ELECTRON

BiTraDER Live Trial Outcomes and Proposed Platform Enhancements

WP11 Trial Reporting

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Abbreviations

ANM - Active Network Management

BAU - Business-As-Usual

BESS - Battery Energy Storage System

CHP - Combined Heat and Power

CLA - Constraint Look-Ahead

DNO – Distribution Network Operator

MOL - Merit Order List

PII - Personally Identifiable Information

Introduction

This report presents Electron's analysis of the BiTraDER Live Trials, focusing on market performance, participant engagement, and learnings derived from the platform's operation. The following sections detail how participants interfaced with the platform, highlighting how it successfully enabled market participation. Furthermore, this deliverable identifies key areas for development requested by users, including enhanced market transparency and half-hourly trading granularity, which would be essential for a transition to business-as-usual (BAU) operations. By evaluating these trial outcomes, the report provides a comprehensive overview of the platform's current capabilities and the strategic modifications required to support a scalable, liquid peer-to-peer trading market.

1 Summary of Live Trial Results

Deliverable 10.3 outlines the format of the BiTraDER Live Trials and the feedback received from project participants.

The Live Trials were conducted with the involvement of five project participants, who collectively operated eight grid-scale assets. The specific technology classifications for these assets are illustrated in Figure 1.

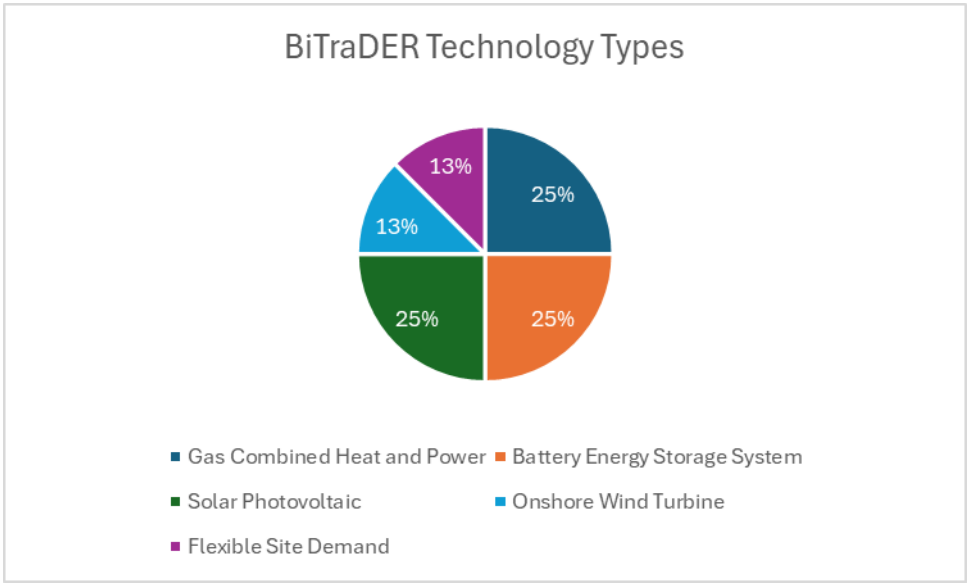

Figure 1: Asset technology types participating in the BiTraDER Live Trials. Source: Electron.

Throughout the two-week trial period, 12 constraints were identified by the BiTraDER platform and presented to participants for bidding. From these identified constraints, successful matched trades were achieved in three instances.

Predicted Constraint Size (MW)	Predicted Constraint Length (hrs)	Actual Constraint Size (MW)	Actual Constraint Length (hrs)	Seller Asset Utilisation (MW)	Delivery as % of Constraint Size
16.5 Import	1	8.25 Import	1	10	121%
20.3 Import	3	20.3 Import	3	12.6	62%
20.3 Import	3	20.3 Import	4	3.9	19%

A convergence of bid and offer prices was observed over the course of the trials, as shown in Figure 2. This trend is attributed to participants refining their pricing strategies in response to market activity and other participant's submissions. Consequently, a higher volume of matching was recorded in Week 2 relative to Week 1. This increase was further facilitated by strategic adjustments made to the market bidding window timings.

