



BiTraDER

Electricity North West Ltd

Technical Requirements Report

Submitted by
Enzen Global Ltd

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Abbreviations

- ANM – Active Network Management
- BAU – Business-as-usual
- DNO – Distribution Network Operator
- ENA – Energy Networks Association
- ENWL – Electricity North West Limited
- EGL – Enzen Global Limited
- MO – Market Operator
- MOS – Merit Order Stack
- SCADA – Supervisory Control and Data Acquisition
- TP – Trading Platform

Introduction

The purpose of this report is to provide a comprehensive overview of the outputs from this phase of actions by the ENWL IT team within the BiTraDER Project. This report outlines the key processes, architecture, and data of the BiTraDER, aiming to help guide the development and implementation process.

In this report, we will outline the major process areas in BiTraDER and summarise the outputs of our conceptual design activity, such as data tables, technical requirements, logical solutions, and interfaces. Each business process will be described at a high level, emphasizing its purpose within the project.

1. End to End Process Development

1.1 Processes

Creating the end-to-end business process involved EGL mapping and integrating various activities and tasks across different user groups or functions within BiTraDER, to achieve a specific flexibility service to the Host DNO via both curtailable and non-curtailable participants. It focused on streamlining and optimizing the flow of work from the initial stage to the final stage, ensuring efficiency, effectiveness, and consistency throughout the entire process.

The first step in developing the end-to-end business process was to map out the existing workflows, tasks, and activities involved in ANM. This included identifying all the stakeholders, inputs, outputs, dependencies, and decision points throughout the process. The goal was to gain a comprehensive understanding of how data flowed between parties, as well as how and when decisions would be made.

During the mapping process, potential bottlenecks, redundancies, and inefficiencies within the proposed processes were identified. These were areas where unnecessary steps were being considered or inconsistencies with the existing ANM system. ENWL, EGL and Electron worked together to identify these issues and helped pinpoint areas for improvement and optimization.

Once the pain points and inefficiencies were identified, the next step was to streamline and standardize the activities. This involved highlighting manual processes and considering where automation would be a desired improvement. In the next phases of the BiTraDER project, this will allow us to establish clear guidelines and standard operating procedures (SOPs). Effective collaboration and communication are crucial for the success of an end-to-end business process. By breaking down silos and promoting cross-functional data exchange, BiTraDER market actors can work together more seamlessly via the trading platform.

Creating these end-to-end business processes is not a one-time effort. It requires ongoing monitoring, evaluation, and continuous improvement. Key performance indicators (KPIs) and metrics will need to be established for BiTraDER to measure each process's performance and identify areas for further optimization. Regular reviews and feedback loops will enable consortium members to adapt and refine the process as needed, ensuring it remains aligned

with changing project requirements that may result from the high-level design, simulation trials or live trials.

1.2 Data Tables

As a key part of defining the end-to-end processes, EGL began to define in tabular form the key data types within BiTraDER.

Defining data tables was important to ENWL and EGL for several reasons:

- They provide a clear and structured representation of how data would move through BiTraDER
- They help in visualizing the flow of data, including its source, transformation, and destination
- By documenting the data in a tabular format, it becomes easier for consortium members to understand and communicate the data movement within the system
- They also allow for the identification and documentation of the inputs and outputs associated with each process or component within BiTraDER.

This helped in ensuring that all necessary data inputs are accounted for and that the outputs align with the desired requirements.

These tables facilitate analysis and validation of the data flow within BiTraDER. By examining the tables, we can identify any missing or redundant data flows, inconsistencies, or potential issues in the data movement. This analysis aids in identifying areas where improvements or optimizations can be made to enhance the efficiency, accuracy, and reliability of the data flow – particularly between participants and the trading Platform and between the Host DNO and the trading platform.

ENWL IT and EGL feel that these data tables serve as a valuable documentation tool for both technical and non-technical stakeholders. They provide a concise and visual representation of the data requirements, which can be easily shared and understood by various team members, including developers, analysts, testers, and business stakeholders. In regulated industries such as electricity distribution, activities including BiTraDER which have systems that handle sensitive data, these data tables play a crucial role in demonstrating where compliance with data protection regulations would be needed. They help in identifying the flow of personal or sensitive information, highlighting any potential risks or vulnerabilities in data handling, and ensuring that appropriate security and privacy measures are in place.

1.3 Functional and Non Functional Requirements Development

As a key part of BiTraDER development, it was important for ENWL IT and EGL to consider both functional and non-functional requirements.

Functional requirements define what the system should do or the specific features and functionalities it should possess. These requirements typically describe the system's behaviour, its inputs, outputs, and the actions it should perform. Functional requirements answer questions like "What tasks should the system be able to accomplish?" or "What are the specific features the system needs to have?" Functional requirements are documented in a detailed manner using a pre-existing ENWL IT template, utilizing the MoSCoW

prioritization method to provide a clear understanding of the system's expected behaviour and functionality.

Non-functional requirements, on the other hand, define the qualities or constraints that the system should possess, rather than specific functionalities. These requirements focus on the system's performance, usability, security, reliability, and other characteristics. Non-functional requirements answer questions like "How fast should the system respond?" or "How secure should the system be?" Examples of non-functional requirements could include:

- **Performance:** The system should respond to user requests within two seconds.
- **Usability:** The user interface should be intuitive and easy to navigate.
- **Security:** The system should implement strong encryption algorithms to protect sensitive data.
- **Reliability:** The system should have a 99.9% uptime and minimize the occurrence of errors.
- **Scalability:** The system should be able to handle a growing number of users and data without performance degradation.

