BiTraDER Trading Platform Design and Data Model Report

WP5.2 Trading Platform Design and WP7.1 Data Model

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Abbreviations

ANM – Active Network Management

API - Application Programming Interface

BAU – Business-as-usual

CLA – Constraint Look-Ahead

DNO – Distribution Network Operator

GUI – Graphical User Interface

MOL – Merit Order List

SCADA – Supervisory Control and Data Acquisition

1 Introduction

This document is a summary report of the BiTraDER trading platform design.

This report covers all components of the BiTraDER trading platform, including the end-to-end BiTraDER market workflow, the full list of functional requirements, user journeys, as well as the logical data model and the data flows.

2 ElectronConnect Product Overview

ElectronConnect is a flexibility market platform which enables and coordinates localised energy markets and distributed energy resources to increase the utilisation of renewable power and network capacity, guaranteeing the best available price for all parties and every transaction.

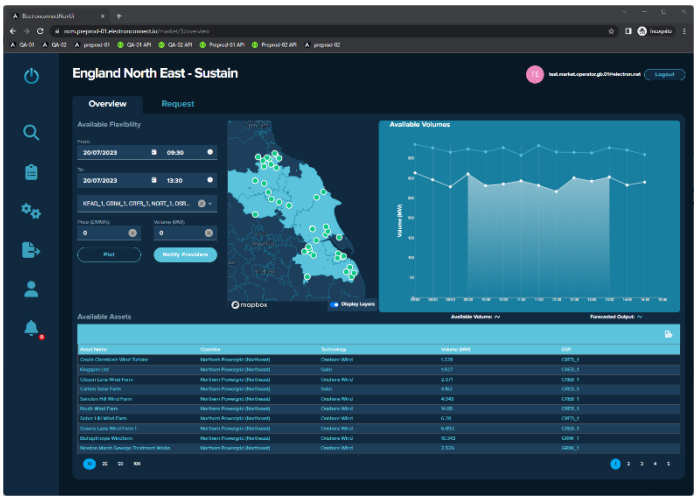

Figure 1. ElectronConnect Flexibility Market Platform. Source: Electron.

ElectronConnect supports a range of trading arrangements (e.g. payment types, matching and clearing configurations) and market products. In addition, multiple market configurations can run on the platform simultaneously, e.g. with different gate closures, payment types, qualification requirements etc.

The platform supports the end-to-end flexibility trading lifecycle, including:

- Provider and resource registration and user management processes.
- Commercial and technical pre-qualification processes.
- Flexibility requirements sign-posting process.
- Bid/ offer submissions process and trade matching.
- Rules-based market coordination.
- Dispatch instructions.
- Performance measurement and verification process.
- Invoicing and settlement process.
- Data analytics and reporting.

ElectronConnect benefits:

Configurability. ElectronConnect supports many market configurations and trading use cases, e.g. peak shaving, load shifting, curtailment avoidance, and peer-to-peer transactions. Market operators can launch new markets quickly using preconfigured templates and run these simultaneously alongside other markets. The ability to define relationships between markets on the ElectronConnect platform enables value stacking and facilitation of primacy rules.

Scalability. ElectronConnect is built with a high degree of automation and is powered by the underlying technology capable of handling real-time flexibility trading. This scalability has been proven in multiple live deployments. ElectronConnect is secure and follows best cybersecurity practices. Electron is ISO27001:2013 certified.

Inclusivity. ElectronConnect enables an ecosystem of aggregators and service providers of many types and sizes, providing access multiple market opportunities. The platform supports web application-based and flat file upload for providers who are operating at lower scale, as well as fully documented APIs for tech-enabled providers to interact with all functions programmatically.

Ease of Use. ElectronConnect is easy to use and built following the principles of Customer-Centric Design. It improves user experiences for both market operators and flexibility service providers, be it through the ElectronConnect Web App or the ElectronConnect API. ElectronConnect's user experience has been designed engaging with >30 flexibility service providers and market operators to understand and solve for key points of friction in the flexibility journey today. This feedback informed some key design choices to maximise flexibility service provider satisfaction.

3 BiTraDER Trading Platform Design

3.1 BiTraDER Market Process Summary

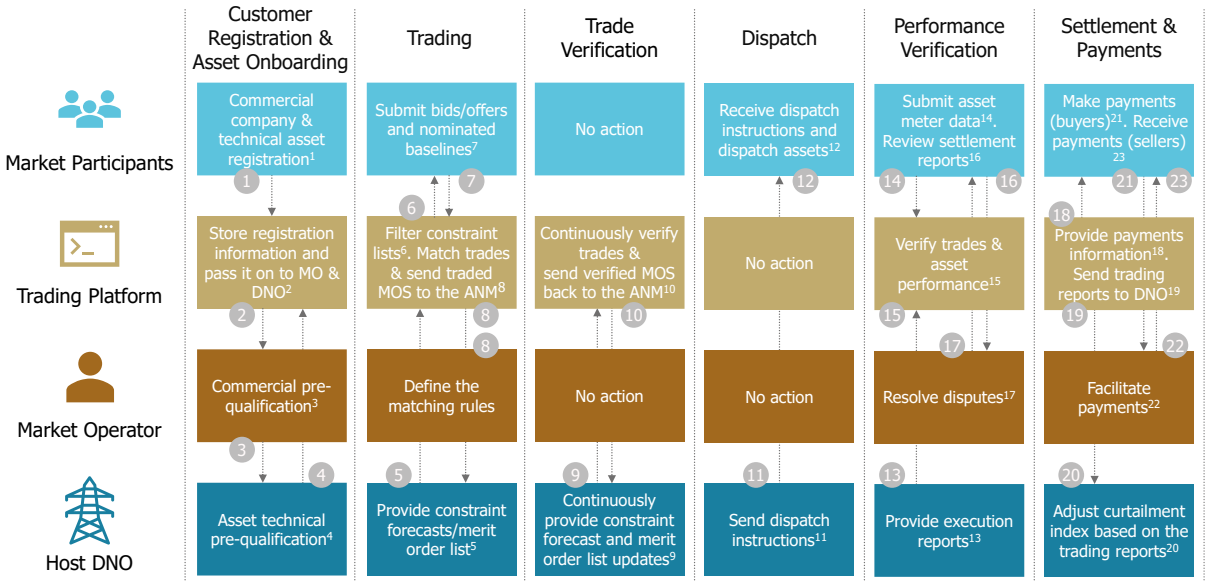

Figure 2. BiTraDER End-to-end Market Process. Source: Electron.

The end-to-end BiTraDER market process consists of six steps:

1. Customer registration and asset onboarding is the first step of the process. In this step, market participants will go through the commercial and technical pre-qualification process to qualify for the market.
2. Trading is the second step of the market process. In this step, market participants will make bid/ offer submissions based on the provided constraint forecast information and the trading platform will match trades.
3. Trade verification is the third step of the market process. In this step, the trading platform and the host DNO's ANM system will verify that trades are valid and can be dispatched on the day of the delivery.
4. Dispatch instructions is the fourth step of the market process. In this step, host DNO's ANM system (or another third-party system) will send dispatch instructions to market participants.
5. Performance verification is the fifth step of the market process. In this step, participants will submit asset meter readings to the trading platform and the trading platform will measure and verify trade performance. If disputes arise, they will be handled by the market operator.

6. The settlement and payments process is the last step of the market process. In this step, the trading platform will provide payments information and market participants will make/ receive payments for the service provided.

3.2 Customer Registration and Asset Onboarding

The market process starts with participant registration, and commercial and technical pre-qualification. To join the market, participants will have to provide their company details, fill out the commercial pre-qualification questionnaire, and sign several legal documents, including the Connection Agreement Addendum (which will enable non-curtailable resources to take part in the market and get curtailed for a payment) as well as the BiTraDER Terms of Use, and the Trading Platform's Terms and Conditions.

