid taking a position in the relevant contract. Although their required availability in the market may allow for a slight increase in trade volumes, we expect the impact on volumes to be significantly smaller than would result from the proposed EPAD auctions. Importantly, if would-be buyers and sellers of EPADs are located in different bidding zones, as we suspect may be the case, market-making will not allow these buyers and sellers to trade. The proposed EPAD auctions will.
- Be comparatively difficult to implement cost-effectively
  Statnett would be reliant on a third party to act as the market maker. We believe that relatively few actors would be willing and able to act as market makers. Nasdaq has, in the past, been unable to find parties willing to undertake the role. Given this, there is a risk that Statnett will either be unable to find a third party to provide market-making or else will need to pay the relevant party a sizeable premium over its costs.

For these reasons, EPAD auctions are preferable.

We believe that converting the proposed EPAD pilot into an enduring solution could be achieved in 18 months. This is within the legal deadlines imposed by the Forward Capacity Allocation Guideline, assuming that Statnett is granted a 6-month extension.

# Contents

# 1 Background to the report

In February of 2024, RME issued a decision directing Statnett to investigate alternatives for price hedging in Norwegian bidding zones. Their decision is made under the authority of the Norwegian Energy Act § 10-1, and Article 30(5)(b) of the Regulation (EU) 2016/1719 of 26 September 2016, which establishes guidelines for forward capacity allocation (FCA).

The purpose of FCA art. 30 is to ensure that those trading electricity have adequate opportunities to manage future price risk in the bidding zones where they operate. Initially, FCA art. 30 states that the TSOs on a bidding zone border shall issue long-term transmission rights between bidding zones as a tool for price hedging. However, regulatory authorities can decide not to implement transmission rights if sufficient price hedging opportunities exist within the bidding zone or if other hedging products are made available. Therefore, RME has assessed whether the products, or combinations of products, offered in the forward markets and bilaterally between actors, provide adequate risk management opportunities in the Norwegian bidding zones.

RME's overall assessment is that the products, or the combination of products, currently offered in the forward markets do not provide effective protection against volatility in the day-ahead market prices in Norwegian bidding zones. In the same assessment, RME concludes that long-term transmission rights are not an appropriate price hedging instrument in the Norwegian market.

Following their conclusion, RME has instructed Statnett to investigate measures that support the function of the organized financial power market. The instruction was given via a letter dated 16th of February, 2024. RME's letter specifies that investigated measures should be national at first, and cover all Norwegian bidding zones. Specifically, RME asks Statnett to examine the auctioning of EPADs and zonal futures contracts between Norwegian bidding zones as one of the measures. Additionally, RME requests Statnett to explore support for market makers as another measure. Statnett is to emphasize the socio-economic benefits of the measures and ensure they are non-discriminatory among market participants. Furthermore, Statnett should consider the adaptability of the measures to varying levels of efficiency in the price hedging market.

This report answers RME's instructions.[1]

[1] We refer to for RME's assessment (NVE report nr. 2/2024; nve.no) and decision letter (nve.no) for further details (in Norwegian only).

# 2 Approach and criteria used to short-list options

The analysis documented in this report is structured based on two separate phases of work. The first phase identified a long list of options and conducted a high-level analysis of these options. The second phase performed a more detailed analysis of the most promising options. In this chapter, we set out the approach and criteria to evaluate the long list of alternatives within the scope of RME's brief (see chapter 1). In the next chapter, we describe in greater detail the short-list of alternatives selected for further analysis.

## 2.1 Process

We started the process by developing an extensive list of alternatives. The alternatives are made up of different versions of the two overarching options identified by RME's brief, i.e. the auctioning of EPADs or zonal futures and support of a market maker function. We developed the long list to ensure that potentially relevant alternatives are not forgotten. Following this, we established the criteria relevant to the selection of preferred options. These criteria are set out in section 2.2 below. We then proceed to narrow down the list of options through the removal of clearly inferior alternatives. This resulted in a residual shortlist. The remaining options were studied in greater detail. Ultimately, we select a preferred option based on an evaluation of these remaining options against our evaluation criteria.

## 2.2 Criteria

The criteria used to short-list options are listed below. Some of the criteria are explicitly required by RME's letter. Others were added to allow for a comprehensive evaluation of the options' effects.

- **Improvement in hedging opportunities in the Norwegian bidding zones**. The first relevant question is whether the option supports the functioning of the organised financial power market and supports price hedging opportunities within the Norwegian bidding zones. This is considered with a theoretical assessment of each option.
- **Ease of implementation**, covering both the *time required* to implement the option and an assessment of any *implementation risk*. The latter includes factors that can have a large effect on the timeline, such as the involvement of external parties or the need to develop new systems.
- **Statnett's costs**, including any *implementation costs* associated with setting up and preparing for the measure and the *running costs* in the operational phase (administrative costs, collateral costs etc.) Costs borne by Statnett and tariff-payers.
- **Financial risk borne by Statnett and tariff-payers.** Some of the options expose Statnett and tariff payers to financial risks that are distinct from the costs of implementation.
- **Costs for third parties**, typically market participants, associated with participating in the measure.
- **Risk of discrimination or market distortion.** Here we consider how access to the market is affected by the choice of measure and if are there any risks related to the exercise of market power.
- **Ability to adjust the level of support provided.** Assessing whether and how Statnett could adjust the level of support provided as market needs change.
- **Risk to Statnett's independence.** Here we consider the implications for Statnett's ability to act independently of the market with respect to fulfilling its TSO functions as the scope to avoid subsiding commercial hedging activity
- **Robustness to future market changes.**

# 3 Design options considered

In this chapter, we highlight some of the key options raised through the short-listing process and explain why specific options were excluded. Different variants of the two overarching options, i.e. auctions and market making, are treated separately in sections 3.1 and 3.2 respectively.

*Table 1: Overview of all the options considered*

| Options included for **market-making** | Relevant design dimensions for **auctions** |
|---|---|
| • Third-party provision<br>• Direct provision<br>• Market making obligations | • Auctions vs. continuous trade<br>• Choice of product<br>• Choice of platform<br>• With or without within-zone matching<br>• Approach to collateral management |

## 3.1 Market making

**Direct provision vs. third-party provision**

Direct provision would mean Statnett taking on the role of the market maker, whereas third-party provision would mean finding a financial or trading party active in the market to undertake this role.

Direct provision has several significant disadvantages and was excluded from further consideration as a result. In particular, direct provision, even though it would be legal, may have a negative effect on the market actors view of Statnett as a neutral and non-discriminatory TSO. Direct provision would also require Statnett to effectively develop an internal trading desk function. This is expected to result in a challenging and costly implementation process. Finally, direct provision would be a threat to Statnett's independence since it would give Statnett a direct role in setting forward market prices.

**Market-making obligations by large incumbent generators**

This variant of market making entails obligating market actors that exceed specific thresholds to take on the role of a market maker. Such obligations were implemented in Great Britain as part of the *Secure and Promote Market Making Obligation (MMO)*. Under this regime, six large energy suppliers were obligated to post bids and offers on an independent platform as a means to support forward market liquidity. Part of the rationale for such measures is that the obligated providers are best placed to meet the market's needs, since they:

- Have existing trading operations,
- Are well informed as to the commercial value of the contracts involved, and
- Have sufficiently large existing trading portfolios in the relevant commodities such that they can relatively easily manage any positions entered into as a result of market-making activity.

We consider that market-making obligations are a potentially appropriate regulatory intervention, particularly if competitive third-party provision of market-making is infeasible.

Such an intervention would imply little to no cost for Statnett and keep Statnett's role strictly independent. However, it would likely imply costs for the obligated parties and, if poorly implemented, potentially distort competition between these parties and their competitors. It would also require regulatory changes and developing the support regulatory framework would necessarily take time. For this reason, we do not consider this option further in the second phase of the analysis.

**Conclusion**

Given the implementation challenges involved in providing market-making directly or via an obligation on market actors, we have excluded these options from the more detailed analysis that follows. The options to implement market-making considered in the remainder of the report assume that market-making is conducted voluntarily as a service by a third party.

## 3.2 Auctions

**Auctions vs. implementation via continuous trade**

The first design decision we consider for the auctioning of EPADs or zonal futures is the mechanism of auctioning and allocating the contracts. An auction would entail a solution similar to the pilot currently being run for Svenska kraftnät in Sweden, where volumes are allocated through a separate auction run independently of the market. In contrast, allocation via continuous trade would mean having a trading desk accept pairs of bids and offers in the continuous market up to a limit similar to that applied in the auction.

We consider auctions to be the superior option of the two. An auction will provide a focal point for liquidity and should support possible participation by smaller actors. This results in a greater expected improvement in hedging opportunities. Our belief, that smaller players will be more likely to participate in an auction, stems from the fact that there are expected to be additional costs to participate via continuous trade. These include the direct trading costs associated with access to the exchange, as well as the potential additional staffing costs associated with continuous participation. Encouraging participation by smaller players not only supports liquidity but is also a benefit with respect to the discrimination criterion set out in 2.2 above.

The mechanistic and transparent nature of the auction clearing process implies a lower risk to Statnett's perceived independence than a series of bilateral trades carried out on Statnett's behalf. This is because auction clearing lends itself more naturally to a transparent rules-based process that can be approved and more easily overseen by the regulator.

**Choice of product**

Two potential products are explicitly identified by RME's brief, i.e. EPADs or zonal futures. In addition, we have also considered zone-to-hub Long Term Transmission Rights (LTTRs), as considered as part of ACER's proposed reforms to forward market design.

An EPAD-based implementation performs best against the identified assessment criteria. However, the relative performance of different products could conceivably change over time.

The main reason for preferring an EPAD-based auction is that most existing activity is in EPADs. Designing the auction to use the product already in use should result in the greatest contribution to increasing hedging opportunities for market actors because doing so concentrates liquidity into a single product set and should encourage the broadest possible participation in the auction.

We also note that, as part of Svenska kraftnät's review of the first year of the pilot, market participants' future plans were "characterized by a wait-and-see attitude towards zonal futures and a desire to keep EPADs as an auction instrument". Since Svenska kraftnät's review, EEX has withdrawn its offer to purchase Nasdaq's Nordic power market business, a development that might otherwise have led to the greater use of zonal futures.

Finally, EPADs are closer to ACER's long-term vision of the European forward market, which is based on regional hub prices. This may slightly reduce the risk of needing to make substantive changes to the market design in future.

Over time, the preference for products in the auction could change. However, we expect that it will be relatively easy to switch the product set to include zonal futures. As such, an EPAD-based implementation does not imply an inability to change the choice of product later and should be relatively robust to changes in the market's preferred product set in future.

An EPAD-based design is also probably the easiest to implement, as it aligns more closely with Svenska kraftnät's current auction design and Statnett's upcoming pilot.

ACER has proposed the development of a pan-European zone-to-hub LTTR solution which is expected to use products that are very similar, if not identical, to EPADs. However, the commercial details of the zone-to-hub LTTR product have yet to be agreed and so formally relying on this pan-European process would add significantly to the likely implementation time and implementation risk.

While recommending the use of EPADs for the reasons above, we note that the use of this product may imply higher margin requirements relative to the use of zonal contracts. This, in turn, implies higher operational costs for Statnett. However, looking across all of the criteria, we consider EPADs to be clearly superior, at least in terms of the initial product choice. As such, the more detailed analysis of auctions assumes that they use EPADs.

**Integrated implementation via an exchange vs. an independent auction platform**

There are numerous options for how the auction process could be run. These include, for example, via an independent auction platform (such as that being used by Svk in their pilot), via the financial market exchange (such as Nasdaq or EEX), or via a single allocation platform (JAO).

We expect the use of an independent platform to be significantly easier to implement since it can build upon existing implementations developed as part of Svenska kraftnät or Statnett's pilots.

In contrast, implementation via an exchange implies several possible challenges. Perhaps most importantly, Nasdaq believed that integration via the exchange was likely to be challenging from a regulatory perspective because the regulatory framework did not seem to be compatible with an integrated auction. We are also conscious that selecting a single exchange to host a Statnett-supported auction could distort competition between the exchanges. Finally, if the exchange charged membership fees to access an integrated auction, this could imply higher costs for market actors relative to a standalone solution (which in theory can be design with no cost of participation). This is both a direct negative according to our criteria and could have a further unintentional discriminatory effect by discouraging participation among marginal participants. For all these reasons, we chose to exclude auctions integrated with the market exchange from the shortlist.