Non-functional requirements are crucial for ensuring the overall quality and effectiveness of the system, as they address important aspects beyond just functionality.

Both functional and non-functional requirements play a significant role in the development of BiTraDER, as they guide the design, implementation, testing, and evaluation processes, ultimately contributing to the success of the system.

The functional and non-functional requirements have been aligned with the business process steps, and a summary table of all functional requirements, and selected non-functional requirements can be found in the following chapter.

2. BiTraDER Process Steps

2.1 Registration

This section covers the registration data flows and process between participants, the trading platform, ANM and other external systems. Section 2.1.1 provides an overview of the process, Section 2.1.2 details the Data tables, 2.1.3 covers the functional requirements linked to the process and 2.5 includes non-functional requirements.

2.1.1 Registration Overview

Registration data flows are the processes and information exchanges involved in the registration of users or participants.

During the registration process, participants provide personal identification details such as their name, contact information (company, email, phone number, etc.), and the physical address. This information helps in uniquely identifying users on the platform. The trading platforms require users to create login credentials to secure their accounts. This includes selecting a username or email address and setting up a password.

The Host DNO, via the trading platform needs to collect certain compliance information related to the assets which will be registered for use to ensure adherence to minimum requirements. This will include the address of the asset, import and export MPAN details, asset type, connection details and other technical information to allow the host DNO to assess the suitability of the asset(s).

Participants are to review and accept the terms and conditions of the trading platform. This includes consent to the platform's user agreement, privacy policy, and any other relevant legal documentation.

Once the registration data is collected and validated by the Host DNO technical and commercial teams, the trading platform creates an account for the participant. This involves assigning a unique account identifier or username to the user and securely storing their authentication credentials.

After successful registration, the platform may send confirmation emails or notifications to the participant, providing them with account details, login instructions, and important information about using the platform.

The process diagram, created by EGL and revised by EGL, Electron and ENWL contains the following steps:

1. Participant completes T&C's and the registration details (see Data tables a1-a2)
2. The information is sent from the TP to the Market Operator and Host DNO for review
3. The MO or host DNO commercial team completes the commercial pre-qualification.
4. The participant is approved leading to step 5a - an approval notification or rejected leading to step 5b – a rejection notification.
6. The participant registers asset(s) (see Data table a3)

7. The Host DNO reviews the asset technical parameters, leading to step 8 – asset approval and step 9 or rejection (step 5b repeated).
9. The asset and customer data are added to the ANM system
10. A Final completion notification is sent to the participant

2.1.2 Registration Data Tables

EGL and the ENWL IT Team assessed the data requirements of the registration process and opted to define data into three distinct categories; Company Details (table A1), User Details (table A2) and Asset details (table A3). This was deemed necessary to differentiate between the technical and commercial data which would ultimately be evaluated for suitability by different teams.

Table 1: Data Table A1 - Company Details

Field ID	Field	Description	Format	Purpose	Notes
1	Company Name	Trading name of participating organisation	Free text	Display in Trading Platform, credit and business checks	Required field
2	Company Address	Address of participating organisation	Minimum of Line1, Post Town and Post Code	Display in Trading Platform, credit and business checks	Required field
3	Company Number	Registered Company Number of participating organisation	8 digits	Credit and business checks	Required field
4	Parent Company Name	Name of Parent Company if applicable	Free text	Credit and business checks	Required field
5	Parent Company Address	Address of parent company if applicable	Minimum of Line1, Post Town and Post Code	Credit and business checks	Required field
6	Parent Company Number	Parent Company number if applicable	8 digits	Credit and business checks	Required field
7	Company Bank Name	Name of bank for participating organisation	Free text	Credit and business checks, automatic settlement of payments due	Required field

8	Bank Account Number	IBAN for participating organisation	22 characters and 4 spaces, eg. GB 29 NWBK 601613 31926819	Credit and business checks, automatic settlement of payments due	2 letter ISO country code, 2 digits IBAN check code, 4 letter SWIFT/BIC code, 6 digits sort code and 8 digits account number
9	Invoice Address	Invoicing Address of participating organisation if different from [2]	Minimum of Line1, Post Town and Post Code	Invoicing of non curtailment penalties if applicable	Required field
10	VAT Number	Company VAT number	Letters 'GB' followed by 9 digits	Invoicing	Required field

Table 2: Data Table A2 - Customer User Details

Field ID	Field	Description	Format	Purpose	Notes
11	User Name	Authorised user from participating organisation	Free Text	Display in Trading Platform,	Required field
12	User email address	Email address for user		Display in Trading Platform, Platform username, used for push notifications	Required field
13	User Password	Password to access platform	TBC	Security	Required field
14	Account Type	Description of user access / function rights	TBC	Determines functionality	Required field

Table 3: Data Table A3 – Asset Details

Field ID	Field	Description	Format	Purpose	Notes
15	Resource Name	name of individual asset	Free text	Display in the Trading Platform, Network checks	Required field
16	Resource ID	Unique resource ID from the ANM system	TBC	To map resources between the trading platform and the ANM	Format should match the Resource ID in the ANM. This field will be added by the Host DNO during the technical pre-qualification.
17	Address Line 1	Address of Individual asset	Free text	Display in the Trading Platform, Network checks	Required field
18	Town/City	Address of Individual asset	Free text	Display in the Trading Platform, Network checks	Required field
19	County	Address of Individual asset	Free text	Display in the Trading Platform, Network checks	Required field