After participants complete and submit their applications, applications will be passed on to the market operator for commercial pre-qualification checks and approval.

Once approved, participants will be granted access to the trading platform and will be able to register their resources. Host DNO will review resource details and will either approve or reject resources from the market. Qualified resources will be able to take part in trading.

As agreed by the project team, commercial and technical pre-qualification questionnaires in BiTraDER will follow standardised pre-qualification process designed by the Energy Network Association's Open Networks programme. Standard pre-qualification questionnaires are presented in Appendix A. Commercial Pre-qualification Questionnaire and Appendix B. Technical Pre-qualification Questionnaire

3.3 Trading

The trading process starts with the host DNO's ANM system identifying upcoming constraints, determining the master merit order stack, and sending this information to the trading platform. Using this information, the trading platform will identify resources that are predicted to get curtailed (buyers of flexibility) and resources that can replace in them in the merit order stack (sellers of flexibility). Buyers and sellers will then be notified by the trading platform.

As part of the Constraint Look-Ahead (CLAs) and master Merit Order List (MOL) filtering process, the trading platform will:

1. Identify all predicted constraints, their sizes, duration, start and end times.
2. Identify all resources, both buyers and sellers, in the CLA and whether they are registered on the trading platform.

3. Identify resources from the CLA in the MOL and filter out (exclude) resources which cannot trade in BiTraDER for various reasons as well as some contracts of resources that can trade, i.e. if a resource has a Flexible Services contract with the Host DNO that contract will not be able to trade in BiTraDER but other contracts of the same resource can.
4. Calculate buyers' maximum instruction sizes (sellers' maximum instruction sizes will be equal to the installed capacity values market participants registered on the platform as part of the technical pre-qualification process.
5. Produce constraint-specific merit order lists which will be used to notify participants about the upcoming constraints and used later for trade matching.

After receiving the notification from the market, participants will have to submit their bids/ offers before the submission deadline. To make a submission, participants will be required to provide information such as bid or offer start and end times, traded volumes, and prices (availability and utilisation or utilisation-only, depending on the payment structure selected). The format of bids and offers will differ slightly.

Following the bid/ offer submissions deadline, the trading platform will match trades. More information about BiTraDER's matching algorithm options is available in the BiTraDER Trading Rules report.

After matching the trades, the trading platform will re-order the MOL and send the 'traded' MOL back to Host DNO. More information on the agreed MOL re-ordering process is available in the BiTraDER Trading Rules report.

When re-ordering the MOL, the trading platform will follow different processes depending on whether it is re-ordering buyers or sellers and whether participants are trading for full or partial capacity:

1. For buyers trading full capacity, the trading platform will move buyers down the MOL to their new position, no other actions need to be taken.
2. For buyers trading partial capacity, the platform will split buyers' contract into two, and move down the MOL only the contract that traded in BiTraDER. This process will include assigning a new Contract ID to the newly created contract and updating instructed volumes of all the buyer's contracts in the MOL.
3. For buyers trading with multiple sellers, the platform will add new entries in the MOL for every trade.
4. For sellers trading either full or partial capacity, the platform will move sellers up the MOL to their new position, no other actions need to be taken.

5. For sellers trading with multiple buyers, the platform will add new entries in the MOL for every trade.

3.4 Trade Verification

Trade verification process starts with the host DNO's ANM system sending updated CLAs to the trading platform before the start of every settlement period. The platform will use this information to verify that all trades, agreed the day before, are still valid on the day and can be dispatched.

This step helps to ensure that sellers can provide a useful service to buyers if/ when network conditions change. If after the trade verification trade counterparties are no longer connected to the same part of the network, their trade will get cancelled as they can no longer provide a useful service to each other. Once the trades are verified, the trading platform will re-order the MOL, notify participants in case of trade cancellations and will send the re-ordered MOL back to host DNO.

Trade verification key principles

The project team has agreed key definitions of a 'valid' trade, these are:

1. The trade will be considered valid if both counterparties of the trade remain on the same part of the network following constraints forecast update, i.e. if both the buyer and the seller appear in the updated CLA for the same constraint they originally traded for.
2. If the first condition is fulfilled, the second condition that needs to be fulfilled is related to time windows. For the trade to be valid, the time window of the trade needs to match the time window of buyer's curtailment in the updated CLA (or fall within the buyer's curtailment window).

If both conditions are fulfilled, the trade is considered as valid, and no further action is required, the seller can be dispatched.

After verifying trades, the trading platform will have to update the MOL to prevent the ANM system from dispatching resources after their trades got cancelled.

After cancelling the trade, the trading platform will have to place the counterparties of the cancelled trade back to their original MOL positions (or the positions they would have ended up at if they had not traded). The logic will differ slightly for buyers and sellers:

- For buyers, they should be placed back to their original MOL position and then pushed down the list by the number of sellers that are now ahead of them in the MOL.

- For sellers, they should be removed from their traded position and placed back into the non-curtailable section of the master MOL.

This description is an early design of the trade verification process. This functionality will not be built into the trading platform for the simulation trials of the project but the learnings from the trials may be used to implement this process for the live network trials (if the project passes the stage gate).

Other trade verification process considerations

- It is possible for the buyer and the seller to appear under a new constraint in the updated CLA. In such a case, the trading platform will cancel their trade, especially if the original constraint they traded for is no longer predicted by the ANM system.
- Another possible scenario is a nested constraint scenario in which the ANM system predicts multiple nested constraints to happen, the buyer and the seller agrees to trade under one of the constraints, but following the CLA update, the constraint they traded for is no longer predicted to happen. As of this right now, the project team has not yet decided on how to treat cases like that. Option 1 is to treat the trade as valid if the seller can still provide a useful service to the buyer. Option 2 is to cancel the trade which would align with the definition of a 'valid' trade discussed above.
- If both trade counterparties appear in the updated CLA for the same constraint but the constraint's time window has shifted, the trading platform will have to compare the time window of the trade with the time window of buyer's curtailment in the updated CLA. For the trade to be valid, the time window of the trade needs to fall within the time window of buyer's curtailment. If that is not the case, the trade should be cancelled for settlement periods where the time windows (the buyer's curtailment window and the trade's window) do not overlap. The trade should still be considered valid for time windows where the two overlap. This may result in some trades getting shorter and some cancelled altogether.
- There are other parameters that can be considered as part of the trade verification process, for example the predicted constraint size. If the constraint size is significantly lower in the updated CLA compared to the original CLA, it may result in the buyer no longer being exposed to the risk of curtailment. In such a case, the buyer will no longer benefit from trading. For now, this consideration is out of the project's scope, but the project team may decide to include it in the BiTraDER design before the live trials, based on the learnings from the simulation trials. Other parameters will be considered too.

3.5 Dispatch

Dispatch process has been agreed to be out of scope for the BiTraDER's trading platform. Following the trade verification process, host DNO's ANM system will issue dispatch instructions to participants. Participants with on-site Supervisory Control and Data Acquisition system (SCADA) will receive dispatch instructions directly from the ANM system. For participants who do not have SCADA on-site, dispatch instructions will be issued via an API.

3.6 Performance Verification

After trades are completed, the trading platform will measure and verify trade performance. To do that, the trading platform will use execution reports produced by the host DNO's ANM system which list dispatch instructions issued by the ANM system during the trading window, these include information such as resource IDs, contract IDs, instruction times, direction, and sizes. In addition to that, the trading platform will collect meter readings and asset monitoring data from market participants, participants should upload this data to the trading platform as soon as it becomes available (ideally in 5 working days or less). Using this information, the platform will measure the service provided, by comparing asset meter readings against the baseline to calculate the volume delivered during the trade. More information on the BiTraDER's baselining methodology is available in the BiTraDER Trading Rules report.