Despite this, it is worth noting that an integrated auction could potentially provide greater benefits to exchange-based liquidity if:

1. Auction participation was improved by inhering an existing active membership, or
2. Bids and offers in the auctions were integrated with the exchange's continuous orderbook.

An integrated solution delivered via the exchange might also make it easier for Statnett to exit if its support were no longer needed.

Implementation via the JAO platform was deemed to entail considerable additional implementation risks, especially for an auction based on EPADs. This reflects the fact that JAO implementation would potentially introduce a range of additional stakeholders into the implementation process, given JAO's multilateral role, and the fact that JAO has no experience with EPAD products. For this reason, JAO-based implementation was also excluded from the shortlist.

# 4 Market making

In this chapter, we undertake a more detailed analysis of the most promising approach to market making, namely via third-party provision. At the end of the chapter, we give a short overview of the analysis structured against the criteria introduced in section 2.2.

## 4.1 Consideration of feasibility, risk of discrimination and the potential to adjust the level of support provided

This measure would entail Statnett paying a market maker to actively post bids and offers for Norwegian EPAD contracts. The implementation process would involve a tendering process to acquire a market maker (or plural), with the tendering process managed either directly by Statnett or by the exchange. The market maker awarded the contract would then fulfil their role on the relevant exchange(s) for the duration of the contract.

This approach to market-making could be implemented in a non-discriminatory way. Since the posting of bids and offers would be implemented via the exchange and the market markers' counterparties would be anonymous, there is limited scope for this measure to inappropriately discriminate among market participants. A more significant challenge when trying to avoid discrimination is the potential of this measure to distort competition between multiple exchanges if market-making is only conducted on a subset of them. This problem could potentially be addressed by requiring market-making on multiple exchanges but would likely increase the total costs of the option.

Under the proposed implementation, the level of Statnett's support could also be changed over time to reflect changing market needs. The requirements placed on the market-maker – such as bid-ask spread limits and volume and timing requirements – could in theory be adjusted over time to alter the level of support required.

A potential concern regarding the implementation for Norwegian EPADs is the limited number of potential providers. As such, the greatest implementation challenge is likely to be running a genuinely competitive tendering process.[2] Our discussions with relevant market actors, such as Nasdaq and others, suggest that there are few providers potentially interested in acting as market makers. In particular, financial players do not appear to see this as an attractive use of their risk capital.

The most likely bidders are therefore those utilities with relatively sophisticated existing trading operations that also have a political or strategic interest in supporting the functioning of the forward market. Possible providers include Statkraft, Å Energi, Aneo, Hafslund E-CO Vannkraft, Ishavskraft, Lyse Produksjon, SKS Produksjon, Ustekveikja Energi and NTE. Many of these would be unlikely to cover all Norwegian bidding zones. Statkraft's presence in all Norwegian bidding zones makes it a natural provider since there are likely synergies in providing market-making across bidding zones.

Concerns about the feasibility of running a competitive process are also augmented by Nasdaq's inability to find market makers in the past. This suggests that there is a real risk that a process to find a provider would have only one or two bidders for some contracts. Ultimately, there is therefore a risk that Statnett and tariff payers end up paying well in excess of the provider's costs to realise a market-making option.

[2] We note that, if running a competitive tender is infeasible, negotiated procurement could be an option. However, this doesn't fully eliminate the challenge. The lack of competition and information asymmetry on supplier's costs will result in a material risk that Statnett pays excess of costs to realise the option.

## 4.2 Cost

Statnett's costs to support a market maker role would consist of two parts, the cost of remunerating the market maker and any internal costs related to administrating the tendering process and the contract.

The costs of remunerating the market maker are expected to take the form of a fixed cost per period and a variable, volume-related payment. The fixed cost is expected to be the largest part of the total compensation. The volume-related payment is needed to cover the market-maker's variable trading cost.

Statnett's internal costs are primarily staffing costs related to running the tendering process to acquire the market maker and then administering the contract. The internal costs are expected to be small relative to the cost of remunerating the market maker.

The market maker's costs, which influence the level of remuneration required, comprise both staffing costs and the cost of managing the financial risk associated with taking an unwanted position. The risk element is a consequence of the fact that the market maker is obligated to be available to trade even if, as is likely to be the case, it does not want to change its position in the market. It is therefore liable to end up with unwanted positions that need to be unwound and will be exposed to the risk of losses until this is done. The premium that the market-maker requires above its direct costs will reflect the size of this risk. Illiquidity contributes to the market-maker's risk since it makes it more difficult to exit any unwanted position. This implies that the less liquid the market is, the more costly it will be to get a market marker. If liquidity were improved, for example through the use of an auction, this risk and the associated costs of being the market maker would likely be lowered. As such, market-making could be seen as complementary to other interventions to improve liquidity.

## 4.3 Impact/benefits

Market making is unlikely to significantly increase trading volumes but would improve price transparency. The reason for the limited volume impact is that market makers typically want to avoid trading and pick bid and offer prices to minimise the likelihood of a trade. If the market maker succeeds and the bid-ask spread is not too tight, there should be little additional trade. The main benefit of this measure is therefore expected to be improved price transparency. The market maker will continuously post bids and offers and the accuracy of these prices will be ensured by the fact that other actors are free to trade at them, forcing the market maker to adjust its pricing in response.

Note that, because the market-maker is not expected to take a net position in the market, market-making will not address any fundamental asymmetry between demand and supply within a bidding zone. Instead, the market-maker will reflect the price level at which this asymmetric demand and supply can be balanced. Thus, in areas with far larger volumes of generators wishing to hedge, the price will be shaded downwards to try and limit the size of the volumes that these generators are willing to hedge. With a market marker, this price-based rationing will be transparent, but the generators will still not have counterparties with which to hedge. Such asymmetry is likely to be a problem in a number of the Norwegian bidding zones due to structural imbalances between the volume of generation and consumption.[3]

[3] As an example, such imbalance was identified as an issue in THEMA-report 2024-04 about power price hedging in NO4.

## 4.4 Analysis overview: Market making via third-party provision

Table 2 gives an overview of the analysis above structured against the criteria introduced in section 2.2.

*Table 2: Key conclusions for each criterion*

| | |
|---|---|
| Improvement in hedging opportunities in the Norwegian bidding zones | • Unlikely to significantly increase trading volumes but would improve price transparency<br>• The measure does not address fundamental asymmetry |
| Ease of implementation | • Implementation risk due to small set of able and willing providers |
| Statnett's costs | • Low liquidity will make the measure more costly (would likely to cheaper in implement in conjunction with auction)<br>• Risk that Statnett overpays if multiple bidders cannot be found for each zone |
| Financial risk borne by Statnett and tariff-payers | • Not significant |
| Costs for third parties | • No additional costs for market actors |
| Risk of discrimination or market distortion | • Limited scope for this measure to inappropriately discriminate among market participants |
| Ability to adjust the level of support provided | • The requirements placed on the market-maker – such as bid-ask spread limits and volume and timing requirements – could in theory be adjusted over time to alter the level of support required |
| Risk to Statnett's independence | • No significant risk |
| Robustness to future market changes | • The requirements placed on the market maker, including contract types etc. could be adjusted over time |

# 5 Auctions

In this chapter, we provide a more detailed analysis of the short-listed auction options. In 3.2, we set out why contracts should be allocated via auctions instead of continuous trading, identified EPADs as the preferred hedging product and determined that an independent auction platform should be used for the process. Given this approach, we now consider what additional design choices exist and analyse the implied costs, risks, impacts and benefits. At the end of the chapter, we give a short overview of the analysis structured against the criteria introduced in section 2.2.

The proposed concept for the auction is essentially the same concept that Statnett plans to pilot and will involve Statnett buying and selling EPADs in the included Norwegian bidding zones. Statnett will tender for a third party to administer the auction. Market actors will be asked to submit bids and offers for the EPAD volumes that they wish to buy or sell in the relevant bidding zones. The auction will then match bids and offers across bidding zone borders (i.e. buying EPADs on one side of the border and selling an equivalent volume of EPADs on the other). In this set-up, Statnett will function as the counterparty to both the buyer and seller. In the matching algorithm, bids will only be matched where the price at which Statnett sells an EPAD in one zone exceeds the price at which it buys an EPAD in another zone. The volume of EPADs that will be matched in any one auction round will be limited so as to ensure that Statnett's overall exposures do not become excessive and to allow for the regular supply of additional EPAD volumes to the market.[4]

## 5.1 Consideration of feasibility, risk of discrimination and the potential to adjust the level of support provided

This option would require Statnett to set up a solution similar to that currently being run by Svenska kraftnät in Sweden. A tendering process would be run to find a third party to operate an independent auction platform.

At least two key design decisions would need to be made, namely:

- **Collateral management arrangements**
  Entering into EPAD contracts will expose Statnett to counterparty risk, which can be managed in various ways. An EPAD contract implies that Statnett's counterparty may be required to make a payment to Statnett as part of the settlement process, and the risk involves the possibility of the counterparty defaulting on this obligation before or at the time of settlement. One way to manage this risk is by using a clearing house, which provides counterparty protection. However, using a clearing house requires Statnett to post collateral, which incurs additional financial costs. To avoid these costs, Statnett could choose not to use a clearing house, but this would necessitate alternative methods for managing counterparty risk. The key design question, therefore, is whether the contracts that are auctioned should be cleared through a clearing house or be subject to alternative collateral management arrangements.
- **Within-zone matching**
  Because the auctions collect both bids and offers for the two adjacent bidding zones, they will also collect a bid and an offer for the same product that can, in theory, be priced in a way that it would be possible for the trade to clear outside the auction itself. If the clearing algorithm in the auction allows for matching a bid and an offer for the same product, this is what is

[4] In the analysis of costs, we assume that the auction clearing mechanism is sufficiently sophisticated to clear each EPAD product simultaneously across all relevant borders. This is more sophisticated than the approach currently employed by Svenska kraftnät's pilot but should be investigated as part of a potential move to an enduring regime.

referred to as *within-zone* matching, as in opposed to only *across-zone* matching, which originally is the main idea of the EPAD auction concept. The design question is whether the auction clearing algorithm should make such, within-zone matches or not.

We discuss these decisions in section 5.5 below.

EPAD auctions can be delivered in a non-discriminatory way. We note that the design of the clearing arrangements could influence the accessibility of the auction to different types of market participant. This will depend on the relative accessibility of different approaches (notably clearing versus the use of bespoke collateral arrangements). In the absence of a more specific proposal for the bespoke collateral arrangements, we cannot conclude in detail on the impact on accessibility.[5] It is important to note that auction participants will need to post collateral regardless of this choice. Consequently, any difference in accessibility is expected to be the result of differences in administrative ease rather than significant changes in actors' collateral costs per se. We do not expect this differences in administrative ease to result in material unwarranted discrimination between market actors.

We note that, if using a clearing house, the choice of clearing house could distort competition between clearing houses, assuming multiple options existed. However, assuming the auction will trade EPADs, Nasdaq Clearing is the only relevant provider. As such, this concern is academic.

In theory, the degree of support provided via auctions could be adjusted over time by changing the volume limits. Smaller volumes would imply less support. However, this assumes that these volume limits are themselves adjustable and not, as may be the case, limited by regulation or European law. We provide the legal context from this in chapter 8. These additional restrictions could potentially make adapting the level of intervention to reflect market needs difficult.

## 5.2 Cost

**Cost structure**

Statnett's total costs will be made up of internal staff time for both implementation and operation, financial costs for collateral management, fees paid to the third-party platform and fees to the clearing house or collateral-management-service provider.

The estimates given below are drawn from a combination of information on Svenska kraftnät's costs for their pilot (scaled as appropriate), input on simulated margin requirements from Nasdaq and our own estimates. As auction volumes[6] are a key cost driver, we show estimates for two examples: one with the tentative-pilot volumes and one with eight times the pilot volume. The latter gives a sense of what a large-scale solution might look like.