20	Postcode	Address of Individual asset	TBC	Display in the Trading Platform, Network checks	Required field
21	Asset Category	Asset category (generation, demand, storage)	Drop-down	Display in the Trading Platform, Network checks	Required field
22	Technology Type	Technology type of the asset	Drop-down	Network checks, Merit order determination	Required field. Describes the type of flexibility service, generation turn up, demand turn down etc.
23	Import MPAN (or CVA)	Meter Point Administration Number at asset POC	21 digits preceded by Letter S	Network checks, cross reference with connection data, cross reference with customer data	Required field
24	Export MPAN (or CVA)	Meter Point Administration Number at asset POC	21 digits preceded by Letter S	Network checks, cross reference with connection data, cross reference with customer data	Required field
25	Grid Supply Point	Grid Supply Point name where the asset is connected	TBC	Network checks, cross reference with connection data, cross reference with customer data	This field will be added by the Host DNO during the technical pre-qualification.
26	Bulk Supply Point	Bulk Supply Point name where the asset is connected	TBC	Network checks, cross reference with connection data, constraint look-ahead filtering	This field will be added by the Host DNO during the technical pre-qualification.
27	Primary Substation	Primary substation where the asset is connected	TBC	Network checks, cross reference with connection data, constraint look-ahead filtering	This field will be added by the Host DNO during the technical pre-qualification.
28	Distribution Substation	Distribution substation where the asset is connected	TBC	Network checks, cross reference with connection data, constraint look-ahead filtering	This field will be added by the Host DNO during the technical pre-qualification.
29	Substation Number	Substation number at the nearest point of connection	TBC	Network checks, cross reference with connection data, cross reference with customer data	This field will be added by the Host DNO during the technical pre-qualification.
30	POC Grid Ref	OS Grid ref coordinates for POC	2 letters 6 Numbers	Location identification and network attribution, network checks	This field will be added by the Host DNO during the technical pre-qualification.

31	POC Latitude and Longitude	Decimal coordinates for POC	2 numbers to 6 dp	Location identification and network attribution, network checks	Required field.
32	Connection Level	Network voltage level where the asset is connected (kV)	Drop-down	Location identification and network attribution, network checks	This field will be added by the Host DNO during the technical pre-qualification.
33	Reactive MEC	Reactive Maximum Export Capacity	TBC	Network checks, Merit order determination	This field will be added by the Host DNO during the technical pre-qualification.
34	MIC	Maximum Import Capacity	TBC	Network checks, Merit order determination	This field will be added by the Host DNO during the technical pre-qualification.
35	MEC	Maximum Export Capacity	TBC	Network checks, Merit order determination	This field will be added by the Host DNO during the technical pre-qualification.
36	Response Time	User defined minimum notice time	Dropdown list	Asset technical pre-qualification	Required field.
37	Communication method	Details the way that the asset can communicate with the DNO systems	SCADA, Non-SCADA	To determine correct communication method	This field will be added by the Host DNO during the technical pre-qualification.
38	Meter Interval	The most granular metering interval available.	Drop-down	Asset technical pre-qualification	Required field.
39	Metering Point	Describes where the asset is metered.	Terminals or Boundary	Asset technical pre-qualification	Required field.
40	Maximum Runtime	Maximum length of time the asset can operate.	TBC	Asset technical pre-qualification, matching algorithm	Required field.
41	Minimum Runtime	Minimum length of time the asset can operate.	TBC	Asset technical pre-qualification, matching algorithm	Required field.
42	Recovery Time	Minimum amount of time required for the asset to recover between instructions.	TBC	Asset technical pre-qualification, matching algorithm	Required field.
43	Connection Status	Describes asset connection status.	Drop-down	Asset technical pre-qualification	Required field.

2.1.3 Registration Functional Requirements

The functional requirements linked to the registration process, and applicable to simulation and live trials stages of the project are as follows:

Table 4: Registration Functional Requirements

Grouping	As a	I want	So that
Registration	Curtailable Participant	To be able to add my user details to the trading platform	So that I can log in and use the platform
Registration	Curtailable Participant	To be able to provide company registration details and accept platform's T&Cs	My company can be evaluated for suitability to participate in BiTraDER for trades not covered by existing obligation
Registration	Curtailable Participant	To be able to add details of the asset that I wish to use in BiTraDER	So that my asset and capability can be verified against my existing contractual obligations
Registration	Curtailable Participant	To be able to see if all mandatory fields are successfully completed	So that I can ensure I am able to participate
Registration	Curtailable Participant	To be able to accept the contractual agreement	So that I can trade in BiTraDER
Registration	Non-curtailable Participant	To be able to add my user details to the trading platform	So that I can log in and use the platform
Registration	Non-curtailable Participant	To be able to provide company registration details and accept platform's T&Cs	My company can be evaluated for suitability to participate in BiTraDER
Registration	Non-curtailable Participant	To be able to add details of the asset that I wish to use in BiTraDER	So that my asset and capability can be verified as being suitable for BiTraDER
Registration	Non-curtailable Participant	To be able to see if all mandatory fields are successfully completed	So that I can ensure I am able to participate
Registration	Non-curtailable Participant	To be able to accept the contractual agreement	So that I can trade in BiTraDER
Registration	Market Operator	To alert the ENWL technical team that a new participant has registered	So that ENWL network specialists can review the asset details against other ENWL systems to determine viability in BiTraDER
Registration	Market Operator	Alert the ENWL Commercial team that a new participant has registered	So that credit and business checks can be carried out via third party systems to determine suitability for BiTraDER
Registration	Market Operator	To be able to carry out business and credit checks on registering participants	We can determine suitability for BiTraDER
Registration	Market Operator	To have the contractual agreements within the trading platform	Upon acceptance of the T&C's, all parties are able to engage in trading