Participants with both half-hourly metering data and minute-by-minute monitoring data will be allowed to participate in BiTraDER:

- For resources with minute-by-minute monitoring data, their minute-by-minute kW response will be recalculated into minute-by-minute MWh values and then used to measure performance.
- For resources with half-hourly meters, their half-hourly meter readings will be disaggregated into minute-by-minute MWh values, assuming a stable (flat) rate of energy usage/ production over the half-hour.

When measuring the volume delivered during the trade, the trading platform will be expecting resource's meter readings/ monitoring data to:

- Show an increase of MWh output (compared to the baseline) for generation turn up/ demand turn up activities.
- Show a decrease of MWh output (compared to the baseline) for generation turn down/ demand turn down activities.

3.7 Settlement and Payments

After measuring trade performance, the trading platform will issue settlement reports detailing provided service volumes and payments due. Settlement reports will be automatically accepted after 5 working days unless contested by either the buyer or the seller. If either the buyer or the seller contests the report, a dispute will be raised, and it will be resolved by the market operator. After resolving the dispute, the market operator will update/ confirm the volume delivered during the trade and will record the trade as completed.

Settlement will be based on the *Service Fulfilment (%)* the seller achieved during the trade. Payments will be proportional to the achieved *Service Fulfilment (%)*, but will depend on the payment type:

- Utilisation payments will be based on the achieved minute-by-minute *Service Fulfilment (%).*
- Availability payments will be based on the achieved *Service Fulfilment (%)* but if a seller is not instructed to dispatch, they will receive their full availability payment (for the settlement period).

As agreed by the project team, sellers will not get paid for over-delivery.

4 BiTraDER User Journeys

This section described the BiTraDER user journeys for each user type.

There are 3 types of interfaces that BiTraDER market actors will use when interacting with the BiTraDER market:

- Trading platform's web application, referred to in the user journeys as a graphical user interface (GUI).
- Trading platform's application programming interface (API).
- 'Off-platform' interface, meaning all other non-trading platform interfaces which users may need to interact with, email to receive notifications or interfaces provided by third parties, e.g. a third-party system for dispatching.

In addition to the 3 types of interfaces, there are some internal market processes, such as the trade matching process, which are not exposed to users directly. These internal processes are marked with the 'BiTraDER market algorithm' symbol.

User journey interfaces in this section are defined assuming the business-as-usual (BAU) phase of the market. During the simulation trials (and the live trials if the project passes the stage gate), some processes will be tested off-platform and simplified, meaning that

users will spend much less time on them than they would in the BAU stage of the market. This is done to ensure that market participants' time and efforts are focused on testing the core parts of the market workflow, specifically the trading process and some others. More information on this will be provided in the next BiTraDER's build phase report but a summary of which processes are going to be facilitated on-platform during the simulation trials is available at the end of each section.

Changes and improvements will be made to the trading platform as the project progresses through different stages of the market trials. Increasingly more functionality will be supported on-platform as the project progresses.

4.1 Market Participants' Journey

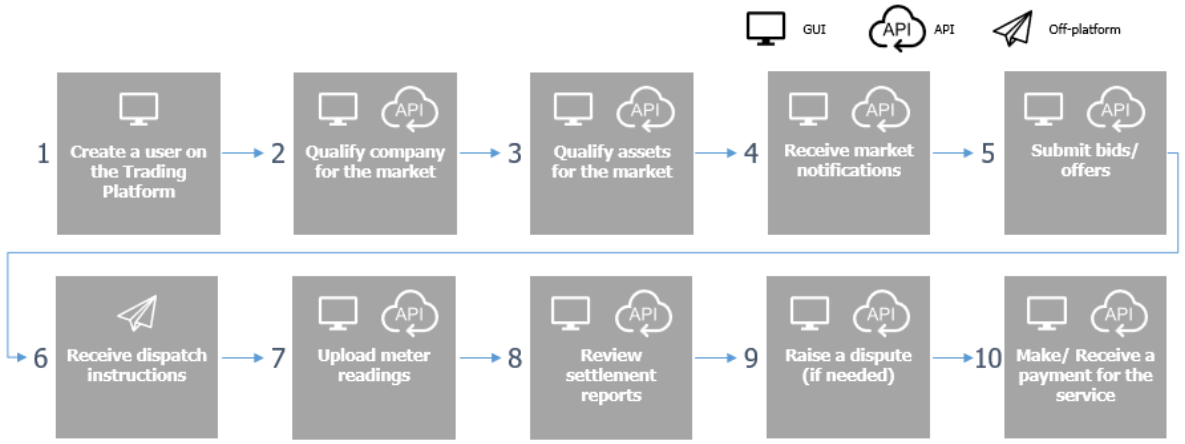

Figure 3. Market Participants' Journey (BAU stage). Source: Electron.

Market participants' BiTraDER market journey consists of ten steps. Suggested interface type for every step is displayed in Figure 3. Some steps have two interface types specified, in such a case, the user will be able to choose between the two.

Summary of the market participants' journey in the BAU stage:

- In the BAU stage, market participants must be able to interact with the trading platform using either the trading platform's web application (GUI) or the API where possible. This will help improve the BiTraDER market's user experience for market participants and reduce participation barriers. That includes steps 2 – 5 and 7 – 10.
- Dispatch instructions will be issued to market participants via a third-party system; hence, step 6 is marked as 'off-platform' within the BiTraDER trading platform's scope.
- The BAU solution of the BiTraDER market could support on-platform payments for services but this process could be also handled off-platform (step 10).

Simulation trials scope:

- In the simulation trials, a lot of the journey steps presented in Figure 3 will be facilitated off-platform. The focus of the simulation trials will be on the trading workflow (see section 3.3 Trading for more information).
- In addition to the trading workflow, other parts of the market process may be facilitated on-platform, these include parts of the performance verification workflow, specifically, step 6 Upload meter readings, and others.

The project team is yet to finalise the simulation trials scope, so areas of focus may change.

4.2 Market Operator's Journey (Incl. BiTraDER Market Algorithm)

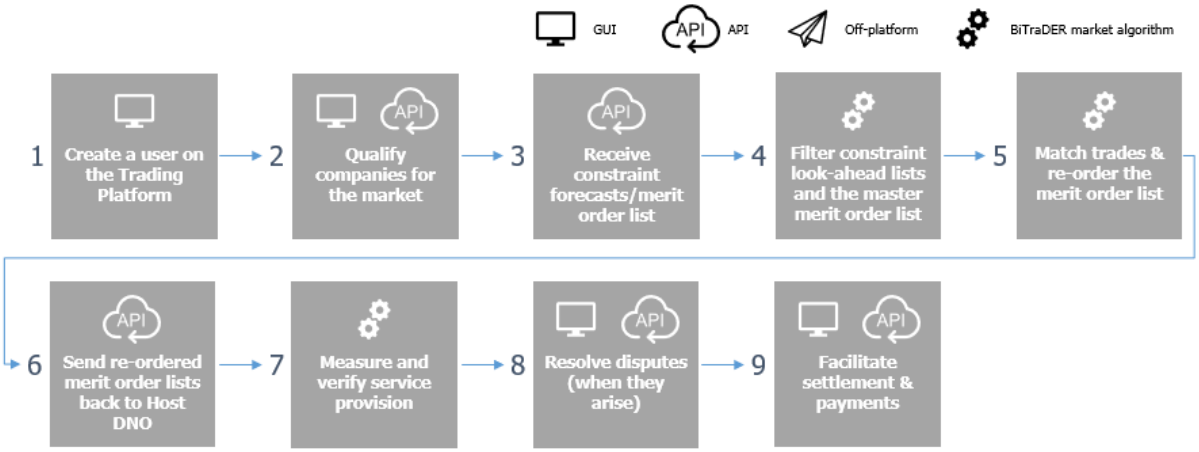

Figure 4. Market Operator's Journey (BAU stage). Source: Electron.