[5] Using a clearing house has the accessibility benefit of using existing procedures and avoiding the creation of new arrangements. This will simplify administration for those actors that are already using clearing. However, if Statnett's own bespoke arrangements were simpler, this could attract participation by smaller players that might have avoided clearing. Larger players are unlikely to be dissuaded from participation in the auction by the need to enter into bespoke bilateral agreements.

[6] For precision, the real driver of collateral costs is *open interest*, i.e. the size of the EPAD positions that are held. This depends on the volume offered at auction and whether subsequent auctions result in Statnett's position being reversed (netting). For example, if Statnett offers the same volume across two auctions but EPADs bought in the first auction are then sold in the second auction, Statnett ends up with zero open interest despite having offered a positive volume in both auctions.

The two largest cost components are the financial costs of posting collateral and the yearly third-party fees for the auction operator. Of these, initial and variation margins[7] are the most difficult to estimate. We have sought to give conservative (high) estimates, but either way, the numbers are uncertain. The fees paid to the auction operator would be decided through a tendering process and would therefore be established at the outset.

The decision to either use the clearing house or else establish separate collateral arrangements could significantly affect Statnett's total costs. The collateral cost estimates given below assume the use of the clearing house. Alternative collateral arrangements could help to reduce these costs. The use of public guarantees could significantly reduce Statnett's collateral costs but would impose a liability on the Norwegian state. The use of such guarantees is not possible at present but may well become possible in the future.

Three things would need to happen for Statnett to use a public guarantee, thereby significantly reducing the costs of collateral. First, the relevant European regulation (EMIR) will need to be revised to permit the use of public guarantees. EMIR is currently under revision and is expected to incorporate the necessary changes. However, the revised version has yet to enter into force. This is expected in the final quarter of this year. Second, following the implementation of EMIR 3, the European Securities and Markets Authority (ESMA) must draft regulatory technical standards (RTS) to enable clearing houses to implement the legislation. ESMA is required to submit draft RTS to the Commission within 12 months of EMIR's implementation date. We suspect that these RTS will enable the use of a public guarantee as intended, however, this process needs to be completed. Finally, the Norwegian state would need to agree to offer a public guarantee to cover Statnett's collateral costs. We do not know whether the Norwegian state would want to do this to reduce network tariffs.

We note that Svenska kraftnät's pilot also results in what they refer to as 'friction costs'. These costs are due to the fact that each bidding zone border included in the auction is cleared independently. Consequently, Svk may end up buying and selling the same contract at different prices in the same auction round. We expect that a more sophisticated combinatorial clearing process should be able to avoid this and would also help protect against trades that are poor value for money. The analysis that follows assumes that any enduring solution will make use of an auction design that avoids friction costs and we therefore assume that these costs are zero.

**Cost estimates**

We estimate that Statnett's total costs for running the recommended auction solution amount to NOK 52m per year, assuming auction volumes equal to those suggested in the pilot. A full-scale solution offering close to full capacity—set here to equal eight times the pilot auction volumes—implies a yearly cost of NOK 352m. Costs scale roughly linearly with auction volumes, increasing by a factor of 6.8 when volumes are increased by a factor of 8. Table 3 sums up the cost estimates for the two volume options.

These estimated yearly running costs exclude the one-time costs of implementation. We assume that these one-time costs will be relatively low and will consist mostly of Statnett's internal staff time.

Collateral costs make up 80–95 percent of total costs.

[7] The *initial margin* is the collateral that needs to be posted to initially enter a position, while the *variation margin* are payments made to the clearing house due to changes in the market price of the contracts held.

*Table 3: Decomposition of cost estimates (NOK 1000), for pilot and full-scale volumes*

| **Cost category** | **One-off/running** | *(alt. %)* **Pilot** *(alt. %)* | *(alt. %)* **Full-scale** *(alt. %)* |
|---|---|---|---|
| *Internal staffing* | | | |
| Implementation | One-off | 4 000 | 4 000 |
| Running costs | Running | 4 800 | 4 800 |
| *Third-party auction operator* | | | |
| Yearly fee | Running | 4 200 | 4 200 |
| Trading fee | Running | 131 | 1 049 |
| *Collateral costs* | | | |
| Default fund | Running | 241 | 1 932 |
| Initial and variation margins | Running | *(38 291)* 42 120 *(45 949)* | *(306 329)* 336 962 *(367 595)* |
| *Other costs* | | | |
| EMIR reporting | Running | 120 | 120 |
| Clearing member fee | Running | 159 | 159 |
| Clearing fees | Running | 332 | 2 659 |
| **Total (running)** | **Running** | *(48 276)* **52 105** *(55 934)* | *(321 249)* **351 882** *(382 515)* |

When posting collateral, Statnett faces a financial cost resulting from the fact that this collateral earns a low rate of interest. The size of this cost is determined by the spread between the rate given by the clearing house and Statnett's funding costs. Our estimates assume a spread of 2.2 percent.The estimated total costs are highly sensitive to the interest spread assumptions. Given the importance of this assumption, we have also conducted a sensitivity analysis using assumptions of 2.0 and 2.4 percent spread. In Table 3, these are given in parentheses next to margins estimates, noted as "alternative percentage". To estimate the margin requirements, we draw on Nasdaq simulations for the tentative auction volumes. These simulations estimate a required margin of NOK 1.9 bn, accumulated for one year of auctions. The simulation exercise assumes no netting of the Oslo EPAD,[8] which according to Statnett's own consideration is a likely outcome. Therefore, we treat this as a conservative (high) estimate of the margin. Assuming the netting of Oslo EPADs would lower Nasdaq's estimated required margin to NOK 1.2 bn and reduce collateral costs by 35 percent. Total collateral costs consist of a contribution to the default fund as well as initial and variation margins. However, contributions to the default fund are relatively small and make up less than 1 percent of total collateral costs.

Yearly costs for the third-party auction platform operator are assumed to comprise a fixed fee and a volume-related trading fee. We expect a fixed fee of approximately NOK 4.2 m and trading fees of NOK 0.1–1.0 m, depending on auction volumes. Both auction platform costs are based on input from Svenska kraftnät and (for the trading fee) scaled with volume. Statnett's contribution to the fixed fee could be lower if such auctions were to become part of a joint Nordic or European solution, with these costs distributed across a larger number of TSOs.

Other smaller cost elements include the fixed fees associated with EMIR reporting and the clearing membership fee. Statnett will also need to pay volume-linked clearing fees. Collectively, these elements add NOK 0.6–2.9 m to total costs.

[8] Because auctions will include both NO1–NO5 and NO1–NO2 borders, we might expect offsetting purchases and sales of NO1 EPADs that will tend to reduce the absolute size of Statnett's positions and, by expectation, the size of Statnett's collateral requirement. This is what is referred to as 'netting'. For the sake of conservative estimates, we assume a situation where this is not the case.

Lastly, setting up and running the auction will require internal Statnett staff time. We assume this will add NOK 4.8 m per year, assuming approximately 320 monthly staff hours.

## 5.3 Financial risk

The EPAD positions Statnett would take via the auctions entail a financial risk. The fundamental reason for Statnett's potential involvement in the forward market is that it is already exposed to cross-zonal price spreads through its congestion income. Taking positions in EPAD combos would result in financial liabilities that potentially offset this existing exposure.

*Figure 1: Illustration of congestion revenue, EPAD Combo pay-out and resulting hedged revenues*


Statnett is well placed to initiate an EPAD auction because it would result in Statnett taking on exposures that partially offset its price exposure from congestion income. Figure 1**Feil! Fant ikke referansekilden.** illustrates the relationship between congestion revenue, an EPAD Combo pay-out and resulting hedged revenues. We elaborate further on this relationship when we address auction volumes in section 8.2 below. Congestion revenues are always positive and increase in magnitude with the absolute price spread between two bidding zones. Selling an EPAD combo entails a liability that grows with the price spread but can result in either a positive or negative pay-out depending on the direction of the price spread. If the allocated EPAD volumes equal the volume of scheduled exchanges and the direction of the price spread is as expected at the auction, Statnett's net exposure to the price spread is reduced. In fact, congestion income revenues will exactly equal payments made under the EPAD combo and overall revenues stay constant (a perfect hedge). If the price spread is reversed however, the contracts in the EPAD combo generate additional revenues for Statnett.

Statnett's net exposure depends on how large the EPAD position is relative to the size of the scheduled exchanges generating congestion income. If volumes allocated in the auctions are e.g. half as large as scheduled exchanges, Statnett's exposure to prices is reduced (a partial hedge). On the other hand, if auctioned volumes exceed scheduled exchanges, e.g. EPAD volumes are 1.5 times scheduled exchanges, the EPAD profile dominates. If the price spread becomes large, Statnett's EPAD liabilities may exceed its congestion income.

Since an EPAD position imposes a financial risk on Statnett and network tariff payers, it is appropriate to ask how large a risk is acceptable and, by extension, how large a position Statnett should be willing or able to take. We return to the question of defining the limits of acceptability in section 8 below. For now, we simply note that EPAD auctions can expose Statnett to financial risks that are distinct from the costs of implementation and that an auction design should probably include explicit position limits to prevent Statnett from taking on excessive price risk.

We must assume that the regulator (RME) will enable Statnett to pass on to the customers the result of the EPAD positions as it already does for the congestion revenue income, as regulated business of Statnett, and we expect the same to be the case for the direct and indirect costs associated with the

activity. This include the net funding costs of the collateral, which is the main cost item, and any (unlikely) default losses related to the collateral deposits itself.

But even if the direct net funding costs of the collateral are covered, Statnett will be exposed to increased liquidity risk related to the collateral and higher financial risk associated with the increased debt for funding the collateral. Statnett already has an aggressive debt profile and investment plans that means that the financial capacity is highly utilized. For a pilot phase limited in volume and time, this may not be critical, but any long term or upscaled continuation after the pilot phase would have to address financial capacity and standby liquidity reserves costs.

It is also worth noting that an EPAD auction effectively entails Statnett selling its congestion income risk in a way that is somewhat similar to the sale of a long-term transmission right. Consequently, the net revenues (or costs) resulting from the sale of EPAD combos should probably be treated in the same way as congestion income in terms of the regulatory regime. If EPAD auction revenues and liabilities are treated differently, the auctions may lead to unintended regulatory incentives as these revenues move around within the regulatory accounts.

## 5.4 Impact/benefits

**Qualitative description of the potential benefits**

Introducing EPAD auctions in the Norwegian bidding zones is expected to support hedging opportunities both directly and by creating supportive conditions for trading. Directly, the auction would enable cross-zonal trade and thereby make it easier for parties to find a counterparty. This is likely to be particularly relevant if structural asymmetry is a problem, as the introduction of cross-zonal trade allows the effective netting of structural imbalances in demand and supply over a larger region spanning several bidding zones. The auction may also provide a simpler and cheaper means for market actors to access the EPAD market relative to participation via the exchange. By lowering barriers to the market, this measure could potentially encourage participation by a broader set of actors and thereby support liquidity.

Indirectly, the auctions may provide more complete and representative information about market price expectations. This is a result of wider participation, as noted above, as well as the auction's pay-as-clear structure. The latter induces participants to truthfully reveal their willingness-to-pay along the full depth of the demand and supply curve, unlike continuous trade. By providing a more reliable indication of supply, demand and market price expectations, participants in potential subsequent trades can be more certain that the market equilibrium price is fair. This reduces traders' risk of being caught unaware and can help overcome a reluctance to trade.

Liquidity is also self-reinforcing. Certainty of greater liquidity in the future means that entering into a position implies lower liquidity risk, i.e. it means that it is easier to exit the position later. As a result of this, market participants are more likely to enter into a trade in the first place, thereby contributing to liquidity.

**Quantitative impact assessment**

In this section, we assess the liquidity impacts of EPAD auctions quantitively, based on the impacts of Svenska kraftnät's pilot, and extrapolate to the likely impact of a Norwegian equivalent.