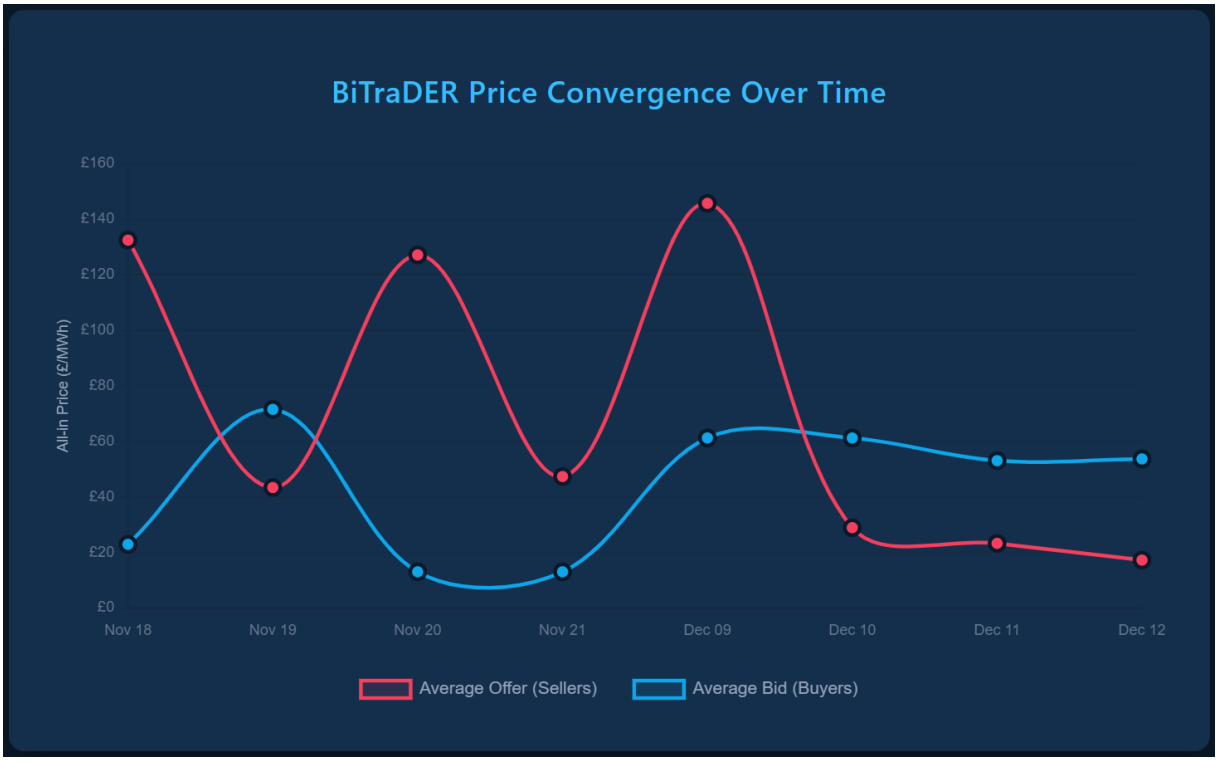

Figure 2: Average submitted all-in price for bids and offers over the trial days. Source: Electron.

Many BiTraDER sellers decided to opt out of partial volume trading, as shown in Figure 3.

Although this feature was originally implemented to accommodate assets with binary operational profiles, such as Gas Combined Heat and Power (CHP), it was adopted across other asset classes. Participants indicated that the novelty of the market created