Market operator's BiTraDER market journey is presented in Figure 4. Market Operator's Journey (BAU stage). Source: Electron.. It consists of nine steps.

Summary of the market operator's journey in the BAU stage:

- In the BAU stage, the market operator will take on multiple responsibilities, such as acting as an intermediary in all communication between the host DNO and market participants, performing commercial pre-qualification of FSPs, resolving disputes, facilitating the settlement process, and more. To be able to do all this, the market operator will need to have access to a lot of information stored on the trading platform, such as FSPs' company information, bid/ offer submissions, transactions data, meter readings, and more.
- Market operator's journey includes steps 3 – 7 that will be fully automated and will not require market operator's manual facilitation. In steps 3 and 6, the trading platform and the host DNO's ANM system will communicate directly using APIs.

Steps 4, 5, and 7 are internal trading platform's processes that the market operator will not be involved in directly, but they will need access to the data.

- In addition to the above, the market operator will need access to tools that would enable them to communicate with market participants. This can be supported on-platform in the form of messaging and platform notifications or done off-platform in the form of emails.

Simulation trials scope:

- In the simulation trials, steps 3 – 7 will be fully automated and facilitated on-platform.
- Steps 1, 2, 8, 9 will either be facilitated off-platform or skipped altogether to direct market participants' efforts (and time) to testing core market processes, such as the trading workflow.

4.3 Host DNO's Journey

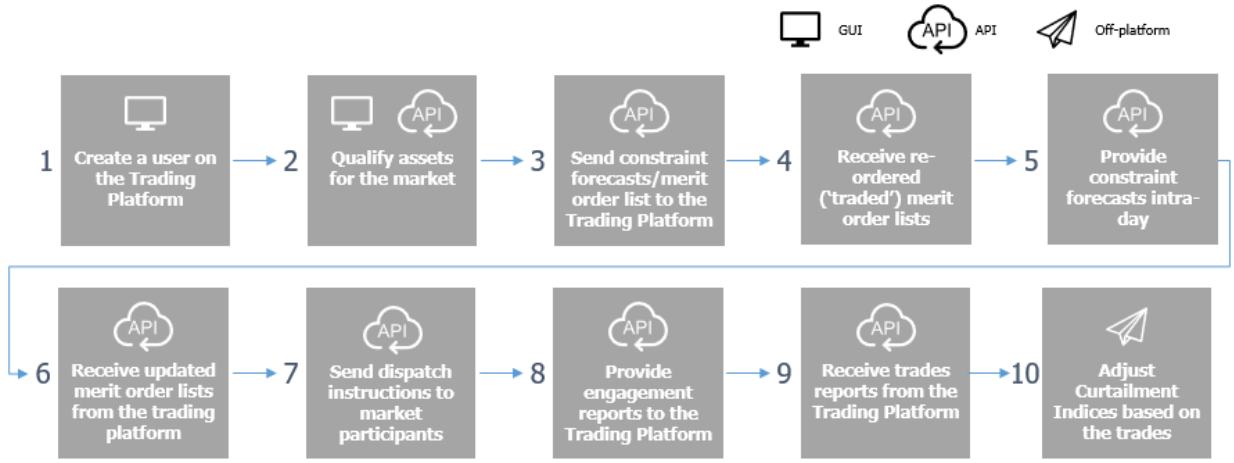

Figure 5. Host DNO's Journey (BAU stage). Source: Electron.

Host DNO's BiTraDER journey is presented in Figure 5. Host DNO's Journey (BAU stage). Source: Electron. It consists of ten steps.

Summary of the host DNO's journey in the BAU stage:

- In the BAU stage, steps 3 – 6 and 8 – 9 will be fully automated and will not require manual facilitation. The trading platform and the host DNO's ANM system will communicate directly using APIs.
- Host DNO will support the market operator in the qualification process, specifically by pre-qualifying participants' assets into the market (technical pre-qualification). To be able to do that, the host DNO will need to access technical asset information on-platform (via the web app and/ or API) and have the ability to update asset

information as well as download it, in cases where registering assets do not yet exist in the host DNO's ANM system's asset registry (step 2).

- Dispatch instructions will be issued by the host DNO (or a third-party service), meaning that the host DNO's ANM system will need to have a direct interface with market participants. Dispatch instructions to participants will be issued by the host DNO's ANM system, using either SCADA or APIs (step 7).
- Curtailment Index adjustments will be done off-platform. This step is internal to host DNO (step 10).

Simulation trials scope:

- In the simulation trials, steps 3 – 4 will be automated and facilitated on-platform.
- Step 2 will not be tested on-platform as participants will use simulated assets to trade. In the process of defining and agreeing these simulated assets, the project team will need to consider standard pre-qualification requirements, such as making sure that the simulated assets are in the right location and their technical parameters allow them to participate in the BiTraDER market.
- Step 5 – 6 will not be tested in the simulation trials because the trade verification process is still not fully defined at this stage of the project. Steps 5 – 6 may be brought into the live trials of the project (if the project passes the stage gate), using the learnings from the simulation trials.
- Dispatch instructions (step 7) will be issued to participants via email to test the process. Other user journey steps (8 – 10) will partially be tested on-platform.

5 BiTraDER Logical Data Model

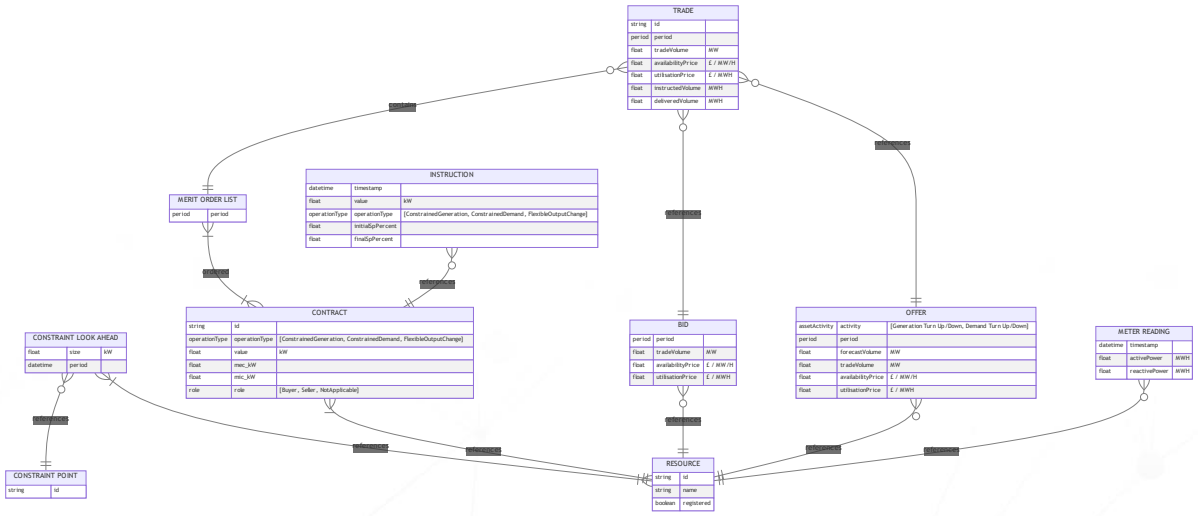

Figure 6. BiTraDER Logical Data Model. Source: Electron.

BiTraDER's logical data model is presented in Figure 6. The data model establishes the structure of key data elements used in BiTraDER and the relationships among them. It provides a high-level view of the data structures, independent of physical database which details specific implementation details.