Registration	DNO	To receive the correct type of technical information about the asset being registered	It can be accurately evaluated for suitability based upon its location on the network, asset type and the type of flexibility service being offered
Registration	DNO	To be able to transfer information from the trading platform to ANM	The proposed assets can then be used within the system to satisfy constraints
Registration	Curtaillable Participant	Capability to create (and remove) user accounts in the platform	I can control who has access from our organisation
Registration	Non-curtaillable Participant	Capability to create (and remove) user accounts in the platform	I can control who has access from our organisation
Registration	Market Operator	Capability to create (and remove) user accounts in the platform	I can perform administrative functions for accounts
Registration	DNO	Capability to create (and remove) user accounts in the platform	I can perform administrative functions for accounts related to technical assets
Registration	Market Operator	Capability to approve or reject participant organisations from the market (commercial pre-qualification)	I can ensure financial stability of the market
Registration	Market Operator	Capability to approve or reject participants' assets from the market (technical pre-qualification)	I can ensure technical suitability for the market
Registration	Market Operator	Capability to upload commercial and technical pre-qualification questionnaires to the trading platform	I can ensure participants provide all of the information required to assess suitability
Registration	Market Operator	Capability to send notifications to participants, market operator, and the host DNO	I can all market actors have the required information at the right time
Registration	DNO	Capability to edit technical asset data in the platform	I can ensure compatibility with the DNO systems
Registration	Market Operator	Capability to download commercial and technical pre-qualification questionnaires in their original formats	I can allow for audit and assurance capability

2.2 Trading Management

The Trading management process flow refers to the sequence of steps involved in managing the dispatch and scheduling of network events based on planned or expected constraints and the interaction between BiTraDER participants and the Market Operator. Section 2.2.1 provides an overview of the process, Section 2.2.2 contains the data tables for the process, section 2.2.3 details the functional requirements linked to the process and Section 2.5 includes non functional requirements.

2.2.1 Trading Management Overview

The Trading Management Process covers the activities of creating the master Merit Order List (MOL), network event forecasting, the submission and prioritization of offers and then the final confirmation of the traded merit order.

The Host DNO forecasts the electricity demand for the upcoming period, considering factors such as historical data, weather conditions, and expected load patterns. Planned network events are also considered, as this is essential in determining the required amount of flexibility service to be dispatched. The Host DNO systems then determine the merit order list of assets already contracted to supply services.

The details of the required flexibility services requested by the Host DNO are relayed to the MO via the TP which filters the registered assets for suitability. Details of the event are then sent to the filtered BiTraDER participants. Interested participants submit offers to the market operator specifying the quantity of flexibility service offered and the corresponding price or bid. These offers are typically ranked from lowest to highest marginal cost. The received offers are sorted based on their marginal cost or volume, with the lowest-cost offers, or largest volume given higher priority. This ranking determines the merit order of participants.

The process diagram, created by EGL and revised by EGL, Electron and ENWL contains the following steps:

1. ANM determines the master MOL for the next delivery window (table b1).
2. ANM identifies upcoming constraints (table b2)
3. Master MOL and Constraint Look-Ahead files are received on the Trading Platform from the Host DNO
4. The Trading platform filters registered participants assets based on suitability.
5. Notification sent to filtered customers detailing trading opportunity by the Trading Platform
6. The participant considers full or partial fulfilment
7. The participant submits volume and price proposal as well as the self-declared baseline.
8. The Trading Platform prioritizes offers on least cost basis
9. The Trading Platform prioritizes offers on largest volume basis
10. A) Participants are notified of final volume, price points and MOS positions by the Trading Platform
10. B) The Trading Platform sends the final traded merit order to Host DNO

11. Final Merit Order Confirmed by the Host DNO

2.2.2 Trading Management Data Tables

EGL, Electron and the ENWL IT Team refined the trading management process and its associated data table (table C1), it was also necessary to include data tables associated with the existing functions of Merit Order (table B1) and Look Ahead (table B2).

Table 5: Data Table B1 - Merit Order

Field ID	Field	Description	Format	Purpose	Notes
44	Times tamp	Date and time of creation	UTC?	Traceability, version control	Check format
45	Stack Order	TBC	TBC	Merit order determination	
46	Contr act ID	Unique ID for resource	TBC	Identification of asset	Same as 'Resource ID' in the Constraint Look-Ahead (table b2)
47	Contr act Oper ation Type	Contract type (curtailable, non-curtailable, flexible service etc.)	TBC	Network management, obligation fulfilment, settlement	
48	Value	Amount of capacity offered	TBC	Merit order determination, settlement	
49	Unit	Quantitative definition of flexibility service	TBC	Network checks, Merit order determination	Based the type of flexibility service, generation turn up, demand turn down etc.
50	React ive MEC	Reactive Maximum Export Capacity	TBC	TBC	
51	MIC	Maximum Import Capacity	TBC	Network checks, Merit order determination	
52	React ive MIC	Reactive Maximum Import Capacity	TBC	TBC	
53	MEC	Maximum Export Capacity	TBC	Network checks, Merit order determination	

54	Resource Name	Name of flexibility asset	TBC	Identification of asset	
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Table 6: Data Table B2 - Look Ahead