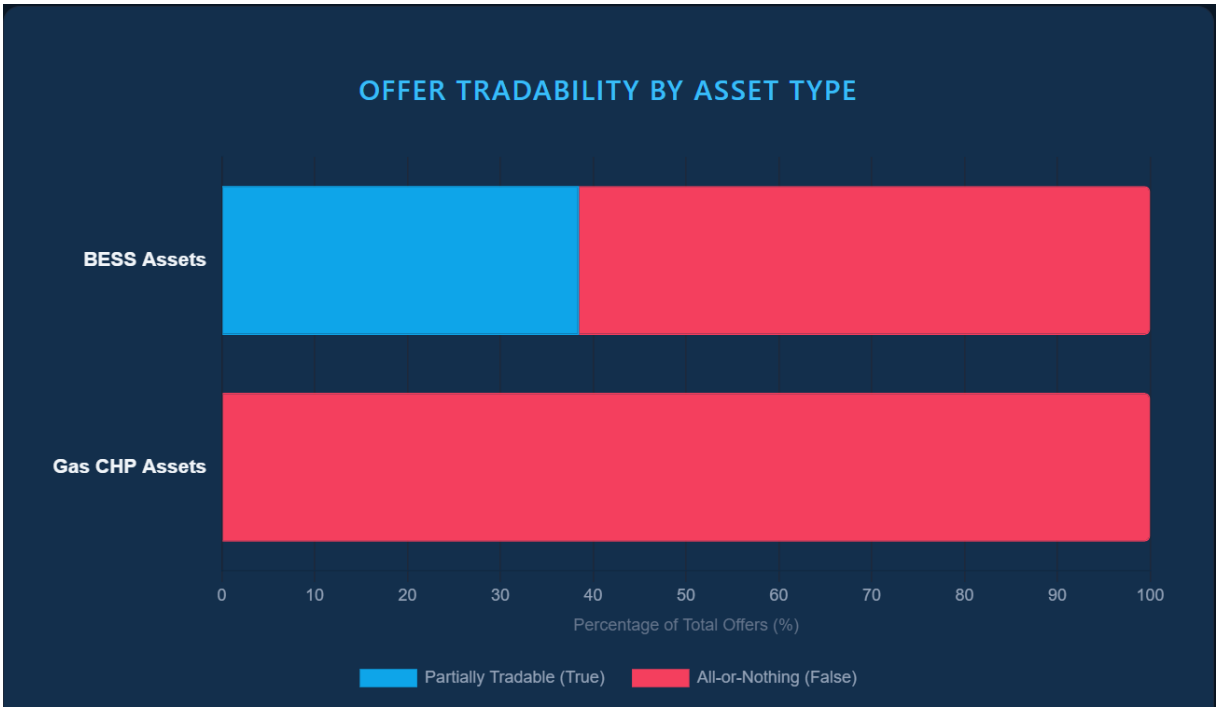

Figure 3: Percentage of seller assets by technology type allowing partial offer volume (MW) matching. Source: Electron.

challenges in calculating opportunity costs; requiring the full offer volume to be confirmed served as a risk management tool to mitigate this uncertainty. As a result, this feature was utilised by Battery Energy Storage System (BESS) assets for 62% of offers.

Significant variation was noted in the cleared All-In price, which was primarily influenced by the buyer's specific commercial model and the timing of the constraint.

Figure 4: Distribution of cleared availability prices (left) and all-in prices (right). Source: Electron.

In alignment with the intended market design, cleared availability prices remained significantly lower than cleared utilisation prices. This confirms that sellers were successfully incentivised to minimise availability pricing to increase the probability of a successful match.

2 BiTraDER Platform Successful Features

As outlined in Deliverable 10.3, participants remained engaged in the market trials despite challenges relating to the novel market mechanism and interaction with a new market platform design.

Participation in the market via the platform was achieved by all participants with minimal user support. Most enquiries from customers related to the market design and constraint parameters rather than the functionality of the platform itself. Participants were able to log in and view constraint information successfully. Furthermore, no enquiries or feedback were received by the support team regarding the interpretation of constraint and merit order data within the Trading Opportunities table.