BiTraDER logical data model consists of 12 components:

- **Resource.** A Distributed Energy Resource (DER) connected to host DNO's network. Resources that are registered on the trading platform are identified via the "Registered" property on the Merit Order List API.
- **Merit Order List.** An ordered list of Contracts that may be required to perform flexible actions, applicable to a specified time period. Resources can appear multiple times, as part of different Contracts.
- **Incoming.** Incoming Merit Order Lists will represent a 24-hour period and are provided to the trading platform by the host DNO.
- **Outgoing.** Outgoing Merit Order Lists are the re-ordered lists after Trades and are applicable to half-hourly settlement periods. These are associated with zero or more Trades - Contracts participating in Trades and are identified by the "Traded" property on the Merit Order List API.
- **Contract.** An agreement between a Resource and the host DNO to provide an agreed volume of flexible service or curtailment in the event of a constraint. A Contract relates to a single Resource, but a Resource may be part of many Contracts.
- **Constraint Look Ahead.** A predicted network constraint for a specified time period and volume. References a list of Resources that can be used to resolve a network constraint. Relates to a single Constraint Point on the network. Received in the same API request as the Merit Order List, but logically a different entity.
- **Constraint Point.** A physical point on the network. No more information is required than a unique identifier.
- **Bid.** A submission by a Buyer (curtailable Resource) to request another Resource to provide flexibility services in BiTraDER. The bid consists of maximum volume, availability, and utilisation prices applicable to a specified time period. Individual Bids may be matched to many Trades as part of different Constraint Look Aheads.
- **Offer.** A submission by a Seller (non-curtailable Resource) to provide flexibility services in BiTraDER for other Resources. The offer consists of maximum volume, and minimum availability and utilisation prices applicable to a specified time

period. The Forecast Volume is used as a baseline in the performance verification process. Individual Offers may be matched to many Trades as part of different Constraint Look-Aheads.

- **Trade.** An agreement between two Contracts, via a matched Bid and Offer, to provide a specified volume of service at an agreed availability and utilisation Price for a particular time period. After completion, the Instructed volume and delivered volume are used to support Performance Verification. Delivered volume is derived from the Offer's forecast volume combined with the relevant Meter Readings.
- **Instruction.** A message sent to a Resource requiring it to perform a flexible service action of a specified magnitude and direction. An Instruction is associated with a single Contract, but individual Contracts will receive many Instructions over time.
- **Meter Reading.** The cumulative amount of active and reactive power measured at a single instant. Required for the performance verification process.

6 BiTraDER Data Flow

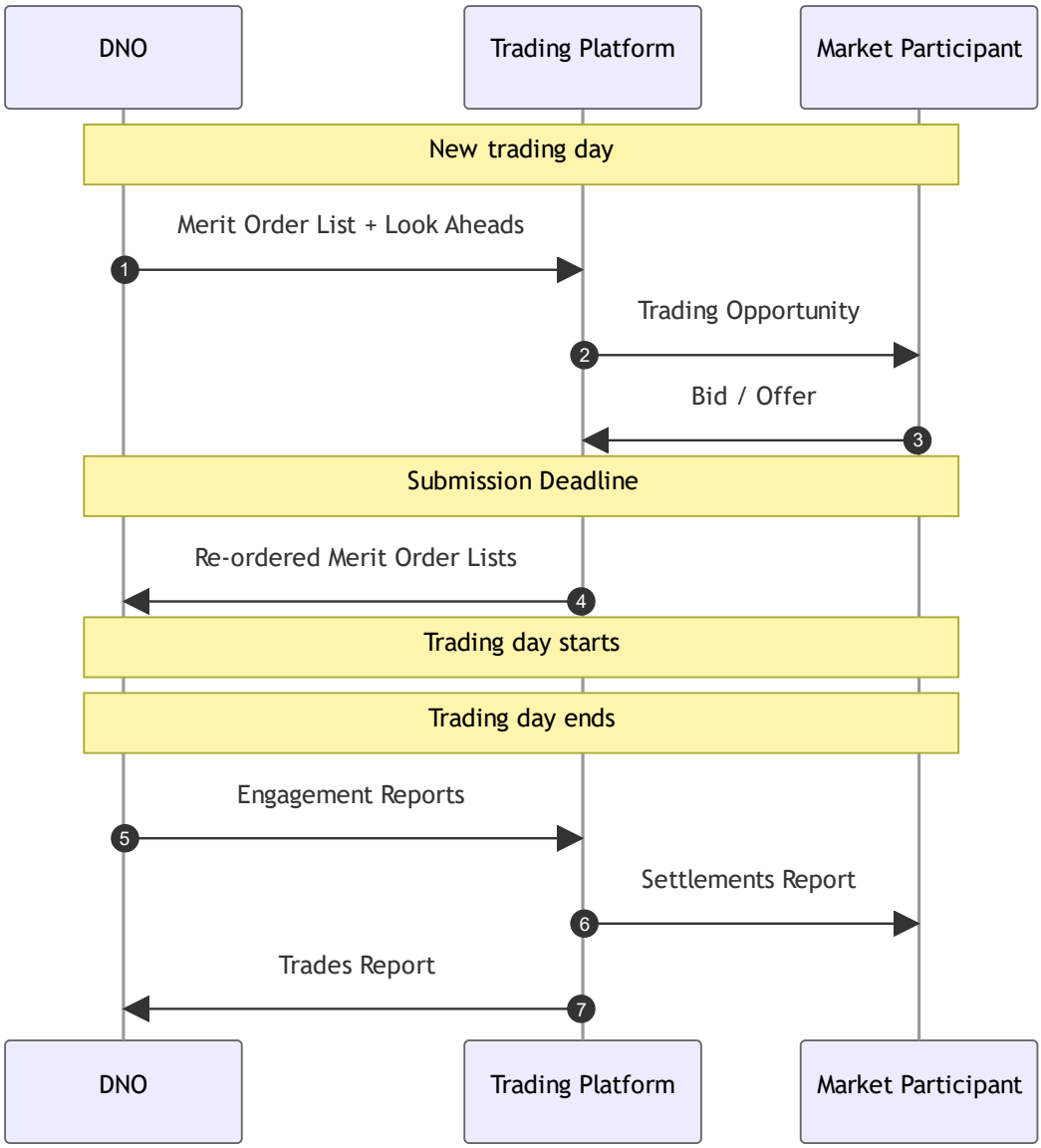

Figure 7. BiTraDER Data Flow Diagram. Source: Electron.

The data flow diagram in Figure 7 maps out the flow of information in the BiTraDER market. It focuses on the core market workflow which includes processes such as sending, filtering, and re-ordering Merit Order Lists and Constraint Look-Aheads, bid/ offer submissions, trade matching, and others. The data flows related to the trade verification process are out of scope for the simulation trials and the APIs for them have not been designed yet. These will be added for the live trials if the project successfully passes the stage gate.

- Host DNO:
    - Generates Merit Order Lists and Constraint Look-Aheads and provides them to the trading platform.

  - Receives updated Merit Order Lists and instructs Resources to dispatch.
  - Generates Engagement Reports and provides them to the trading platform.
- Trading platform/ market operator:
  - Matches Trades based on Bids and Offers provided by market participants.
  - Generates updated Merit Order Lists and returns them to the host DNO.
- Market participant:
  - Registers Resources on the trading platform.
  - Submits Bids and Offers based on Merit Order Lists and Constraint Look Aheads provided by the host DNO and filtered by the trading platform.