Field ID	Field	Description	Format	Purpose	Notes
55	Timestamp	Date and time of creation	UTC?	Traceability, version control	Check format
56	Period	Time, date and length of constraint	TBC	Network management, obligation fulfilment, settlement	
57	Constraint ID	Identifier of constraint location	TBC	Network management, Customer suitability, Merit order determination	Not sure if this is network name, network ID – must be location specific
58	Constraint size	Volume of flexibility service required	TBC	Network management, Merit order determination, obligation fulfilment, settlement	Unsure of unit applicability or range
59	Units	The units the magnitude is measured in	TBC	Network management, Merit order determination, obligation fulfilment, settlement	
60	Resource ID	Unique ID for resource	TBC	Identification of asset	
61	Resource Name	Name of flexibility asset	TBC	Identification of asset	
62	Timestamp	Date and time of creation	UTC?	Traceability, version control	Check format

Table 7: Data Table C1 - Bilateral Trading

Field ID	Field	Description	Format	Purpose	Notes
63	Timestamp	Date and time of request creation	UTC?	Traceability, version control	Check format
64]	Constraint ID	Identifier of constraint location	TBC	Network management, Customer suitability, Merit order determination	
65	Constraint size	Volume of flexibility service required	TBC	Network management, Merit order determination, obligation fulfilment, settlement	Unsure of unit applicability or range
66	Stack Position	Place in Current MOL of obligation being traded	TBC	Merit order determination, obligation fulfilment, settlement	
67	Contract Operation Type	Contract type (curtailable, non-curtailable, flexible service etc.)	TBC	Network management, obligation fulfilment, settlement	

68	Traded Volume	Volume of flexibility service offered	TBC	Network management, Merit order determination, obligation fulfilment, settlement	Originating from customer bidding to fulfil
69	Trade Price	Cost of flexibility service offered	TBC	Network management, Merit order determination, obligation fulfilment, settlement	Originating from customer bidding to fulfil
70	Traded Stack Position	Place in traded MOS of obligation being traded	TBC	Merit order determination, obligation fulfilment, settlement	
71	Total Fulfilment Volume	Volume of traded and accepted flexibility services from market participants	TBC	Merit order determination, obligation fulfilment, settlement	Communicated to Host DNO by the trading platform
72	Total Fulfilment Cost	Costs of traded and accepted flexibility services from market participants	TBC	Merit order determination, obligation fulfilment, settlement	

2.2.3 Trading Management Functional Requirements

The functional requirements linked to the trading process, and applicable to simulation and live trials stages of the project are as follows:

Table 8: Trading Management Functional Requirements

Grouping	As a	I want	So that
Merit Order	DNO	To have a starting master merit order for each constraint zone based on existing flexibility providers	The initial route to dealing with the constraint is known
Merit Order	DNO	To be able to forecast possible constraint events based on static and dynamic data	Assets providing flexibility can be evaluated for suitability in resolving the constraint
Merit Order	DNO	To be able to see if assets are available to be utilised to resolve a forecasted constraint	The constraint can be successfully resolved
Merit Order	DNO	To be able to publish the details of the constraint and the suggested (Master?) Merit order produced by ANM on to the Trading Platform signalling gate opening	Participants can review the requirements and Merit Order to determine if trading is required
Trading	Market Operator	To be able to filter participants based on the constraint type and location	I can communicate the constraint details to parties that may be able to trade
Trading	Curtailed Participant	To be able to get details of the constraint in a timely manner	I can determine if I am able to fulfil the obligation that has been set out by the DNO

Trading	Non-curtailable Participant	To be able to get details of the constraint in a timely manner	I can determine if the date/time and volumes required are suitable for me to offer flexibility services
Trading	Participant (all Types)	To be able to issue volume and price proposals for flexibility to meet the requirements of the constraint	The Market Operator can administer the trading process
Trading	Market Operator	To be able to prioritise the price and volume proposal that have been received from the participants	The constraint can be resolved based on lowest cost , then largest volume basis
Trading	Market Operator	Capability to re-order the master merit order stack, following trade matching	It can be communicated with the DNO to replace the Merit Order
Merit Order	DNO	Verify the Traded Merit Order received from the trading platform following gate closure	I can be sure that the assets are available and can fulfil the requirement
Trading	Market Operator	Communicate the finalised Merit Order, Volume and Pricing to the successful trading participants	The contracts for the constraint are finalised.
Merit Order	Participant (all Types)	Receive confirmation of successful trades in a timely manner	I can prepare for the flexibility provision and understand the financial impact of the trade.
Fulfilment	DNO	Update ANM with the verified and finalised Merit Order	Control signals are sent to the correct assets during the constraint window
Fulfilment	DNO	To check that the asset on the Merit Order List is available	I can confirm that control signals can be sent and received
Fulfilment	DNO	To be able to issue the control signal to the asset	To begin the flexibility event
Fulfilment	DNO	To be able to issue the control signal to the asset	To end the flexibility event
Fulfilment	DNO	To be able to remove assets from the merit order list	If no response to control signals is received, an alternative asset can be used to fulfil the flexibility requirement
Fulfilment	Non-curtailable Participant	To be able to know when my flexibility provision will begin and end	I can ensure that the service is provided when required
Fulfilment	Curtailable Participant	To be able to know when my flexibility provision will begin and end	I can ensure that the service is provided when required
Fulfilment	Market Operator	To be able to know when the provision traded has been fulfilled	I can trigger verification of the trade.