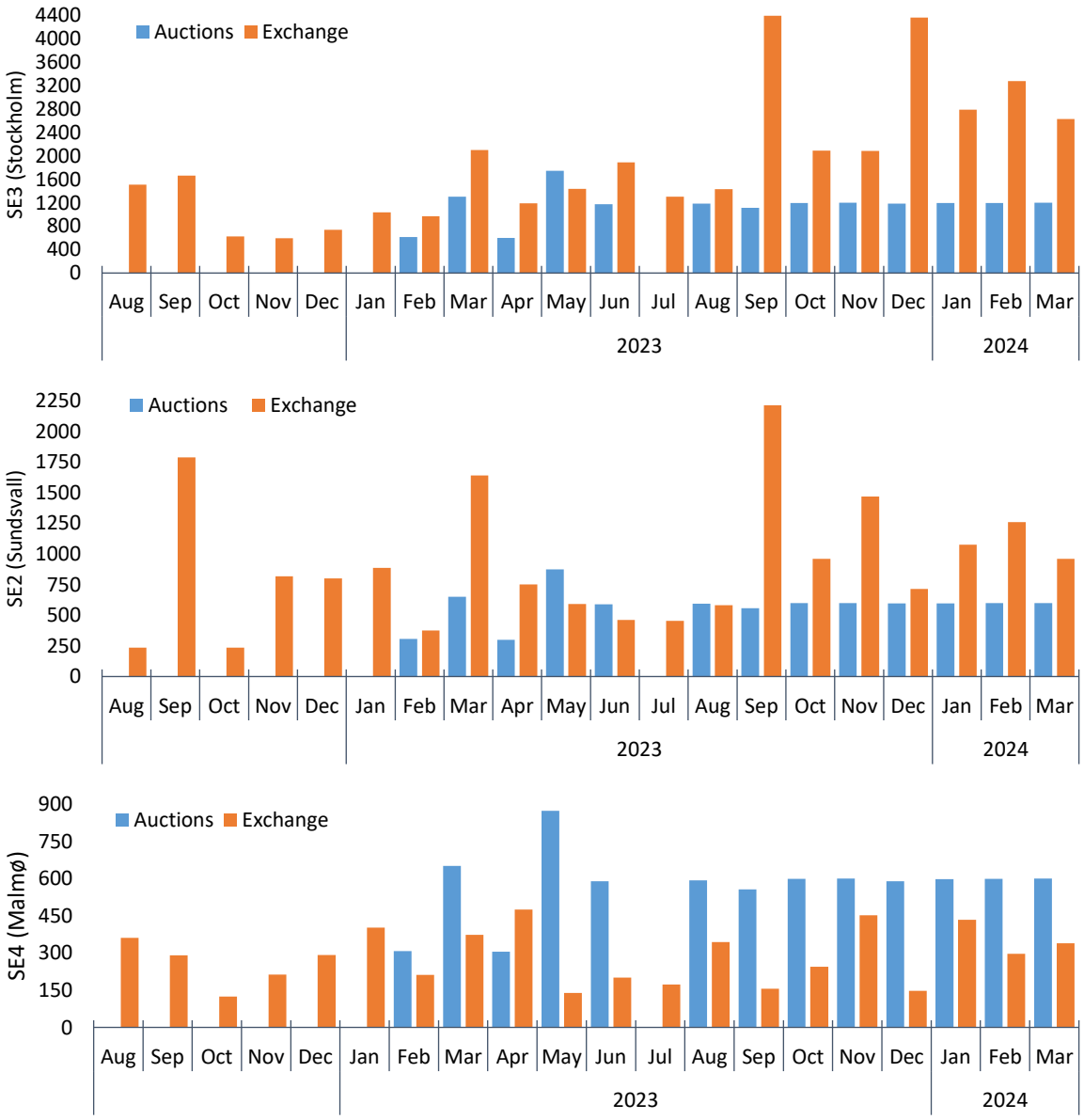
There is no single metric to measure liquidity. Instead, we have looked at traded volumes, bid-ask spreads and open interest. These metrics provide some insight into trading conditions. It is important to note here that the data we analyse is limited to information available to Nasdaq. This excludes bilateral trade that is not cleared, which is expected to be a large share of the relevant market.

## Traded volumes

Volumes show the implicit amount of energy traded. The traded volume shows the amount of energy (MWh) bought and sold during a specified trading period. Larger volumes tend to indicate more active trading and suggest that the market for the relevant product is more liquid.

The traded volumes for those EPAD contracts included in Svenska kraftnät's pilot have increased following the introduction of the auctions. Figure 2 shows monthly traded volumes for EPAD contracts in SE2, SE3 and SE4 respectively over the period August 2022 to March 2024. We have split the volumes depending on whether they are traded via the auction or the exchange.

*Figure 2: Monthly traded EPAD volumes (GWh), split between auction and non-auction volumes*




*Data source: Svenska kraftnät*

Taken together, there is a slight increase in exchange volumes following the introduction of the auctions – mostly driven by a positive trend in Stockholm, which due to its larger size relative to the other zones has a bigger impact on total volumes. The auction volumes appear to represent a net gain, meaning that these trades are adding to overall trading volumes rather than displacing volumes that

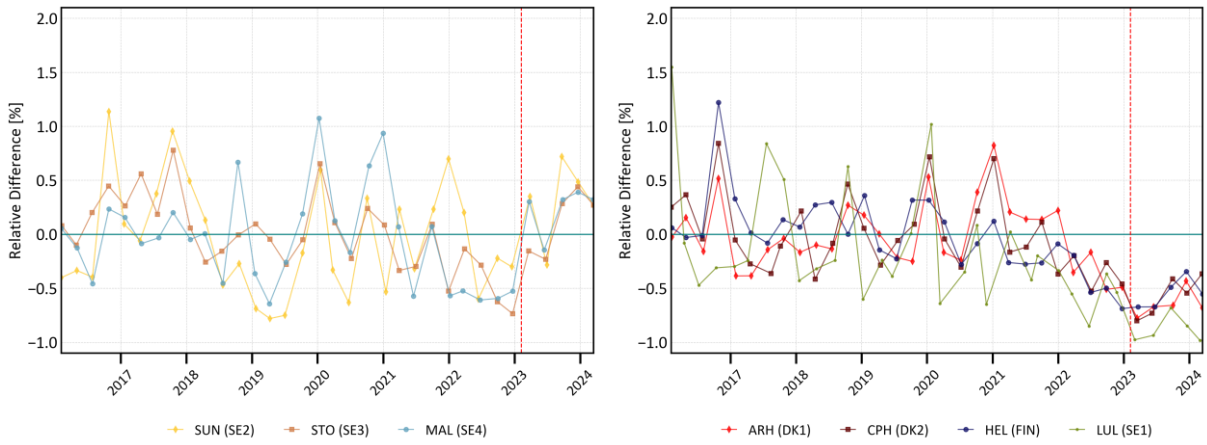
would otherwise be traded at the exchange. This is true even when considering each bidding zone individually.

For the exchange-only volumes, Figure 3 illustrates their development over a period from January 2016 to June 2024. The red vertical line indicates the date of the first auction in Svk's pilot. The horizontal axis has been calibrated to equal the average over the pre-auction period. These period observations are based on the sum of exchange-traded volumes over 90-day intervals for the relevant EPAD contract location. These sums are the total of monthly, quarterly and yearly contract volumes. Critically, we have also shown the development in volumes for some zones not included in the pilot to act as controls. Overall, each observation can be read as the 90-day traded volume relative to the pre-auction average. Thus, observations above the axis show above-average trade volumes whereas observations below the axis indicate below-average trade volumes.

For the Nasdaq-only volumes, there appears to be an uptick in traded volumes for the relevant Swedish EPADs in the period after the first auction with Svenska kraftnät, but it might be too early to tell if this will last. For the period before the auction, traded volumes fluctuated around the pre-auction average. After the auction, SE2, SE3 and SE4 EPAD traded volumes seem to have increased. Given the short amount of time since the auctions began and the volatility in pre-auction volumes, it is hard to conclude if the above-average volumes will last.

Compared to the control bidding zones, the trend in the relevant Swedish EPADs is notable. ARH, CPH, HEL and LUL EPADs all show relatively low volumes in the period after the auctions began, following a clear downward trend.

*Figure 3: Exchange-traded volumes by bidding zone, summed averages over 90-day intervals relative to the pre-auction average.*




*Data source: Nasdaq*

## Bid-ask spreads

The bid-ask spread is the difference between the prevailing bid and ask price for a given contract. It both affects and is affected by liquidity. The spreads' influence on liquidity is the result of its function as a transaction cost. A large spread implies that a large value must be paid to meet the expectations/costs of a counterparty. This large transaction costs tends to harm liquidity by reducing the scope for profitable trade.

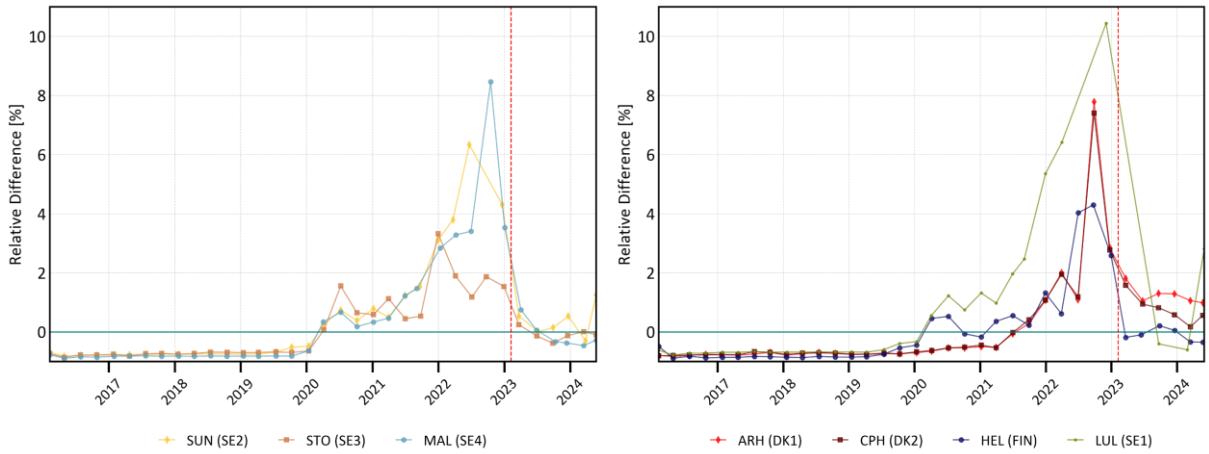
Conversely, liquidity itself influences the spread. Poor liquidity means that holding a contract is relatively risky since positions cannot be easily changed. This means that counterparties demand more to enter into a position in the first place, which tends to push bid and ask prices apart.

The interaction of bid-ask spreads with liquidity, both as a cause and a result, make bid-ask spreads a potentially informative metric of market liquidity. However, it is worth noting that the bid-ask spread will be affected by other factors, such as greater market certainty as to the underlying power prices. For this reason, changes in the spread need to be interpreted carefully.

Figure 4 shows development in the bid-ask spread for monthly contracts for the three bidding zones included in the auctions (Sundsvall, SE2; Stockholm, SE3 and Malmø, SE4) and four control bidding zones (Århus, DK1; Copenhagen, DK2; Helsinki, FIN and Luleå, SE1). Again, as with the traded volumes figure above, we show observations relative to the pre-auction average level, which is shown by the horizontal axis. The absolute bid-ask spreads are averaged over 90-day intervals. Observations below the horizontal axis indicate a bid-ask spread that is tighter than average; observations above the axis indicate wider-than-average spreads.

We see that spreads for the relevant Swedish contracts seem to have been a lot tighter recently following the first Svk auction (as shown by the red line). Performance in the relevant contracts looks slightly better than comparable zones for which there are no auctions. Interpreting the figure, we need to bear in mind that the preceding period was exceptionally volatile and uncertain, which likely contributed to higher-than-average spreads. However, current spreads in the control areas look high in comparison with levels before 2020. Again, this suggests that the auctions have had a beneficial impact in bringing down bid-ask spreads.