New trading window starts:

1. Host DNO uploads Merit Order List and predicted Constraint Look Ahead for each trading period via the Trading Platform's Merit Orders API.
2. Trading platform notifies market participants of trading opportunities via email where their Resources are included in a Constraint Look Ahead. Upcoming opportunities are also shown on the Trading Platform website.
3. Market participants upload Bids and Offers to the trading platform via the Bids API and Offers API.

Submission deadline reached:

4. Trading platform matches Bids and Offers into Trades and host DNO retrieves updated Merit Order Lists from the trading platform via the Merit Orders API.

Trading window ends:

5. Host DNO provides Engagement Reports to the trading platform via the Engagements API.
6. Host DNO retrieves Settlements Report from the trading platform's web app.
7. Host DNO retrieves Trades Reports from the trading platform's web app.

7 BiTraDER Functional Requirements

BiTraDER functional requirements are presented in Appendix C. BiTraDER Functional Requirements. This requirements list is final as of February 2024. The project team will continue to make changes and amendments to this list as more information becomes available, specifically during the simulation trials of the project. There are 78 functional requirements for the BiTraDER trading platform in total:

- **Registration and asset onboarding process:** 26 requirements, 17 of which are ‘Must Have’.
- **Trading process:** 16 requirements, 16 of which are ‘Must Have’.
- **Trade verification process:** 7 requirements, 0 of which are ‘Must Have’.
- **Dispatch process:** 4 requirements, 4 of which are 'Must Have’.
- **Performance verification process:** 19 requirements, 15 of which are 'Must Have’.
- **Settlement process:** 6 requirements, 4 of which are 'Must Have’.

The list of functional requirements defines the functionality needed for the business-as-usual deployment of the BiTraDER platform. Not all functionality will be implemented for project trials, primarily to enable a better user experience for market participants. The project team will decide and agree the trials solution scope during the build phase of the project.

8 Appendix

8.1 Appendix A. Commercial Pre-qualification Questionnaire

Category	Field	Responses	Pass criteria
Company information	Registered/ legal name of contracting party	Free text	Completed
	Company registered number	Free text	Completed
	Registered address 1	Free text	Completed
	Registered address 2	Free text	Completed
	Registered address 3	Free text	Completed, blank
	Registered address postcode	Free text	Completed
	Key contact first name	Free text	Completed
	Key contact last name	Free text	Completed
	Key contact email	Free text	Completed
	Key contact number	Free text	Completed
	Organisation website	Free text	Completed
	Legal relationship with flexibility asset/s	Owner, Operator, Aggregator	One code completed
	VAT registration number	Free text	Completed
T&Cs	Acceptance of ENA standard flex services agreement	Y/N	Y
	Do you declare that you have the authority to submit this application and by confirming you declare that to the best of your knowledge, the information in this form is accurate?	Y/N	Y
Due diligence	Is the contracting party a member of Flex Assure Code of Conduct?	Y/N	Y/N
	Where Achilles UVDB registration has not been advised, you understand that the Company may access the Providers most recent audited financial accounts via Companies House for the purpose of credit checks. [Y(pass), N(fail)]	Y/N/NA	Y/NA
	Is this organisation currently, or has it ever been in receivership? [Y(fail), N (pass)]	Y/N	N
	Is this organisation currently, or has it ever been in administration? [Y(fail), N (pass)]	Y/N	N

	Is this organisation currently, or has it ever been in liquidation? [Y(fail), N (pass)]	Y/N	N
	Is this organisation currently, or has it ever been unable to pay its debts as they fall due (within the meaning of Section 268 Insolvency Act 1986)? [Y(fail), N (pass)]	Y/N	N
	Is this organisation currently, or has it ever had, in the past 3 years, any petitions for winding up (other than vexatious petitions)? [Y(fail), N (pass)]	Y/N	N
	Is this organisation currently, or has it ever had any petitions for bankruptcy (or their equivalent in the country in which the Applicant is incorporated) within the last three years? [Y(fail), N (pass)]	Y/N	N
	Is this organisation currently, or has it ever been convicted of any of the offences or has any discretional exclusion occurred, as contained in Regulation 80 of the Utilities Contract Regulations 2016 (UCR), and listed in Regulation 57 (1) and 57 (8) of the Public Contracts Regulations 2015 (PCR)? [Y(fail), N (pass)]	Y/N	N
	Is this organisation currently, or has it ever had, in the past 3 years, any similar contracts terminated prematurely and/or had damages claims or other comparable sanctions brought against the organisation for any significant or persistent deficiencies in performance of a substantive requirement of the contract? [Y(fail), N (pass)]	Y/N	N
	Has the organisation been subject to any material non-employment related litigation (pending, threatened or determined) or other legal proceedings against the organisation within the last three years that may be relevant to your ability to deliver services. [Y(fail), N (pass)]	Y/N	N
Insurance	Does the Organisation have or commit to have Employer's liability insurance with a minimum limit of £5m [Y(pass), N(fail)]	Y/N	Y
	Does the organisation have or commit to have public liability insurance with a minimum limit of £10m [Y(pass), N(fail)]	Y/N	Y
	Will the organisation provide copies of such insurances upon request [Y(pass), N(fail)]	Y/N	Y

8.2 Appendix B. Technical Pre-qualification Questionnaire

Category	Question/ Field	Allowable Responses	Pass criteria	Completed by
Connection	DER connection status	Energised, Awaiting Energisation, Planned, Speculative	Energised, Awaiting Energisation, Planned, Speculative	Market participants
	If awaiting energisation, Firm date of energisation	DD/MM/YY, NA	Completed	Market participants
	If awaiting energisation, Connection reference number	Free text, NA	Completed	Market participants
	If planned, Connection voltage level	11, 33, 132, NA	Completed	Market participants
	If planned, Connection offer status	Not yet applied, applied awaiting offer, offer		Market participants
	If planned, Connection reference number	Free text, NA	Completed	Market participants
	If planned, Target delivery date	DD/MM/YY, NA	Completed	Market participants
	If speculative, Service readiness date	DD/MM/YY, NA	Completed	Market participants
	If speculative, Recruitment status	ASSET CONTRACTED, ASSET KNOWN, ASSET	Completed	Market participants
	CMZ location	Free text, NA	Completed	Market participants
Site/ Location	If Energised, Awaiting Energisation, Planned; Postcode	Free text, NA	Completed	Market participants
	If Energised, Awaiting Energisation, Planned; Import MPAN (if known)	Free text (13 characters), NA	Completed	Market participants
	If Energised, Awaiting Energisation, Planned; Export MPAN (if known)	Free text (13 characters), NA	Completed	Market participants
	If Energised, Awaiting Energisation, Planned; MSID (where applicable)	Free text, NA	Completed	Market participants
	DER [IF SPECULATIVE, THEN AGGREGATED GROUP] Name/ Ref	Free text	Completed	Market participants
	If Energised, Awaiting Energisation, Planned; Grid Supply Point	Free text, NA	Completed	DNO
	If Energised, Awaiting Energisation, Planned; Bulk Supply Point	Free text, NA	Completed	DNO
	If Energised, Awaiting Energisation, Planned; Primary Substation	Free text, NA	Completed	DNO

	If Energised, Awaiting Energisation, Planned; Distribution Substation	Free text, NA	Completed	DNO
	If Energised, Awaiting Energisation, Planned; Lat	Free text (6 decimal points)	Completed	Market participants
	If Energised, Awaiting Energisation, Planned; Long	Free text (6 decimal points)	Completed	Market participants
Technology	Asset Scale	DOMES, CANDI	Completed	Market participants
	Metering Point	POIOC, ASSEL	Completed	Market participants
	DER Type; Gen/Storage	Y/N	Y/N	Market participants
	DER Type; Demand	Y/N	Y/N	Market participants
	If Generation&/Storage, Energy Source	BACAS, COMAS, ENGCR, GASTU, GEOPP, HYDPS, LIQAS, OFFWT, ONWIT, PHOTO, STEAT, STEGT, TIDAL, TIDSD, WAVED	Completed	Market participants
	If Generation&/Storage, Energy Conversion Type	ADVAF BIFAD BIOLG BIOOT BIOSG BIOMA FOBCL FOSCG FOSSG FOSHC FOSSO FOSOS FOSOT FOSSP GEOTH HYDRO NUCLE SOLAR WASTE WATEH WINDD STORE	Completed	Market participants
	If Demand, Technology Type	AIRSO GRSHP WASHP HYBHP EVCHP EVVTG SITEB SITED	Completed	Market participants
	Service Type; respond to active services	Y/N	Y/N	Market participants