Fulfilment	DNO	To generate Trades reports and send them to host DNO	I can inform the Market Operator which assets were used to resolve the constraint
Dispatch	Market Operator	Capability by the trading platform to issue dispatch instructions to participants via SCADA	I can instruct participants to begin fulfilling their trade obligation
Dispatch	Market Operator	Capability by the trading platform to issue dispatch instructions to participants via API	I can instruct participants to begin fulfilling their trade obligation
Trading	Market Operator	Capability to receive and store constraint look-ahead and master merit order stack files from the host DNO's ANM system	I can initiate trade and store for audit and assurance purposes
Trading	Market Operator	Capability to filter constraint look-ahead and master merit order stack by participant	I can ensure suitability of trade participants
Trading	Market Operator	Capability to notify participants about the upcoming trading opportunities	I can allow possible participants to evaluate trading opportunities
Trading	Market Operator	Capability to accept bid / offer submissions from participants, consisting of asset identifier field, price, volume, self-declared baseline, and time windows	I can facilitate the trade
Trading	Market Operator	Capability to impose market deadlines, e.g., bid/ offer submissions deadline and others.	I can ensure compliance with host DNO constraint timelines
Trading	Market Operator	Capability to match trades based on the agreed trade matching process	I can facilitate the trade
Trading	Market Operator	Capability to return the "traded" master merit order stack to host DNO	The host DNO can update their systems
Trading	Market Operator	Capability to receive and store updated constraint forecasts.	I can update the trading opportunity with accurate information
Trading	Market Operator	Capability to compare the updated constraint forecast with the original constraint forecast.	I can store for audit and assurance capability
Trading	Market Operator	Capability to cancel trades if one of the trade counterparties no longer appears on the constraint forecast.	I can ensure the obligation can be fulfilled
Merit Order	Market Operator	Capability to update the master merit order stack following trade cancellations.	I can ensure the obligation can be fulfilled
Merit Order	Market Operator	Capability to notify participants about trade cancellations.	I can ensure participants have accurate information about trading opportunities

Merit Order	Market Operator	Capability to return the updated master merit order stack to host DNO.	The DNO can update its systems
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2.3 Verification and Settlement Process

A Settlement process, produced by EGL and ENWL IT, was supplemented by Electron who detailed the trade verification process which would need to happen within the Trading Platform and, as such, this would become a sub process of Settlement. Section 2.3.1 provides an overview of the Trade Verification sub process, Section 2.3.2 is an overview of the Settlement Process, Section 2.3.3 contains the data tables for the processes, section 2.3.4 details the functional requirements linked to the processes and Section 2.5 includes non functional requirements.

2.3.1 Trading Verification Overview

The trade verification process within the trading platform is a crucial step in ensuring the accuracy and legitimacy of trades executed by BiTraDER participants (both curtailable and non curtailable). It involves several steps and checks to verify and confirm the details of a trade before it is executed and settled. When a participant submits a commitment to buy or sell a flexibility service through the TP, the platform's order management system records the trade based on specified parameters such as the quantity, price, and type.

The process diagram, created by Electron and reviewed by EGL and ENWL contains the following steps:

1. Updated Constraint Look-Ahead file is sent to the Trading Platform.
2. Trades are verified against the updated look-ahead for the next settlement period
3. A) Notification is sent to a customer informing of the trade cancellation
3. B) TP updates the merit order stack for the next settlement period
4. TP sends the final traded merit order stack to Host DNO
5. The Final merit order stack for the next settlement period is confirmed.

2.3.2 Settlement Process Overview

In the context of BiTraDER, settlement refers to the process of finalizing and completing the financial transactions associated with the trading of flexibility products or services.

Using the determined price from the trading window and the various bids from BiTraDER participants, the settlement function calculates the financial obligations for each participant involved in the trading process. This calculation takes into account the quantity of flexibility service or curtailment, the duration of the imbalance, and the agreed-upon terms and conditions. Based on the settlement calculations, invoices are generated for each participant, detailing the financial obligations they owe or are owed. These invoices include information such as the quantity of flexibility, the price, and any additional information such

as final MOS position. Participants are then responsible for settling these invoices by making payments or receiving payments, depending on their net position.

The settlement process should operate on a predefined settlement period, depending on the trading rules. At the end of each settlement period, the invoices and payments are reconciled, and the net positions of participants are determined. Settlement amounts are then transferred between participants to settle the financial imbalances. Throughout the settlement process, various reports and documentation are generated to provide transparency and accountability such as the exception report and the settlement report referred to in tables D1 and D2.

Efficient and accurate settlement processes will be essential in BiTraDER to ensure fairness, transparency, and trust among participants. They will help to facilitate the smooth exchange of flexibility services, enable accurate financial reconciliation, and provide both curtailable and non curtailable participants with the necessary information to evaluate their performance and manage their financial positions.

The process diagram, created by EGL and revised by Electron and ENWL contains the following steps:

1. A) Execution report is generated to confirm obligation fulfilment (table d1).
1. B) Seller submits meter data to the trading platform
2. Meter data is compared against the baseline and performance is verified
3. A) Settlement report is issued to Buyer with invoice
3. B) Settlement report is issued to Seller
4. A) Buyer accepts the report? If yes, Step 7a, otherwise step 5
4. B) Seller accepts the report? If yes, Step 7a, otherwise step 5
5. Clarification and/or dispute procedure is initiated
6. Market Operator updates the disputed baseline in the trading platform
7. A) Trade is recorded as completed
7. B) Trades report received
7. C) Customers’ curtailment index adjusted based on the market outcomes
8. Buyer confirms Invoice details and makes the payment
9. Payment Received by MO
10. Market Operator transfers the payment to the Seller
11. Seller confirms Receipt

2.3.3 Settlement Process Data Tables

The data table for Execution report which as the trigger for the settlement process has been defined as table D1, whilst the settlement report data is within table D2.