*Figure 4: Bid-ask spread at close for monthly contracts by bidding zone, averaged over 90-day intervals, relative to normalized pre-auction averages.*




*Data source: Nasdaq*

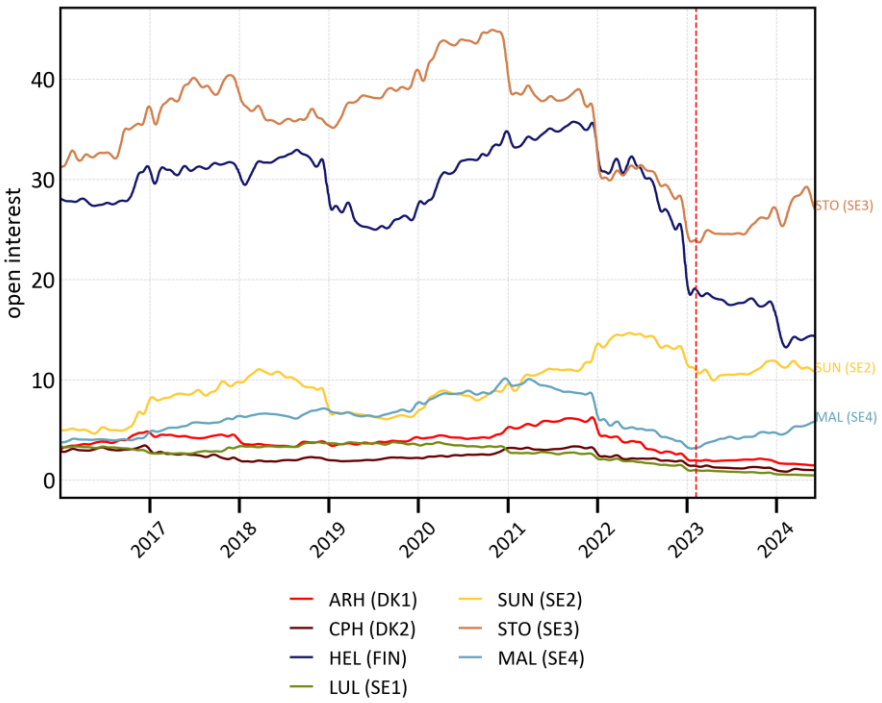
A similar trend can be seen for the quarterly and yearly contracts. We have therefor excluded plots of them from the report.

### Open interest

Open interest refers to the total size of open positions with a clearing house at a given point in time. The cumulative size of open positions implies the scale of hedging activity in a given contact. If more market actors are being encouraged to hedge or market actors are willing to hedge a larger position, this activity will be reflected in higher open interest. Consequently, resolving asymmetry between supply and demand will tend to increase open interest. However, open interest may also be affected by changes to the share of hedging activity is cleared. As such, we again need to be careful in how we interpret the data.

Figure 5 shows open interest for EPAD contracts, summed across all contract durations. Separate lines are show for each bidding zone. We show the same selection of zones as above, those included in the pilot (SE2–4) and control zones (DK1 and 2, FIN and SE1). It is difficult to draw clear conclusions from the development of open interest. The declining trend in open interest in Stockholm and Malmø seems to halt after the auctions were implemented. In contrast, the control zone Helsinki seems to have continued on this declining trend that ran parallel to Stockholm 2021–2023. There is no clear change in Sundsvall.

*Figure 5: Nasdaq open interest by bidding zone (TWh)*




*Data source: Nasdaq*

## 5.5 Key design decisions

In this section, we discuss the implications of the two design decisions noted earlier, namely:

- Whether the contracts that are auctioned should be cleared or subject to alternative collateral management arrangements, and
- Whether the auction should match and clear bids and offers within the same zone.

The design of volume limits is discussed separately in chapter 8.

**Within-zone clearing**

Within-zone clearing occurs when the auction matches a bid and an offer for products in the same bidding zone. The design question is whether the auction clearing algorithm should make such, within-zone matches or be restricted to matching bids and offers only when these relate to different zones.

If allowing within-zone clearing enables trades that would not have occurred otherwise, there would be a direct contribution to liquidity. However, performing within-zone clearing entails Statnett taking on a function already provided by the market. For liquidity to benefit, we would need to assume that Statnett performs this function better, enabling within-zone trades that would not otherwise occur in the existing EPAD market.

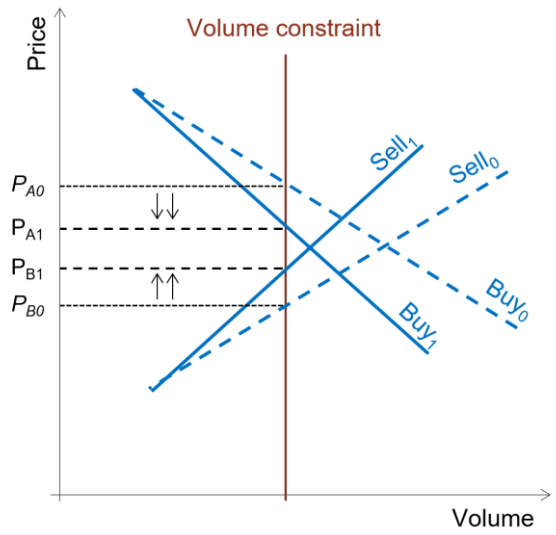
Statnett has a principled objection to taking over existing market functions or functions that could be readily implemented by commercial actors. Thus, even if one believes that an auction setup might support additional within-zone trading, and thereby improve liquidity, there is nothing to prevent Nasdaq from arranging a commercial auction. If Statnett undertakes such commercial roles, it will prevent fair competition for the relevant service.

In addition to this principled objection to undertaking a commercial role, within-zone clearing entails additional implementation risks. The potential distortion to competition mentioned above increases the risk of a legal challenge.

Within-zone clearing would also likely reduce the revenues obtained by Statnett and its tariff payers via the auctions. By definition, the within-zone matching of bids and offers, if it has any effect at all, will remove some bids and offers from consideration when we consider possible cross-zone matches. Assuming that the volume of cross-zone matches resulting in the auction is unchanged (e.g. because this volume is effectively determined by the auction volume limits), removing bids and offers from consideration for cross-zone matching will lead to prices being set by less attractive bids and offers.

Figure 6 illustrates this effect. Here, we consider the opportunities to match bids and offers between two zones. The full set of bids and offers relevant to finding a match are shown by the dashed blue lines. If we have access to all of these bids and offers when determining cross-zone matches, we will match bids and offers on these dashed lines until we reach the auction volume constraint. This will result in Statnett selling at $P_{A0}$ and buying at $P_{B0}$. Now let us assume that we allow within-zone matching. Some of the bids and offers are matched within a zone and are therefore no longer relevant for cross-zone matching. This will result in some of the volumes being removed from the set of relevant bids and offers. This is shown visually by the move to the solid blue lines. These lines imply Statnett selling at $P_{A1}$ and buying at $P_{B1}$. As can be seen, this implies Statnett trading at worse prices following the introduction of within-zone matching.

*Figure 6: Illustration of changing auction prices with within-zone clearing*




**Clearing arrangements**

Unlike transmission right options, EPADs imply that Statnett's counterparty might be obligated to pay Statnett as part of the settlement process. If Statnett is to sell EPADs, it needs to manage the resultant counterparty risk in some way. If choosing to use a clearing house, the counterparty protection will go

both ways and Statnett will face costs, notably associated with posting collateral. Estimates of these collateral costs are provided in section 5.2 above. Alternatively, Statnett could:

1. Seek to have its default risk covered by the Norwegian state through a public guarantee, or
2. Implement its own bespoke collateral arrangements in which it does not post collateral.

Using a clearing house would allow for fairly rapid implementation and, since the clearing arrangements could be altered later, the use of the clearing house makes sense both for Statnett's pilot and possibly as part of the initial implementation of an enduring scheme. However, the size of Statnett's implied collateral costs means that it would also make sense to explore options to either reduce collateral costs or, failing that, potentially recoup them from Statnett's counterparties.

This recommendation reflects the assessment criteria identified earlier. We explain the relevant interactions with each of these below.

### Improvement in hedging opportunities and cost for third parties

The impact of this decision on the availability of hedging opportunities depends on whether the choice of clearing arrangements affects market accessibility or the costs borne by potential participants. As we don't have a clear model for how bespoke collateral arrangements would be implemented, the impacts of such a model are hard to assess. However, there are reasons to think that the use of the clearing house would be easier for market actors, and this might in turn allow the auctions to make a greater contribution to liquidity.

The first potential benefit relates to *netting*: Using a common clearing house allows actors to net positions realised via the auction against cleared positions obtained outside the auction (i.e. from bilateral trade or trade via the exchange). Netting could reduce costs and allow for more seamless trade across platforms.

The second potential benefit is that using the clearing house removes the need to create a new administrative framework for collateral management. For those market participants that are already using the clearing house, adding another framework risks adding to their costs and the administrative difficulty of participating in the auction.

The only potential benefit of a new framework in terms of the auction's contribution to liquidity would be if this framework were designed to be more accessible for marginal players. In that case, the bespoke collateral framework might attract new actors to the market and thereby contribute to greater liquidity.

### Ease of implementation

Using the clearing house entails much lower implementation risk relative to the alternatives and could be implemented more rapidly by making use of existing arrangements for the upcoming Statnett pilot and Svenska kraftnät's ongoing auctions.

In contrast, the use of public guarantees involves two key risks: the guidance to be developed by the European Securities and Markets Authority (ESMA), and the willingness of the Norwegian government to issue a public guarantee. (See section 5.2 above for more details on this.)

Implementing bespoke arrangements would require an additional workstream to design these arrangements and, potentially, an additional tendering process to find a third party to manage them. This would add to the expected implementation time and the risk of delays, as we do not know in advance how difficult it would be to design successful bespoke arrangements.

### Statnett's costs

A significant share of Statnett's costs relate to providing collateral (see section 5.2). A public guarantee could remove these costs and convert them into a liability for the Norwegian state. The latter would probably be borne at a much lower cost (possibly zero). Bespoke arrangements could also potentially result in significant cost savings for Statnett but would still imply a cost for administering these arrangements (possibly paid to a third-party provider). Statnett's counterparties would, in theory, bear a more significant risk of default as a result of losing protection via the clearing house. However, this risk is considered to be negligible. There is also a risk that the bespoke arrangements are not well-designed and that Statnett bears a higher risk of losses due to a defaulting counterparty as a result.

### Discrimination

The choice of clearing arrangements could result in inadvertent discrimination in two ways:

1. By distorting competition among different clearing houses and
2. By discriminating among potential auction participants.

As noted previously, the first of these issues is purely academic provided that Nasdaq Clearing remains the only clearing house for the relevant contracts (i.e. EPADs). However, this could potentially change if other clearing houses opt to clear EPADs or if the auction design adapts to include other contracts, like zonal futures.

If clearing house competition becomes relevant, then a bespoke process could avoid inadvertently encouraging market participants to clear using one specific clearing house (to benefit from netting). However, in practice, this concern would probably be better addressed by facilitating clearing via multiple clearing houses than by changing the whole approach to managing counterparty risk.

Discrimination among potential auction participants is only relevant if the bespoke arrangements are more or less discriminatory than the use of a clearing house. This is hard to judge in the abstract. Possibly a bespoke process could be more accessible for smaller participants but, equally, the opposite could also be true. As such, all of the options perform equally well against the discrimination criterion.

### Robustness over time

If zone-to-hub long-term transmission rights do become traded on JAO, as proposed by ACER, JAO will likely need to develop its own collateral arrangements. These could meet Statnett's needs. However, the future development of this market is so uncertain that planning to use JAO's future arrangements at this stage would likely entail delayed implementation, given the need to await progress at a European level. It would also introduce considerable risks to implementation. We therefore do not think that this option for collateral management is worthy of consideration at this stage.

## 5.6 Market structure and the risk of market power

In this section, we consider the risk of market power being exercised in the auction and the potential to mitigate this risk through the auction design. We conclude that we have insufficient information to assess the risk of market power empirically. Market monitoring is the only option that we identify as potentially helpful in mitigating the risk of abuse. However, such monitoring is likely to be difficult. This increases the importance of ensuring that the other features of the design encourage widespread participation and the comprehensive submission of bids and offers.

There are two potential strategies that we consider to be potentially relevant as a means of abusing market power.