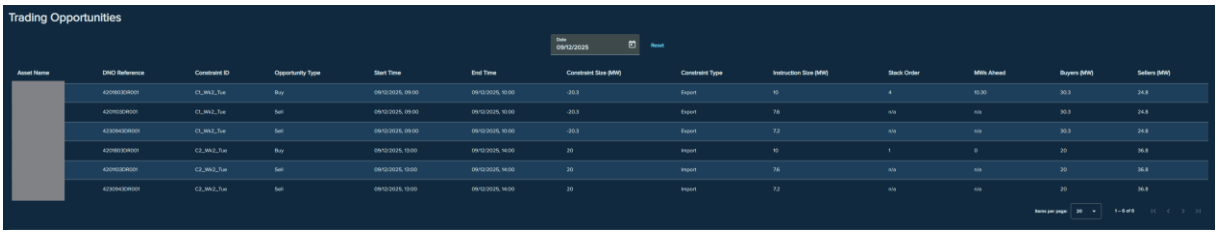

Figure 3: Trading Opportunities table for a BiTraDER participant (PII hidden). Source: Electron.

The information provided enabled participants to submit bids and offers with ease. Even in instances where participants managed multiple assets across several constraints, participation was maintained without requiring support from Electron. This was facilitated by the simplified Bid and Offer Submission form, which restricted users to valid combinations of assets, constraints, roles, activities, and capacity.

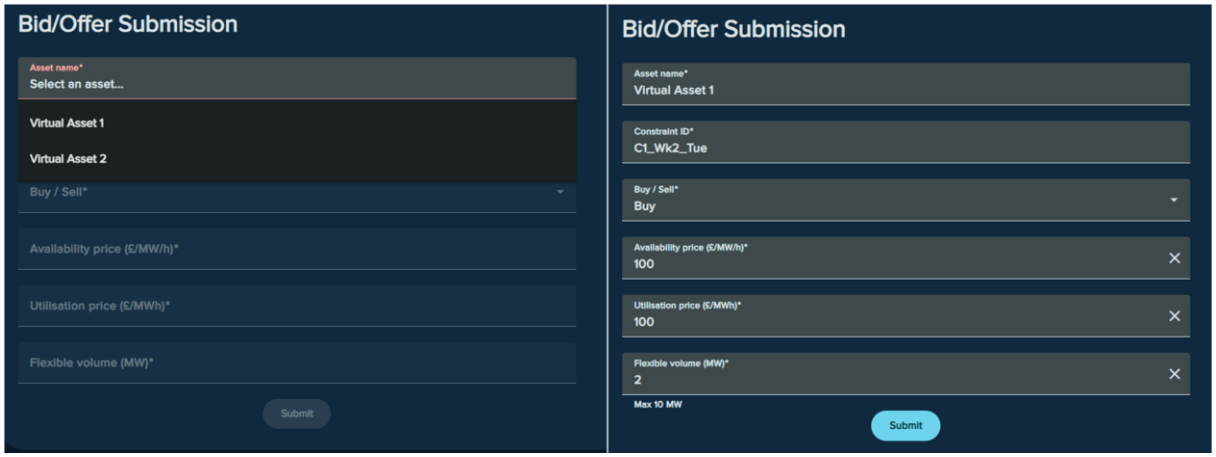

Figure 4: Bid/Offer Submission form in the BiTraDER platform. Drop down showing asset choices (left), filled out form (right). Source: Electron.

Successful submission of bids and offers was clearly visible to participants through the Submissions table. Consequently, no assistance was required for participants to verify their successful market participation.

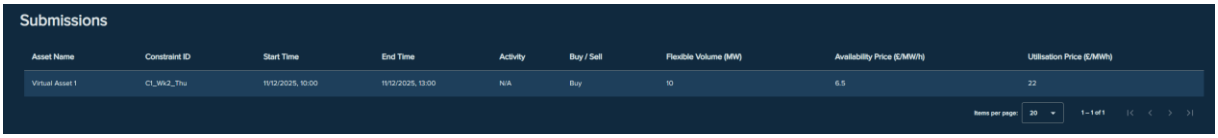

Figure 5: Submissions table in the BiTraDER platform. Source: Electron.

Participants were also able to use the Completed Trade tabs to successfully view their matched trades. However, certain minor improvements were requested for this page, which are detailed in Section 3.8.