	Service Type; respond to reactive services	Y/N	Y/N	Market participants
DER Parameters	Installed Capacity [IF SPECULATIVE, THEN AGGREGATED GROUP]	Free text	Completed	Market participants
	Flexible Capacity- demand turn up [IF SPECULATIVE, THEN AGGREGATED GROUP]	Free text	Completed	Market participants
	Flexible Capacity- demand turn down [IF SPECULATIVE, THEN AGGREGATED GROUP]	Free text	Completed	Market participants
	Flexible Capacity- Gen turn up [IF SPECULATIVE, THEN AGGREGATED GROUP]	Free text	Completed	Market participants
	Flexible Capacity- Gen turn down [IF SPECULATIVE, THEN AGGREGATED GROUP]	Free text	Completed	Market participants
	Min Operating Duration [IF SPECULATIVE, THEN AGGREGATED GROUP]	HH:MM	HH:MM	Market participants
	Max Operating Duration [IF SPECULATIVE, THEN AGGREGATED GROUP]	HH:MM	HH:MM	Market participants
	Response Time [IF SPECULATIVE, THEN AGGREGATED GROUP]	HH:MM	HH:MM	Market participants
	Recovery Time, The time required by the DER [IF SPECULATIVE AGGREGATED GROUP] to recover from one instruction until the next instruction can be actioned.	HH:MM	HH:MM	Market participants
Metering	Metering Granularity	MIN, HH	MIN, HH	Market participants
BiTraDER	Resource ID	Free text	Completed	DNO
	Communication method	SCADA, Non-SCADA, NA	SCADA, Non-SCADA, NA	DNO

8.3 Appendix C. BiTraDER Functional Requirements

Story ID	Requirement Type	As a	Process	I Want	Current/New	So That	Priority (MoSCoW)
BT1	Functional	Flexibility Buyer	Registration	To be able to create a user account on the trading platform	New	So that I can log in and use the platform	Must Have
BT2	Functional	Flexibility Buyer	Registration	To be able to add my organisation details and accept platform's T&Cs	New	So that my organisation can be pre-qualified to participate in BiTraDER's market	Must Have
BT3	Functional	Flexibility Buyer	Registration	To be able to download company and asset registration forms in xlsx or csv formats	New	So that I can do the company and assets registration via document upload	Should Have
BT4	Functional	Flexibility Buyer	Registration	To be able to add or register assets that I wish to use in BiTraDER market	New	So that my assets can be pre-qualified to participate in BiTraDER's market	Must Have
BT5	Functional	Flexibility Buyer	Registration	To be able to edit asset registration details on the trading platform	New	So that missing information can be added and incorrect information amended	Must Have
BT6	Functional	Flexibility Buyer	Registration	To be able to see if all mandatory fields are successfully completed	New	So that I can provide all the necessary information	Should Have
BT7	Functional	Flexibility Buyer	Registration	To be able to review and sign all required legal contracts	New	So that I can trade in BiTraDER	Must Have
BT8	Functional	Flexibility Buyer	Registration	To be able to add users from my organisation	New	So that my colleagues can use the trading platform	Should Have
BT9	Functional	Flexibility Buyer	Registration	To be notified about my registration and qualification status	New	So that I am informed about the status of application	Should Have

BT10	Functional	Flexibility Seller	Registration	To be able to create a user account on the trading platform	New	So that I can log in and use the platform	Must Have
BT11	Functional	Flexibility Seller	Registration	To be able to add my organisation details and accept platform's T&Cs	New	So that my organisation can be pre-qualified to participate in BiTraDER's market	Must Have
BT12	Functional	Flexibility Seller	Registration	To be able to download company and asset registration forms in xlsx or csv formats	New	So that I can do the company and assets registration via document upload	Should Have
BT13	Functional	Flexibility Seller	Registration	To be able to add or register assets that I wish to use in BiTraDER market	New	So that my assets can be pre-qualified to participate in BiTraDER's market	Must Have
BT14	Functional	Flexibility Seller	Registration	To be able to edit asset registration details on the trading platform	New	So that missing information can be added and incorrect information amended	Must Have
BT15	Functional	Flexibility Seller	Registration	To be able to see if all mandatory fields are successfully completed	New	So that I can provide all the necessary information	Should Have
BT16	Functional	Flexibility Seller	Registration	To be able to review and sign all required legal contracts	New	So that I can trade in BiTraDER	Must Have
BT17	Functional	Flexibility Seller	Registration	To be able to add users from my organisation	New	So that my colleagues can use the trading platform	Should Have
BT18	Functional	Flexibility Seller	Registration	To be notified about my registration and qualification status	New	So that I am informed about the status of application	Should Have
BT19	Functional	Market Operator	Registration	To be notified when a new organisation registers on the trading platform	New	So that I am informed about the new organisations registering on the trading platform	Should Have
BT20	Functional	Market Operator	Registration	To be able to review commercial pre-qualification documents submitted by participants	New	So that credit and business checks can be carried out to qualify new organisations for BiTraDER's market	Must Have
BT21	Functional	Market Operator	Registration	To be able to review BiTraDER contracts signed by participant organisations	New	So that upon signing the contracts, participant organisations can be admitted to the BiTraDER market	Must Have

BT22	Functional	Market Operator	Registration	To alert the DNO's commercial team that a new organisation has registered on the trading platform	New	So that credit and business checks can be carried out to qualify new organisations for the BiTraDER market	Must Have
BT23	Functional	Market Operator	Registration	To alert the DNO's technical team that a new asset has registered on the trading platform	New	So that DNO's team can review the asset details and qualify new assets for the BiTraDER market	Must Have
BT24	Functional	DNO	Registration	To be able to edit asset registration details on the trading platform	New	So that missing information can be added and incorrect information amended	Must Have
BT25	Functional	DNO	Registration	To be able to download asset registration details from the trading platform	New	So that new assets could be added to the ANM system	Must Have
BT26	Functional	DNO	Registration	To be able to review legal contracts signed by participants organisations	New	So that the DNO can ensure that all required legal arrangements have been made	Must Have
BT27	Functional	DNO	Trading	To be able to produce the master merit order stack for the next instruction window	Current	So that it can be shared with the trading platform	Must Have
BT28	Functional	DNO	Trading	To be able to produce constraint look aheads for the next instruction window	Current	So that they can be shared with the trading platform	Must Have
BT29	Functional	DNO	Trading	To share the master merit order stack for the next instruction window with the trading platform	New	So that it can be filtered and presented to participants	Must Have
BT30	Functional	DNO	Trading	To be able to share constraint look aheads for the next instruction window with the trading platform	New	So that it can be filtered and presented to participants	Must Have
BT31	Functional	Market Operator	Trading	To be able to filter assets based on the constraint type and location	New	So that I can communicate constraint details to participants organisations	Must Have
BT32	Functional	Market Operator	Trading	To be able to notify participants about the upcoming constraints	New	So that they can decide whether to take part in the BiTraDER market	Must Have
BT33	Functional	Flexibility Buyer	Trading	To be able to review constraint information	New	So that I can decide whether to submit a bid	Must Have