Table 9: Data Table D1 - Execution Report

Field ID	Field	Description	Format	Purpose	Notes
73	Timestamp	Date and time of request creation	UTC?	Traceability, version control	Check format

74	Constraint ID	Identifier of constraint location	TBC	Network management, Customer suitability, Merit order determination	
75	Constraint size	Volume of flexibility service required	TBC	Network management, Merit order determination, obligation fulfilment, settlement	
76	Stack Position	Place in the fulfilled master MOL	TBC	Merit order determination, obligation fulfilment, settlement	
77	Contract Operation Type	Contract type (curtailable, non-curtailable, flexible service etc.)	TBC	Network management, obligation fulfilment, settlement	
78	Traded Volume	Volume of flexibility service fulfilled	TBC	Network management, Merit order determination, obligation fulfilment, settlement	

Table 10: Data Table D2 - Settlement Report

Field ID	Field	Description	Format	Purpose	Notes
79	Timestamp	Date and time of request creation	TBC	Traceability, version control	
80	Constraint ID	Identifier of constraint location	TBC	settlement	
81	Resource ID	Unique ID for resource	TBC	Identification of asset	
82	Resource Name		TBC	Identification of asset	
83	Stack Position	Place in Current fulfilled Merit order	TBC	settlement	
84	Contract Operation Type	Contract type (curtailable, non-curtailable, flexible service etc.)	TBC	settlement	
85	Traded Volume	Traded service volume	TBC	settlement	
86	Baseline Volume	Baseline volume	TBC	settlement	

87	Measured Volume	Meter reading	TBC	settlement	
88	Delivered Volume	Actually, delivered volume	TBC	settlement	Baseline compared against the measured volume
89	Total Amount	Total cost	TBC	settlement	
90	Utilisation Amount	Utilisation cost	TBC	settlement	
91	Availability Amount	Availability cost	TBC	settlement	

2.3.4 Settlement Functional Requirements

The functional requirements linked to the trading process, and applicable to simulation and live trials stages of the project are as follows:

Table 11: Settlement Functional Requirements

Grouping	As a	I want	So that
Settlement	Participant (all Types)	To be able to send meter data to the trading platform	I can evidence the flexibility service provided
Settlement	Market Operator	Compare the meter data with the trade requirements to verify the trade	A confirmation report can be issued to the DNO to allow them to raise an invoice to the buyer for the cost of the flexibility trade
Settlement	Market Operator	Compare the meter data with the trade requirements to verify the trade	An Invoice can be raised to the buyer for the cost of the flexibility trade
Settlement	DNO	To receive confirmation that the flexibility provision was as per the requirement	The impacts on the network can be fully understood
Settlement	DNO	Receive payment for the flexibility from the buyer	I can make payment to the seller
Settlement	Market Operator	Receive payment for the flexibility from the buyer	I can make payment to the seller

Settlement	Participant (All Types)	To know when payment is made or received	I can know the financial impact on the business
Settlement	DNO	To know what trades were successful	I can update the curtailment index and Merit Order List
Settlement	Market Operator	Capability to generate invoices after trades are completed	I can ensure correct financial information is provided for the trade
Settlement	Market Operator	Capability to receive and store participant meter data.	I can ensure trading obligation has been carried out accurately
Settlement	Market Operator	Capability to receive and store host DNO's Execution reports.	I can be aware of the end of a constraint period and have applicable network information
Settlement	Market Operator	Capability to carry out performance measurement and verification.	I can ensure determine the effectiveness of the trade
Settlement	Market Operator	Capability to generate settlement reports and present them to buyers and sellers.	I can ensure all participants have information on final prices and volumes for the trade
Settlement	Participants (all Types)	Capability to accept or reject settlement reports (by market participants).	I can communicate my satisfaction / dissatisfaction with the accuracy of the report
Settlement	Market Operator	Capability to record trades as completed after dispute is resolved	I can resume the settlement process
Settlement	Market Operator	Capability to notify the market operator about rejected settlement reports and other events.	The host DNO can update their systems
Settlement	Market Operator	Capability to notify participants about settlement reports and other events.	I can ensure that all participants have the correct information in a timely manner

2.4 Systemwide Non- Functional Requirements

This section describes the key non-functional requirements, identified by ENWL IT team for inclusion in this report and that will be applicable to the BiTraDER processes for the simulation and live trials stages of the project. Please note that all security related non-functional requirements are documented in a separate Cyber Security report.

Table 12: Systemwide Non Functional Requirements

Grouping	As a	I want	So that
Audit	Internal Audit	All system and manual users' access to BiTraDER systems are logged in their respective systems.	The logs are available to review the users who accessed the system and assess any lapses if required
Audit	Internal Audit	All activities performed by system and manual users are logged and available for analysis.	To support any audit concerns that may arise as per the legal rules
Audit	Internal Audit	Logs of High Privilege access to systems granted by Administrator and the associated system activities should be available for Audit purposes.	To support any audit concerns that may arise on why additional privileges are granted
Audit	Internal Audit	The data is stored and processed within the system depending on its criticality and confidentiality classification.	Depending on the data classification appropriate controls can be enforced
Audit	Internal Audit	The data should be archived in the industry standard format and can be retrieved easily.	Data can be retrieved in a timely way as required
Service	Service Manager	The system is available for use 24 hours over 7 days a week, during the trial period.	End users can access the system to carry out their tasks with no limitations
Service	Service Manager	The system should have the overall 99.99% availability during the trial period with predefined maintenance schedules.	System is available except for the predefined maintenance schedules