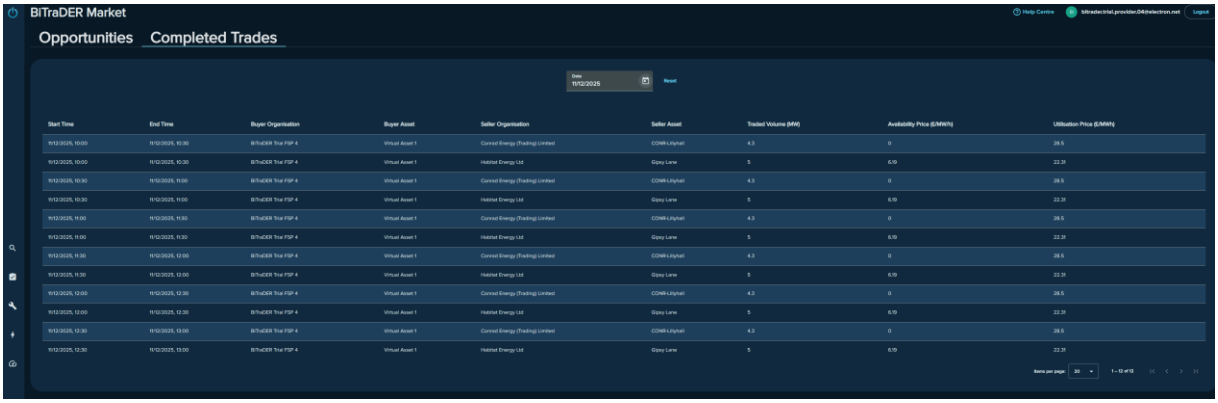

Figure 6: The Completed Trades tab in the BiTraDER platform. Source: Electron.

3 BiTraDER Platform Proposed Enhancements

The BiTraDER team received valuable feedback from project participants regarding potential modifications to the BiTraDER platform. These enhancements would be essential to supporting market participation in a BAU environment.

3.1 View Anonymised Bid and Offer Information

As outlined in Deliverable 10.3, BiTraDER participants requested greater market transparency to support bidding decisions. As shown in Figure 2, participant bid and offer prices converged over time due to price information received via email from the BiTraDER team. These price ranges were sent considering guide prices used in other markets to support price discovery by participants. However, due to limited market liquidity and the variation in participant commercial structures, it remained difficult for participants to successfully match their prices. This was compounded by the need for two different prices to overlap: utilisation and availability prices.

One market participant stated: *"We believe that due to limited liquidity and different value/cost drivers for each participant, this market should be fully transparent similar to the EPEX continuous market or the balancing mechanism to allow for better pricing*

matching." In the final BiTraDER workshop, other market participants concurred with this statement.

In the BiTraDER platform, a new 'Order Book' page could be created which displays anonymised bid and offer data made by other BiTraDER participants. An example of this from the EPEX Spot continuous intraday market is shown in Figure 9.

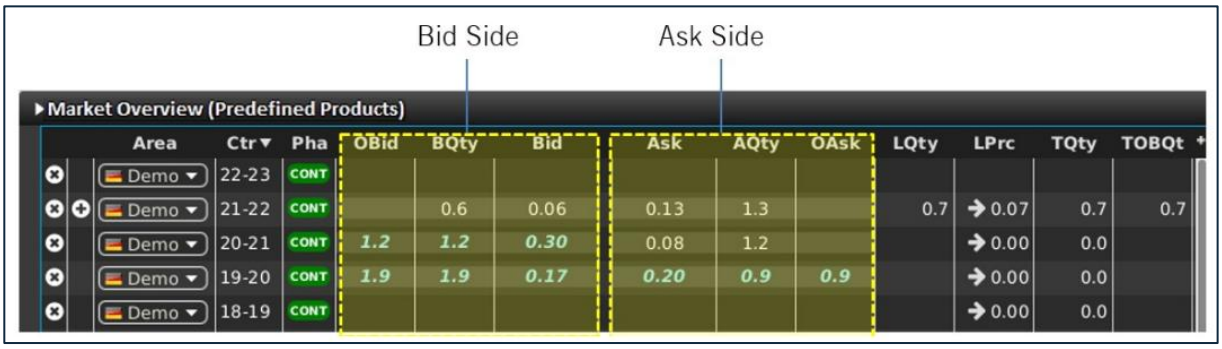

Figure 7: The Order Book from the M7 Trading System, used in the EPEX Spot continuous intraday market. Source: Deutsche Börse Group.