The first would be an attempt to corner the market by a dominant supplier of EPADs. Under this strategy, the provider would try to buy up all of the relevant EPADs available via the auction to preserve

its dominance in the supply of the relevant EPAD contract. By doing so, the supplier could maintain a high price for these EPADs in trade outside of the auction and reap a benefit through this high price. We consider this approach to be unlikely because it would be very conspicuous. That said, the auctions should be monitored to check that EPADs are being sold to a range of parties.

The second approach would be withholding. Under this strategy, a party would strategically withhold bid- or offer-volumes from the auction to try and influence the price. For example, a seller of EPAD contracts might choose to restrict the volume offered in the auction (or to price these volumes high) with the intent of pushing up the clearing price in the auction. If this higher auction price becomes an anchor for subsequent bilateral trade, the withholding party may be able to earn this high price on sales in the bilateral market.

The likelihood of such behaviour will depend on this strategy's profitability and the ease with which it can be detected.

In considering the strategy's profitability, we need to account for the fact that the potential gain is a function of both the realised change in price as well as any implied change in the volume traded. The profitability of withholding is greatest when it results in a significant change in the price and this improved price can be realised over large trading volumes. A favourable shift in the clearing price typically results in an unfavourable change in traded volumes. Therefore, successful withholding requires that the party in question can realise a bigger positive change in price than the corresponding loss in trading volumes. The greater the price impact and the lower the volume impact, the more profitable the strategy.

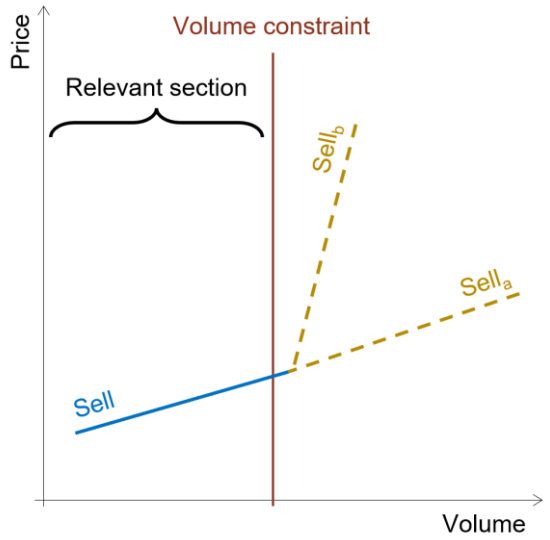
As noted previously, one of the complicating factors here is that the auction will form only a part of the EPAD market and so one needs to consider the relevant price and volume impacts across the EPAD market as a whole, i.e. including the bilateral market. We begin by considering the auction in isolation before extending to a consideration of the EPAD market more broadly.

The auctions are expected to be constrained by volume limits. Assuming that these limits are binding, as seems likely, clearing prices will be set based on the intersection of these volume limits and the relevant bid and offer curves.

Figure 7 illustrates how the structure of the relevant bid and offer curves affects the profitability of withholding. The scope of the withholding party to influence the price will depend on that party's share of demand or supply to the left of the volume limits (marked with "relevant section" in the figure), i.e. its concentration at the far left of the bid or offer curve. This is because withholding will have the effect of removing segments of the bid or offer curve and therefore shifting these curves to the left. Since the price is set at the intersection of the curve with the volume limit, withholding elements of the curve to the right of the volume limit has no impact on the intersection or the clearing price. Bids and offers to the left of the volume limit are also those volumes that will be cleared in the auction, and therefore have the potential to benefit from a more favourable price. Thus, in assessing the risk of market power, we care about concentration in the 'relevant section' of the bid or offer curve, rather than across the curve as a whole.

The shape of the curve immediately to the right of the volume limit determines how effective withholding a given volume will be in altering the clearing price. The figure shows two versions of the curve to the right of the limit, A and B. Where the curve rises steeply to the right of the volume limit, as in B, withholding results in a large impact on the clearing price. In the case of curve A, where the curve rises less steeply, the impact is smaller.

*Figure 7: Illustration of volume withholding*




Taking these points together, we see that the direct profitability of withholding is greatest where:

1. The shape of the curve around the volume limit is steep, such that marginal changes in volume result in significant price changes, and
2. The party benefiting from the abuse continues to have significant cleared volumes (i.e. those to the left of the volume constraint) after withholding.

If, as may be the case, the auction price acts as an anchor for prices in subsequent bilateral trading, then it may also be relevant to consider the scope to reap the benefits of price manipulation over these bilateral volumes. In this case, a manipulating party could gain from withholding capacity in the auction, or even not participating in the auction at all, primarily or exclusively via better prices in bilateral trade.

We do not have enough information on the nature of these curves to assess the potential profitability of withholding. The pilot should provide additional information, particularly about the shape of the relevant curves around the volume limits and the distribution of volumes traded with different parties. However, it will not provide information on what is happening via bilateral trade and, if withholding is occurring, the withheld bids and offers will, by definition, not be observed. This makes monitoring potential abuses difficult.

Overall, we conclude that a strategy of withholding seems to be the most likely potential form of abuse. Specifically, it is conceivable that a market actor responsible for large buy or sell volumes in the bilateral market might deliberatively place its bids to the right of the volume limit in the auction to influence the auction price and thereby receive a better price in the bilateral market.

We see little scope to foreclose this possibility through the design of the auction itself. We have assumed that Statnett will not be permitted to impose reserve prices due to concerns about it manipulating the market, as well as the practical difficulty in setting the relevant values. Statnett is also unlikely to have much control over the volumes offered.

The best response would appear to be to conduct regular market monitoring to:

- Verify that contracts are being sold to a variety of parties (i.e. that the market is not being cornered),

- Verify that the bid and offer curves are relatively flat (minimising the value of withholding), and
- Verify that large actors in the bilateral market are active participants in the auction and that the profile of their bids is not abnormally skewed.

Overall, our consideration of market power does not lead us to reject auctions as a viable intervention. However, it does highlight the potential risk of abuse and the importance of achieving both widespread participation in the auction and deep and comprehensive bid and offer curves that represent the EPAD market as a whole.

## 5.7 Analysis overview: EPAD auction

Table 4 gives an overview of the analysis above structured against the criteria introduced in section 2.2.

*Table 4: Key conclusions for each criterion*

| | |
|---|---|
| Improvement in hedging opportunities in the Norwegian bidding zones | • An auction will provide a focal point for liquidity and should support participation by smaller actors<br>• The preliminary results from Svenska kraftnät's pilot suggest that EPAD auctions can contribute to liquidity and improved price formation |
| Ease of implementation | • Follows on directly from Statnett's pilot and similar to the solution currently being run by Svenska kraftnät in Sweden, both of which make the marginal implementation relatively easy |
| Statnett's costs | • Costs for internal staffing, the third-party auction operator and posting collateral<br>• Estimated to amount to NOK 52m per year, assuming auction volumes equal to those suggested in the pilot. A full-scale solution offering close to full capacity (assumed eight times the pilot auction volumes) implies a yearly cost of NOK 352m.<br>• Clearing imposes significant costs. Public guarantees would remove or transfer these away from Statnett. Bespoke arrangements might remove them but would likely entail additional administrative costs. |
| Financial risk borne by Statnett and tariff-payers | • Provided the size of EPAD positions is suitably limited, the financial risk should be largely offset by changes in congestion incomes.<br>• Statnett may be exposed to increased cash liquidity risk, which will need to be managed |
| Costs for third parties | • The choice of clearing arrangements could affect the costs borne by potential participants. |
| Risk of discrimination or market distortion | • EPAD auctions can be delivered in a non-discriminatory way.<br>• Choice of clearing arrangements could influence accessibility to different types of market participant, but the direction of the impact is unclear. |
| Ability to adjust the level of support provided | • The degree of support provided via auctions could be adjusted over time by changing the volume limits. |
| Risk to Statnett's independence | • The mechanistic and transparent nature of the auction clearing process implies a lower risk to Statnett's perceived independence. |
| Robustness to future market changes | • We expect that key design decisions, such as choice of product, will be relatively easy to change over time. |

# 6 Conclusion

We recommend implementing an EPAD auction for the Norwegian bidding zones as a measure to support power price hedging opportunities. Auctions should be implemented without within-zone matching and with plans to explore options to reduce collateral costs over time. The key argument for our recommendations is that, unlike market making, auctions can address asymmetry in demand and supply in bidding zones and, based on Svenska kraftnät's experience, seem likely to contribute to liquidity. Specifically, the Swedish experience suggests that such auctions will result in a net increase in traded volumes and reduce bid-ask spreads. The use of EPADs as the product ensures a direct contribution to the liquidity of those products already in use by market participants and is consistent with our understanding of what market participants want. Avoiding within-zone matching avoids encroaching on the commercial market and has the secondary benefit of simplifying the implementation. Using the clearing house initially to manage counterparty risk will support rapid and simple implementation and does not foreclose the option to pursue cost reduction in the longer term. Adopting an approach similar to Svenska kraftnät's ongoing pilot also allows for potential coordination on the borders with Sweden if necessary and for small savings from cost-sharing in the future.

## 6.1 Market-making

We consider it inappropriate to try and introduce market-making initially or as a standalone measure. This reflects concerns as to the feasibility and cost of implementation as well as the measure's ability to improve liquidity.

If Statnett is required to support market-making, we consider that this service will need to be provided by a third party. We are concerned that there may be too few interested parties in some of the relevant zones to allow this service to be competitively tendered. Based on our discussion with some relevant market actors, financial or pure trading parties are not interested in undertaking this role. Statnett would therefore be significantly dependent on utilities with relatively advanced existing trading operations (e.g. Statkraft, Å Energi). Given this and Nasdaq's long history of trying and failing to find interested parties, we are concerned about the feasibility of running a competitive tender. An attempt to find a market maker could be unsuccessful or else result in significant costs unless, e.g., Statkraft is politically motivated to take the role. We are also concerned that the current lack of liquidity will add to the market-maker's costs and, ultimately, to the costs borne by Statnett and tariff payers. Assuming that auctions allow for somewhat improved liquidity, it may be possible to introduce market-making at a lower cost as a follow-up measure.

We expect the liquidity benefits from market making to be small. As the market-maker will price to avoid taking a net position, this measure will not address any structural imbalance between supply and demand in individual zones. Overall, because prices will be set to avoid trade, we expect market-making to make only a limited contribution to traded volumes. The main benefit of market-making is expected to be better price formation and transparency.

## 6.2 Auctions

EPAD auctions are expected to offer the best chance of improving hedging opportunities while limiting the costs and risks faced by Statnett's tariff payers. The preliminary results from Svenska kraftnät's pilot suggest that these auctions can contribute to liquidity and price formation. Specifically, the volume traded in Svenska kraftnät's auctions represents a net gain in traded volumes, with a slight increase in exchange volumes also possible. The exchange data also suggests more stable bid-ask spread behaviour following the introduction of the auction, which may be indicative of greater certainty regarding the equilibrium price.

These auctions should not match bids and offers from within the same zone. Such matching competes directly with the commercial market and would distort fair competition for exchange services. Within-zone matching should already be happening on commercial terms. Consequently, the benefits of conducting such matching via the auction would be limited to any net additional trades not already happening by other means. Within-zone matching would also add to the implementation risk, since a clearing mechanism that suitably accounts for both internal and external bids would need to be designed. Lastly, within-zone matching may affect pricing to the determinant of tariff-payers.

For the initial set-up, we recommend that the clearing house be used to manage counterparty risk, while Statnett explores options to reduce the significant costs of collateral. There may be scope to reduce collateral costs by using public guarantees or by introducing bespoke collateral arrangements. However, such arrangements would need to be developed in partnership with other stakeholders.

The decision to use the clearing house, at least initially, reflects the following considerations (structured around those criteria from 2.2 relevant for the decision):

- **Improvement in hedging opportunities and the cost for third parties.** Using a common clearing house allows for netting, reducing third parties' costs and potentially increasing their willingness to trade. It also avoids the need for a new collateral management framework, which could create additional administrative costs.
- **Ease of implementation.** Using the clearing house allows for the easiest implementation. The use of public guarantees would be contingent on approvals from ESMA and the Norwegian government. Bespoke arrangements need to be designed and would potentially require a second procurement exercise to find a collateral manager.
- **Statnett's costs.** Clearing imposes significant costs. Public guarantees would remove or transfer these away from Statnett. Bespoke arrangements might remove them but would likely entail additional administrative costs.
- **Discrimination.** There is no clear difference among the approaches to collateral management in terms of their ability to avoid undue discrimination among market participants. A potential distortion of competition among clearing houses could likely be avoided by facilitating clearing across multiple clearing houses.
- **Robustness.** JAO might develop suitable clearing arrangements in the future, but these developments are too unclear/immature to make this a sensible alternative.