BT34	Functional	Flexibility Seller	Trading	To be able to review constraint information	New	So that I can decide whether to submit an offer	Must Have
BT35	Functional	Flexibility Buyer	Trading	To be able to submit a bid in the BiTraDER market, consisting of price, volume, and a time window	New	So that I can take part in the BiTraDER market	Must Have
BT36	Functional	Flexibility Seller	Trading	To be able to submit an offer in the BiTraDER market, consisting of price, volume, a time window, and a self-declared baseline	New	So that I can take part in the BiTraDER market	Must Have
BT37	Functional	Market Operator	Trading	To be able to sort bids (highest to lowest) and offers (lowest to highest)	New	So that trades can be matched following BiTraDER's trading rules	Must Have
BT38	Functional	Market Operator	Trading	To be able to match highest bids with lowest offers, and continue matching until there are no bids and offers left to match	New	So that the new traded master merit order stack can be established	Must Have
BT39	Functional	Market Operator	Trading	To be able to re-order the master merit order stack based on the trading outcomes	New	So that the traded master merit order stack can sent back to the DNO	Must Have
BT40	Functional	Market Operator	Trading	To be able to notify buyers and sellers about the successful trades	New	So that buyers and sellers are aware of the actions they need to take in the next instruction window	Must Have
BT41	Functional	Market Operator	Trading	To be able to send the traded master merit order stack back to the DNO	New	So that the DNO can insert the traded master merit order stack into its ANM system	Must Have
BT42	Functional	DNO	Trading	To be able to update the ANM system with the traded master merit order stack	New	So that control signals are sent to correct assets during the instruction window	Must Have
BT43	Functional	DNO	Trade Verification	To be able to produce updated constraint look aheads hourly during the instruction window	Current	So that they can be shared with the trading platform	Should Have
BT44	Functional	DNO	Trade Verification	To be able to share updated constraint look aheads with the trading platform	New	So that the Market Operator can filter assets using the updated constraint look aheads	Should Have

BT45	Functional	Market Operator	Trade Verification	To be able to filter assets based on the constraint type and location within the instruction window	New	So that the Market Operator can identify assets that are no longer constrained	Should Have
BT46	Functional	Market Operator	Trade Verification	To be able to identify trades that are no longer valid	New	So that the master merit order stack can be updated ahead of dispatch	Should Have
BT47	Functional	Market Operator	Trade Verification	To be able to notify buyers and sellers about cancelled trades	New	So that participants are informed about cancelled trades	Should Have
BT48	Functional	Market Operator	Trade Verification	To be able to update the traded master merit order stack following trade cancellations	New	So that the master merit order stack is up to date	Should Have
BT49	Functional	DNO	Trade Verification	To be able to update the ANM system with the traded master merit order stack following trade verification process	New	So that control signals are sent to correct assets during the instruction window	Should Have
BT50	Functional	DNO	Dispatch	To check that the asset on the master merit order stack is available	Current	So that I can confirm that control signals can be sent and received	Must Have
BT51	Functional	DNO	Dispatch	To be able to issue the start control signal to the asset	Current	So that the asset can begin the flexibility action	Must Have
BT52	Functional	DNO	Dispatch	To be able to issue the end control signal to the asset	Current	So that the asset can end the flexibility action	Must Have
BT53	Functional	Flexibility Seller	Dispatch	To be informed when my flexibility provision should begin and end	New	So that I can ensure that the service is provided as and when required	Must Have
BT54	Functional	DNO	Performance Verification	To be able to produce execution reports detailing the control signals that were sent during the instruction window	New	So that the Market Operator can start the performance verification process	Must Have
BT55	Functional	DNO	Performance Verification	To be able to send execution reports to the trading platform	New	So that the Market Operator can start the performance verification process	Must Have
BT56	Functional	Market Operator	Performance Verification	To be able to identify assets that were called to take action during the instruction window	New	So that I can start the performance verification process	Must Have

BT57	Functional	Market Operator	Performance Verification	To be able to notify Flexibility Sellers to upload their meter readings to the trading platform	New	So that I can measure their service provision	Must Have
BT58	Functional	Flexibility Seller	Performance Verification	To be able to upload meter readings to the trading platform	New	So that the Market Operator can measure the service provided	Must Have
BT59	Functional	Market Operator	Performance Verification	To be able to compare assets' meter readings against their self-declared baselines to estimate delivered volume	New	So that I can then compare it against the traded volume	Must Have
BT60	Functional	Market Operator	Performance Verification	To be able to compare assets' delivered volume against the volume traded to measure their service fulfillment	New	So that I can produce settlement reports for Flexibility Buyers and Sellers	Must Have
BT61	Functional	Market Operator	Performance Verification	To be able to generate settlement reports detailing the service fulfillment	New	So that they can be shared with participants	Must Have
BT62	Functional	Market Operator	Performance Verification	To be able to share the settlement report with the Flexibility Buyer	New	So that the Flexibility Buyer can review it	Must Have
BT63	Functional	Market Operator	Performance Verification	To be able to share the settlement report with the Flexibility Seller	New	So that the Flexibility Seller can review it	Must Have
BT64	Functional	Flexibility Buyer	Performance Verification	To be able to review the settlement report	New	So that I can review and accept the volume delivered by the Flexibility Seller and proceed to settlement	Must Have
BT65	Functional	Flexibility Seller	Performance Verification	To be able to review the settlement report	New	So that I can review and accept the estimated volume delivered and proceed to settlement	Must Have
BT66	Functional	Flexibility Buyer	Performance Verification	To be able to reject the settlement report and raise a dispute	New	So that I can clarify the delivered volume calculation and the amount I owe	Should Have
BT67	Functional	Flexibility Seller	Performance Verification	To be able to reject the settlement report and raise a dispute	New	So that I can clarify the delivered volume calculation and the amount I am owed	Should Have
BT68	Functional	Market Operator	Performance Verification	To be able to initiate a dispute resolution process to clarify the	New	So that I can update the disputed delivered volume in the trading platform	Should Have

				volume delivered and the payment amount			
BT69	Functional	Market Operator	Performance Verification	To be able to update the disputed delivered volume in the trading platform	New	So that the dispute can be resolved	Should Have
BT70	Functional	Market Operator	Performance Verification	To be able to record the resolved trade as completed in the trading platform	New	So that the trade can proceed to the settlement stage	Must Have
BT71	Functional	Market Operator	Performance Verification	To be able to send information about the completed trades to the DNO	New	So that the DNO can update Flexibility Buyers' curtailment indices after trading in BiTraDER's market	Must Have
BT72	Functional	DNO	Performance Verification	To be able to update Flexibility Buyers' curtailment indices	New	So that Flexibility Buyers' curtailment obligations would not transfer to the future instruction windows	Must Have
BT73	Functional	Market Operator	Settlement	To be able to generate an invoice for the Flexibility Buyer	New	So that I can receive the payment from the Flexibility Buyer	Must Have
BT74	Functional	Flexibility Seller	Settlement	To be able to generate an invoice for the Market Operator	New	So that I can receive the payment from the Market Operator	Must Have
BT75	Functional	Market Operator	Settlement	To be able to make the payment to the Flexibility Seller	New	So that I can pay Flexibility Seller for the service they provided	Must Have
BT76	Functional	DNO	Settlement	To be able to make the payment to the Flexibility Seller	New	So that I can pay Flexibility Seller for the service they provided	Should Have
BT77	Functional	Flexibility Buyer	Settlement	To be able make the payment to the DNO	New	So that I can pay for the service I received	Should Have
BT78	Functional	Flexibility Buyer	Settlement	To make the payment to the Market Operator	New	So that I can pay for the service I received	Must Have