The M7 Trading System used for this market orders 'bids' and 'asks' by execution priority. A similar system could be used in the BiTraDER market, where bids and offers are ordered by price ahead of trade matching.

3.2 Bid/Offer Resubmission

Many participants requested to be able to resubmit bids/offers, due to mistakes or a need to adjust pricing or volume later in the trading window based on new information. This would be a minor change to the BiTraDER platform that would provide high value for users, supporting users to adjust their pricing based on other participants' pricing signals once these were added to the platform. One participant stated: *"…from a process perspective, it is easier to upload pricing earlier in the day and then have the option to change it after the day ahead half hourly auction."*

3.3 Enable Half-Hourly Trading

As outlined in Deliverable 10.3, solar and battery asset operators requested half-hourly market clearing rather than for the entire constraint period.

The BiTraDER platform already creates re-ordered Merit Order Lists (MOLs) in half-hour sections, meaning it would be possible to trade at this granularity.

Whilst this update is possible, in BAU it would be important to find a balance between trading flexibility and ease of user experience. Even with trading simplified by bid/offers being against a given constraint, the BiTraDER platform presents users with a significant volume of information which must be parsed to participate. Users would also need to be able to submit a higher volume of bids/offers.

Example features from the ElectronConnect platform could support user experience where a higher number of submissions is required. In ElectronConnect, users can submit offers in bulk via CSV, with the ability to create a prefilled offer template based on valid asset and market combinations. A similar feature could be added to the BiTraDER platform, prefilling the template based on asset roles for specific constraints.

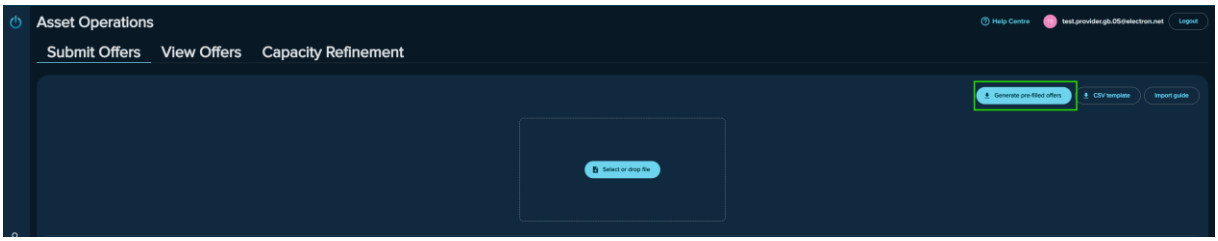

Figure 8: The Submit Offers tab in the ElectronConnect Flexibility Market Platform, with the 'Generate pre-filled offers' button highlighted. Source: Electron.

It is noted that Constraint Look-Ahead (CLA) data is provided in hourly granularity, meaning the constraint data may not be accurate when half-hourly trades are made. This is a wider issue in the BiTraDER market, as constraints are not currently updated over time as they change closer to delivery.

More granular trading would provide an opportunity for constraint information to change with increased granularity, as participants could adjust bids and offers based on the variable constraint information. For this scenario, the Trading Opportunities table would likely need to be updated to support a higher number of data points. A new tab could be created which shows constraint size over time in a graphical format, as seen in the wireframe in Figure 11. This set-up could also allow participants to view constraint information as the Active Network Management (ANM) system updates between bidding and delivery.

3.4 Enable Trade Verification

Ahead of the Live Trials, it was agreed that the platform would not be required to update constraint information over time and verify all trades agreed day-ahead are still valid. This is because BiTraDER live trial constraints were simulated. However, if the BiTraDER market were to run in BAU, this would be required to ensure actions taken by participants are effective in mitigating a constraint and do not cause unexpected issues on the network.