Statnett's total costs will be significantly determined by the overall size of the EPAD positions that it takes. As such, the volume limits imposed in the auction will be a significant determinant of Statnett's expected costs. Given volumes equal to those expected from the pilot auctions, we estimate that Statnett's total costs will amount to NOK 52m per year. If we assume a full-scale solution offering close to full capacity, set here to equal eight times the pilot auction volumes, we reach a yearly cost of NOK 351m. Costs scale almost linearly with auction volumes—increasing by a factor of 6.8 when volumes increase by a factor of 8. Collateral costs make up the vast majority of these costs at 80–95 percent of the estimated total costs. These costs comprise the difference between Statnett's cost of capital and the comparatively low interest received on funds placed with the clearing house. As such, Statnett's assumed cost of capital (i.e. the implied alternative interest rate that Statnett could realise through the alternative use of these funds) is a critical assumption in estimating these collateral costs. As noted above, Statnett's collateral costs could be significantly reduced through the use of public guarantees or the use of bespoke collateral arrangements and options to realise cost reductions should be explored further if the auctions are introduced.

# 7 Implementation plan

Below we present a draft implementation plan for the recommended option. The plan includes important milestones for the process. Where relevant, we address key time risks.

With this plan, we consider it possible to implement an EPAD auction in 18 months, within the legal requirement given in FCA GL art. 30(6). The 18-month period includes a 6-month extension which needs approval by RME upon request from Statnett.

Figure 8 shows the draft implementation plan, followed by more details of each step in

Table 5.

*Figure 8: Draft implementation plan*

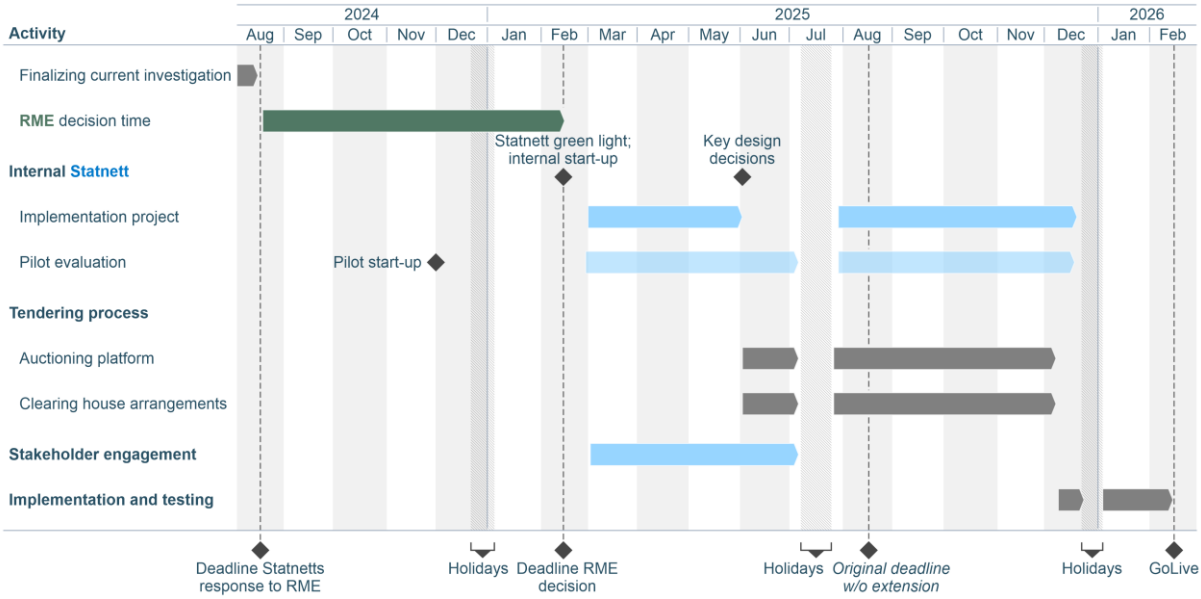


*Table 5: Draft plan for Statnett implementing EPAD auction in Norwegian bidding zones*

| | |
|---|---|
| August 2024 | Finalising current evaluation and delivery of report to RME by August 16th. |
| Aug. '24–Feb. '25 | Consideration by RME. This also includes any RME public hearing. For Statnett, this period is an area of risk during which it does not have control over the timeline. Dialogue is advised. Early warning from RME ahead of their final decision would allow for earlier preparation by Statnett and is advisable. This would enable Statnett to begin work in parallel. |
| February 2025 | Internal Statnett start-up. |
| February 2025 | The deadline for RMEs decision will be February 16th, following the 6-months requirement given by FCA GL. We assume Statnett is instructed to begin implementation. |
| March–June 2025 | Internal Statnett implementation project; key design decisions are taken. (A continuous monitoring and evaluation of the pilot is a part of the implementation project for the enduring version.) |
| Jun.–Dec. 2025 | Latest initiation of a tendering process for third-party actors. Including the auctioning platform and clearing house arrangements. (Assumes a six-month tendering process). |
| *August 2025* | *Original legal requirement for implementing measure, according to FCA GL. Before this point, Statnett/RME will need to decide on whether to apply for extended implementation plan. We assume that this happens.* |
| Aug.–Dec. 2025 | Cont. of implementation project. Statnett prepares monitoring framework, set up systems and decides on metrics. |
| Dec. '25–Feb. '26 | Final implementation and testing. |
| February 2026 | Go-Live. Final legal requirement to implement measure, 12 months after RMEs decision. |
| From Feb. 2026 → | Running of auctions. Monitoring and follow-ups. |

# 8 Auction limits

## 8.1 Legal context

According to FCA GL art. 30(3), the TSOs have a responsibility to ensure that sufficient hedging opportunities are available for the market participants in all biding zones. As expressed by FCA GL art. 30(1), the default option for TSOs, when insufficient hedging opportunities are detected by the relevant NRAs, is to issue LTTRs.

The Norwegian regulator, RME, have found that the hedging opportunities in the Norwegian bidding zones are insufficient. However, RME have also stated that the introduction of LTTRs is not an option to be considered. Thus, we are turning to the optionality offered by FCA GL art. 30(5)(b) "*to make sure that other long-term cross-zonal hedging products are made available to support the functioning of wholesale electricity markets*".

Based on FCA GL art. 30(5)(b), Statnett's proposed solution is the introduction of EPAD-auctions. Surely, EPADs are not cross border instruments but it is fully possible for a market participant to construct a cross-border hedge by adding two EPADs (one buy and one sell) in two different bidding zones. Thus, the choice of EPAD auctions is justified by the FCA GL as a way of ensuring that other cross border hedging products are made available to market participant.

## 8.2 Principles to be used when setting volume limits

As part of CCR Nordic, the formal long-term capacity calculation for Norway is defined in the Nordic Long Term Capacity Calculation Methodology (LT CCM). According to FCA GL articles 29, 31 & 39(1)(b), the volume of LTTRs offered by TSOs shall be based on a formal capacity calculation methodology. For other long term hedging products, such as market making or EPAD solutions, there are no similar requirement for a long-term capacity calculation in the present FCA GL.

EPADs are financial products with close similarity to energy products, being structured contracts with delivery in a specific bidding zone at a specific zonal strike-price. Thus, an EPADs is not in itself an LTTR or a cross-border product. Market making, which in our case is the obligation to provide a volume and a bid-ask spread for EPADs, can neither be regarded as LTTRs. Because these products are specifically designed to meet market participants need to hedge zonal price risk and are also traded at the continuous market at Nasdaq, EPADs behave quite different from LTTRs. Therefore the process of deciding on volumes for EPAD auctions should be based on other principles than the coordinated capacity calculation developed for LTTRs.

We propose that finding the target volumes should be based on FCA GL art. 30(3). This requires finding a volume that secures that sufficient hedging opportunities are available in all bidding zones. To assess whether the target is met, we should look at FCA GL art. 30(4)(b) for metrics. Thus, our proposal for setting volumes in the EPAD auctions are as follows:

1. Start with the volumes anticipated in the Statnett EPAD pilot.
2. Each year (or every second year) assess if the targets is met.
    - If the target is not met or overshot, the volumes should be adjusted accordingly.

Secondary to the principles above, there are also two other important considerations that should be observed when setting volume constraints in the auction:

1. Preventing Statnett from being exposed to excessive risk, and
2. Preventing Statnett from entering into positions that are poor value.

In both cases, since Statnett is funded by network tariff payers, these constraints are designed to promote the interests of network tariff payers. We consider each objective separately below.

**Limiting Statnett's risk exposure**

Tariff payers are already exposed to cross-zonal power price spreads via Statnett's congestion income. EPAD auctions, if introduced, would result in Statnett taking on positions in EPADs, creating separate exposures to these same prices.

In considering the risk exposure of tariff payers, we need to consider these two sets of exposures together, since both are driven by the same future power price spreads.

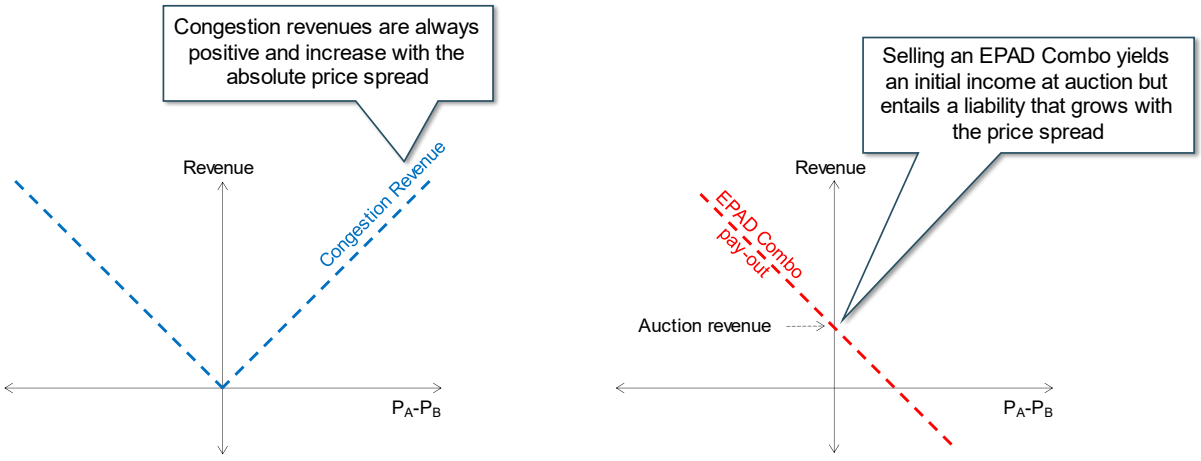
Despite being a function of the same set of prices, the structure of payments and liabilities associated with congestion incomes and EPADs are different in some important respects.

Congestion incomes reflect the absolute size of the price spread between two zones, irrespective of the direction of the relevant spread. The greater the absolute size of the spread, the greater the congestion income earned. In contrast, the direction of payments that results from EPADs are determined by the direction of the price spread. In one direction, Statnett will need to pay out, in the opposite direction, Statnett will collect income.

The structure of the auction implies that Statnett will take a position in EPADs such that it realises an initial revenue from taking a position, selling a high-price EPAD and buying a low-price EPAD. Assuming these EPAD prices reflect future price expectations for the relevant zones, this implies that, in expectation, the price spread between the relevant zones will be such that Statnett has to pay out money during the delivery period.

The implied payout structures for congestion incomes and EPADs are shown in Figure 9 below. The outturn price spread between the two zones is shown along the horizontal axis, with a zero price spread at the origin. Statnett's implied net revenues are shown on the vertical axis. Note that the payout for the EPADs crosses the y-axis at a positive value. This value is the auction revenue that Statnett obtains through the auction.