To facilitate trade verification, the BiTraDER platform would need to:

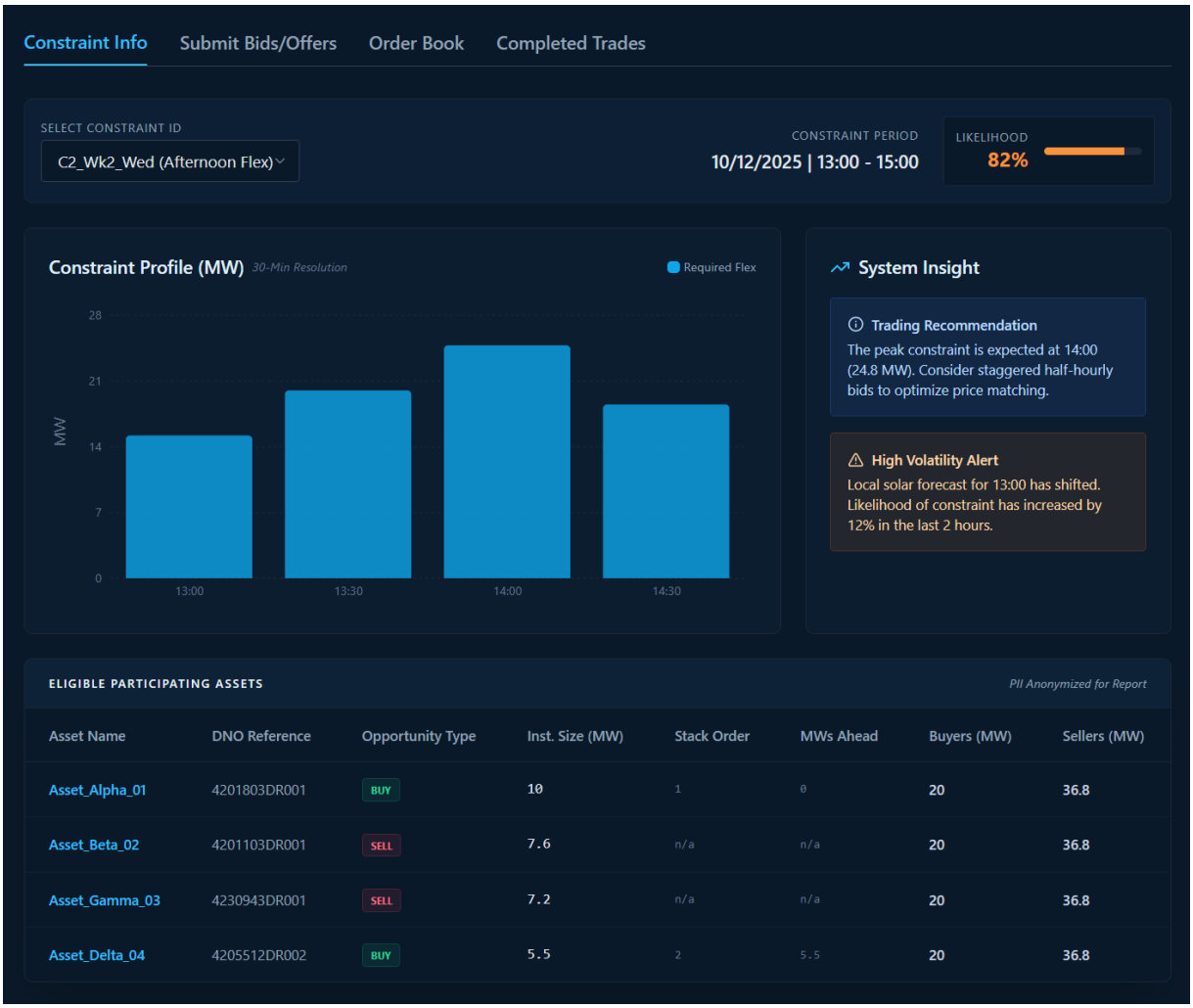

Figure 9: Wireframe demonstrating how variable constraint information could be shown in the BiTraDER platform. Source: Electron.

- Automatically ingest new CLA and MOL data throughout the trading and delivery windows.
- Provide dynamic updates to constraint information within the platform.
- Review established trades and cancel those no longer considered valid.
- Update post-trade MOLs and communicate cancellations to affected participants.

The introduction of trade verification would represent a significant change to both business logic and platform design, requiring substantial development and testing effort ahead of market transition to BAU.

3.5 Trading Opportunities and Submission Considers Asset Operational Data

Participants identified several operational factors that influence market participation, as documented in Deliverable 10.3. For a BAU rollout, the platform should incorporate specific asset parameters during the submission and matching processes.

For example, intermittent generation assets experience capacity fluctuations due to meteorological conditions. During the trials, one participant submitted a bid of 1MW, despite an asset size of 4MW in the platform, because *"that was their asset would actually be generating during the constraint period."* Currently, the merit order lists received by the platform do not adjust for these variations. The resolution of this issue is contingent upon the ANM system's ability to provide lists that reflect actual asset capability.

While the platform records maximum asset run-time, this is not currently factored into trade matching. BESS operators emphasised that the incorporation of run-time and state-of-charge considerations is critical to increasing participation from storage assets.

3.6 Automatic Seller Dispatch via ANM

The existing dispatching functionality requires Market Operator users to manually trigger asset dispatch via the user interface. In a BAU context, this reliance on manual intervention presents risks of human error and operational overhead for the Distribution Network Operator (DNO). Updating the platform to enable dispatch triggered directly by the DNO's ANM system would enhance operational efficiency. This transition would require sellers to be configured for API-based dispatch, the barriers to which are discussed in Section 4.2.

3.7 BiTraDER Settlement Calculations

Due to the short-term nature of the live trials, settlement calculations were carried out manually. In a BAU scenario, Electron would utilise existing ElectronConnect settlement functionality to enable automatic settlement calculations and report generation for BiTraDER.

3.8 Other Usability Improvements

Additional usability enhancements were requested by users to further refine the platform experience. It was noted that the date filters for completed trades currently default to the following day of delivery, whereas participants typically require access to results immediately following the close of the trading day. This automatic filtering has been identified as a source of confusion. Furthermore, the current half-hourly display

of results on this page is inconsistent with the constraint-based trading model. Consequently, a comprehensive update to this interface would be required prior to any transition to BAU operations.

Further feedback indicated a requirement for automated trading capabilities to support participants operating with fixed pricing strategies. Additionally, the inclusion of a notification system was proposed to alert participants when bidding becomes available on a specific day. Such a feature would be of particular value in a BAU context, where the frequency and location of constraints are expected to vary significantly.

4 Other BAU considerations

4.1 Market Liquidity

It should be noted that simulated constraints were utilised for the trials, as real constraints do not currently occur frequently enough. During the recruitment phase, it became clear that liquidity within individual Constraint Management Zones (CMZs) was insufficient to support local constraint management through the BiTraDER peer-to-peer model. To address this and facilitate trading, constraints were simulated across the wider license area.

Market liquidity may be improved by exploring the participation of domestic aggregators as sellers. This requirement was not addressed during the trials due to limitations within the current ANM system.

4.2 Real-Time Dispatch

Whilst the platform provided real-time dispatch functionality, this was not used during the trials. This was due to either a lack of technical capacity to integrate with the webhook or a lack of commercial justification for a short trial period. While a 1.5-hour notice period was sufficient for these trials, in a BAU scenario, such delays could result in actions that fail to mitigate constraints if network conditions or topology change in the interim.

Electron's experience in flexibility markets suggests that while some technically advanced participants can support API-based dispatch, others lack the necessary infrastructure. The BiTraDER market must offer clear, guaranteed value to justify the upfront integration costs for these participants.

Consequently, a strict requirement for real-time dispatch may further reduce market liquidity. Further analysis is needed to determine if alternative dispatch methods would be acceptable to reduce barriers to entry and encourage participation.