*Figure 9: The structure of payouts for congestion income and EPADs.*

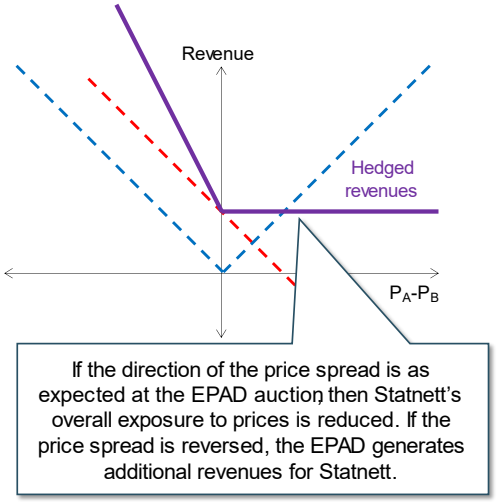



In addition to this difference in the structure of payouts between congestion incomes and EPADs, these payouts are earned on potentially different volumes. Congestion incomes are earned on the volume of scheduled flows between the relevant zones. These volumes may change from settlement period to settlement period and will be affected by network outages. EPAD payments reflect contract

volumes, which are fixed when the contract is traded and are constant across the entire delivery period (of a month or more).

For simplicity, let us assume that these volumes are the same. Then, by entering into EPADs via an EPAD auction, tariff-payers' implied exposure to the future price spread is given by the purple line in Figure 10 below. This is the sum of the other two lines. Put simply, Statnett effectively sells its expected congestion revenues at auction. Provided that the direction of the price spread is as expected, Statnett's total revenues remain equal to the initial auction revenue because any change in its congestion revenue is offset by changes to its EPAD payment obligations. If, however, the price spread reverses direction, then Statnett earns both the payment from the EPAD and the congestion income.

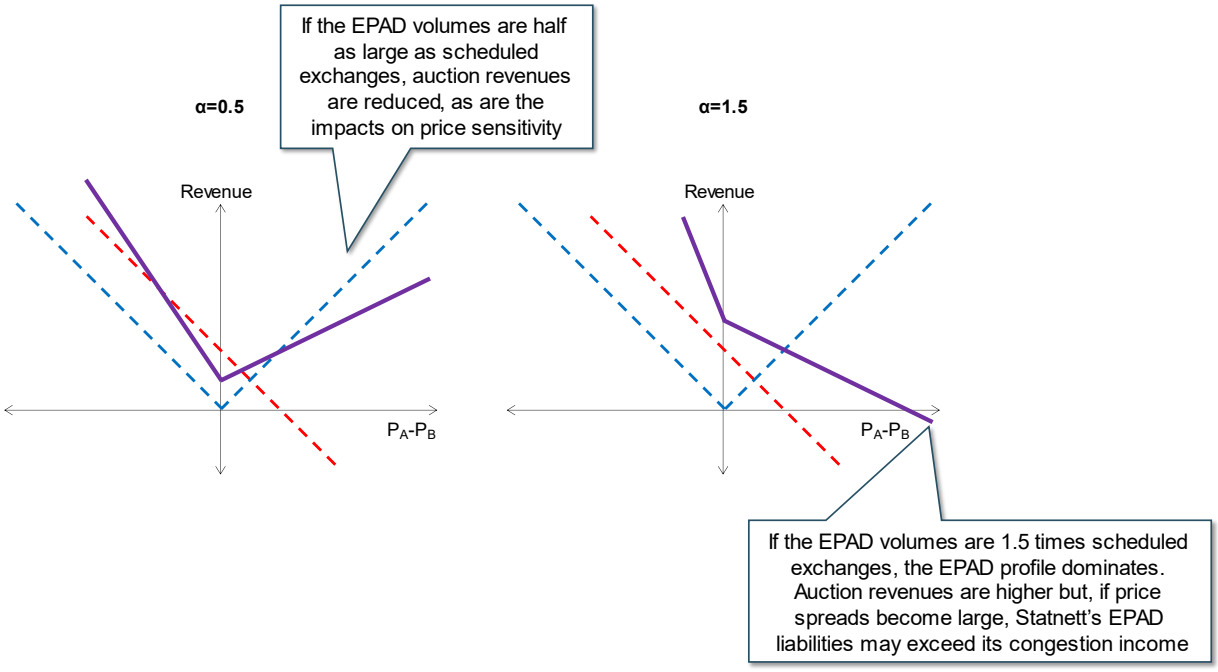
*Figure 10: The structure of payouts implied by an EPAD auction*




The invariance of Statnett's revenues with the price spread is a result of the fact that the volumes are the same for both congestion incomes and the EPADs. This equivalence ensures that price movements give rise to precisely offsetting incomes and liabilities.

The consequences of having EPAD volumes that are greater than or less than the volume of scheduled flows are illustrated in Figure 11 below. The figures show the implication of different ratios between the EPAD volume and congestion-income volume (we label this ratio α). As can be seen, if EPAD volumes exceed scheduled flows, as shown on the right, Statnett can potentially lose money when the price spread becomes large. Put simply, as soon as the EPAD volume exceeds the volume of scheduled flows, then as the price spread widens, Statnett's EPAD liabilities grow more quickly than its congestion income.

*Figure 11: Implications of alternative EPAD volumes for Statnett's exposure to the power price spread*




We believe that Statnett should never enter into EPAD positions that could result in a net loss due to unfavourable price developments. Doing so implies that Statnett is taking positions in EPADs that are not backed by its congestion income exposure and would be analogous to a TSO auctioning long-term transmission rights for network capacity that it did not actually have.

This implies that EPAD auctions should be run with position limits that equal expected scheduled flows and that the auction should not clear trades that would violate these position limits.

The parameterisation of such limits is complicated by the fact that the volume of schedule flows is not known in advance and is likely to vary throughout the delivery period. We consider each of these problems in turn, beginning with the variable profile of scheduled flows.

Let us assume that, though variable, the volume of scheduled flows in each settlement period is known. We define the relevant volume for each settlement period, $i$, as $v_i$. If we define the relevant price spread in each settlement period similarly as $s_i$ and, for the sake of simplicity, assume that the price spread does not reverse, we get the following equation for congestion income.

$$Congestion\ income = v_1 \times s_1 + v_2 \times s_2 \ \ldots$$

The corresponding equation for EPAD liabilities is as shown below, noting that the relevant EPAD volume is constant.

$$EPAD\ liabilities = \bar{v} \times s_1 + \bar{v} \times s_2 \ \ldots$$

Solving for the EPAD volume by setting EPAD liabilities and congestion incomes to equal one another yields the following.

$$\bar{v} \ = \ \frac{v_1 \times s_1 + v_2 \times s_2 \ \ldots}{s_1 + \ s_2 \ \ldots}$$

In words, when setting an equivalent EPAD volume, one needs to take a weighted average of the expected scheduled exchange volumes. These weightings should be based on the size of the price spread if one wants expected congestion incomes to equal expected EPAD liabilities.

If one alternatively wanted to minimise uncertainty in the net revenue position and had a view over which periods or schedule flow levels were likely to give rise to the greatest uncertainty in the price spread, one might alternatively want to set the EPAD volume limit based on weights that emphasised those periods with the greatest price uncertainty.

Returning to the uncertainty over the future volume of scheduled flows, the auction limits will need to consider some estimate of these volumes. Here, we propose developing some conservative scenarios that account for future cross-zonal capacity development as well as historic restrictions in observed flows, for example, due to network outages.

**Avoiding positions that are poor value**

We also ideally want to provide Statnett and tariff-payers with some defence against entering into positions that are objectively bad value. This is analogous to TSOs' desire to want to avoid selling LTTRs under their value. As the difficulty in preventing the undervaluation of LTTRs has shown, this ambition is hard to realise.

The most fundamental problem is that limits designed to protect against poor value imply that Statnett forms, explicitly or otherwise, a view of the fair value of contracts. In addition to the practical difficulty of estimating a value, doing so raises some difficult questions about Statnett’s appropriate role in the market.

To avoid concerns about Statnett inadvertently manipulating the market, an indicator of fair value would presumably need to be calculated deterministically from some independent market indicator. This indicator would need to provide both a sufficiently accurate indication of the market's price expectations to be useful and be free from potential manipulation.

The presence of exchange-listed prices for EPADs provides one possible basis for an indicator of fair value. However, with low liquidity and the settlement price occasionally informed by input from third parties, it is not clear whether the exchange prices meet these requirements.

That said, preventing the auction price from clearing too far from the exchange price, if legal, might afford Statnett some protection against entering into contracts that were objectively a poor deal for tariff payers.

An alternative approach would be to try and impose volume limits designed to prevent oversupply, thereby preventing prices from reaching levels that represent poor value-for-money for tariff payers. This begs the question of how large a volume is needed before the market is oversupplied.

The effect of volume limits on price will depend on the shape of the bid and offer curves in the auction. Figure 12 below illustrates two different potential outcomes. In both cases, we imagine that volume limits are increased (shifted to the right) from an initial position at which fundamental demand is met to a position at which the market is oversupplied. The vertical distance between the buy and sell curves shows the implied spread in clearing prices at the auction and therefore the spread that Statnett will receive in the form of auction revenues.

*Figure 12: The potential consequences of oversupplying the EPAD market*


In the leftmost example, we assume that the financial value of the underlying EPAD contracts is broadly recognised. This is reflected in the shape of the respective bid and offer curves. Even if Statnett oversupplies the market, competition to secure these valuable contracts prevents the price of the EPADs from falling below their fair value.

In the rightmost example, bid and offer prices are sensitive to the volumes offered and, in this specific case, Statnett offers volumes that are so large that the bid and offer curves cross, resulting in the EPAD prices in both zones converging. This convergence implies that Statnett earns no revenue at the auction and shows that convergence results in a floor for how poorly Statnett can do. Nevertheless, in this example, if the convergence relates to EPAD in zones that are likely to have a price spread, Statnett will have received zero revenue in exchange for having to pay out the price spread between these zones.

Again, these examples underline the importance of trying to encourage extensive participation in the auction so that the bid and offer curves are as flat and deep as possible.

Various approaches could be used to define appropriate limits. We consider three in particular:

1. Bidding zone asymmetry,
2. Net scheduled exchanges, and
3. Analysis of auction bids and results.

One of the fundamental arguments for requiring TSO intervention in the market is as a means of facilitating hedging among generation and consumption where these are located in different zones. Put differently, Statnett's role can be seen as relieving asymmetry in the demand for and supply of EPADs across bidding zone borders where there is a systematic imbalance between supply and demand. Although theoretically tidy, we cannot easily observe the demand for and supply of EPADs, at least not in advance of the auctions themselves. Consequently, it would be hard to calculate limits on this basis.

A more workable solution, as suggested by at least one paper on the design of LTTR auctions, implies imposing volume limits based on the net scheduled exchange of energy between zones. These exchanges represent the size of the energy imbalance between the zones. If we assumed that generators and consumers wanted to hedge all of their generation or consumption using EPADS, this net exchange would equal the mismatch between the demand and supply of EPADs in the relevant zones. The problem is that, although the energy imbalance is relatively easy to estimate, it is not necessarily a good indicator of the imbalance in the demand and supply of EPADs. Put simply, generators and consumers can have differing preferences for the extent to which they wish to hedge using EPADs. These differences will imply that the energy imbalance is not necessarily a good proxy for the imbalance in the forward market.

The best view of the supply and demand for EPADS in each zone, as well as participants' assessments of fair value, is likely to be provided by the bid and offer information gathered through the auction process itself. Plateaus in the relevant curves, as illustrated in Figure 12 for example, might provide useful information on price expectations. Similarly, in the longer term, an analysis of clearing prices against ex-post outturns may help to assess value-for-money over time.

Overall, and assuming it can be accommodated by the legal framework, a prudent approach may be to begin with conservative volume limits and then to expand these volumes gradually while monitoring the impact on prices and expected value for money. Notwithstanding, the auction should in all cases be bound by risk-limiting position limits discussed in the previous section.

**Statnett SF**
Nydalen allé 33, Oslo
PB 4904 Nydalen, 0423 Oslo
Telefon: 23 90 30 00
Fax: 23 90 30 01
E-post: firmapost@statnett.no
Nettside: www.statnett.no

Statnett