Service	Service Manager	The system should have the capability for automatic monitoring its performance, availability, utilisation, failures etc.. And raise alerts through predefined service management tool, concern team or person	System availability and utilisation reports are available for review and take appropriate actions as required
Service	Service Manager	BiTraDER platform should be made available for the following User Groups. They will access these systems either from their offices, homes, or anywhere within UK. Customers, Market Operator and DNO	All the required users can access the systems as per the predefined rules within UK
Service	Service Manager	BiTraDER platform must have at least the following environments during build, testing and trials: Production Test Environment Development Training	Standard application development life cycle and service management processes can be adopted
Service	Service Manager	All the environments should have the following response time irrespective of whether they are accessed from office, home or anywhere in the UK Screen Load time : <5 secs Screen Refresh time: <2 secs Transaction Processing time: <2 Secs	BiTraDER systems are user friendly and respond to users in a timely fashion
Disaster Recovery	Business Continuity Manager	Process, Roles, and procedures are defined and documented for Disaster Recovery (DR) and Business Continuity Process (BCP). These are tested and the	DR and BCP process are available in the event disaster occurs

		documents are updated prior to the trials.	
Disaster Recovery	Business Continuity Manager	BiTraDER system should have a Recovery Time Objective (RTO) of 1 hour Maximum.	BiTraDER platform can be recovered fully and made operational within this window
Disaster Recovery	Business Continuity Manager	BiTraDER system should have a Recovery Point Objective (RTO) of 0 hours to avoid any data loss of critical trading transactions that are performed between participants.	No data is lost in the event a disaster occurs
Disaster Recovery	Business Continuity Manager	BiTraDER system must be capable of handling Data Storage of 0.5TB	All data storage needs can be met for the trial period
Usability	Customer	BiTraDER platform should work on all supported browsers	Users customers can access the platform from their browser of choice

3. Logical System Architecture

As part of this phase of work, ENWL and EGL have undertaken initial logical systems architecture development. This was the process of designing and defining the logical structure and components of a BiTraDER. It involved creating a high-level representation of the system's functionality, interactions, and data flows, without delving into the specifics of implementation or technology choices. The activity followed a structured approach, which included understanding and documenting the projects' needs, goals, and the functional and non functional requirements of the system.

EGL created a conceptual model that represents the high-level structure and behaviour of the system. This includes identifying major system components, defining their interactions, and outlining the data flow between them as well as selecting appropriate architectural patterns and design principles that best fit the system's requirements and objectives. It was also necessary to identify and design the data entities and relationships required to support the system's functionality.

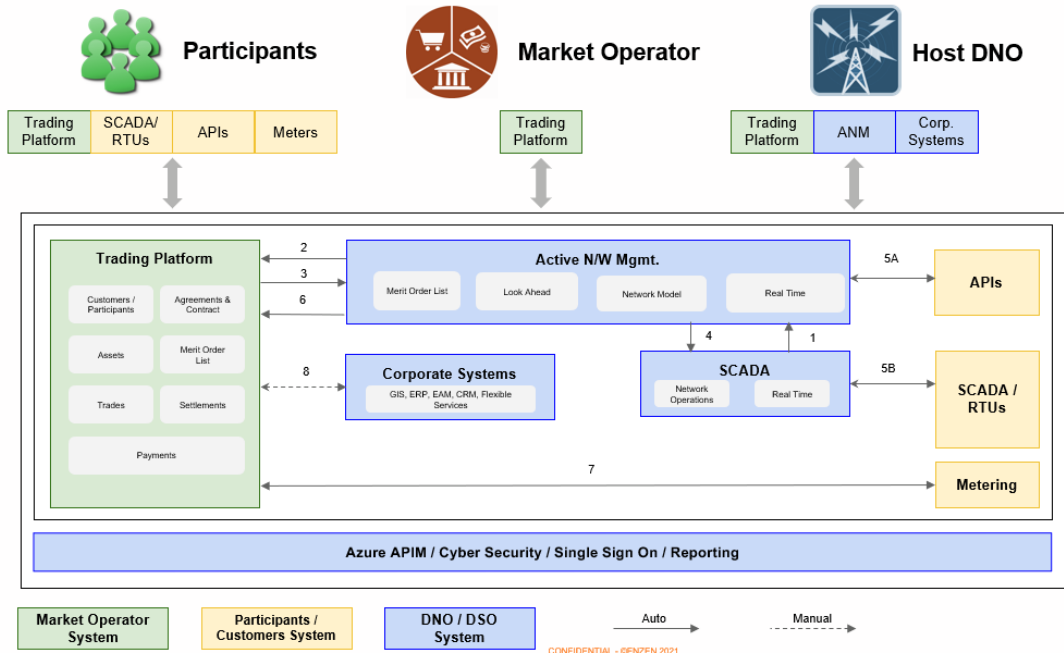


Fig.1 : Logical Solution Landscape produced by EGL

Logical interfaces provide a clear and standardized way for components to interact, enabling system integration, interoperability, and the ability to replace or upgrade components without affecting the overall system functionality. They serve as a contract between components, allowing them to work together effectively while maintaining modularity and separation of concerns. ENWL and EGL have defined the initial list of logical interfaces which can be used for further development purposes as the project moves into the high level design phase. These initial logical interfaces can be seen in the table below.

Table 13: Initial Logical Interfaces

ID	Source System	Target System	Direction / Auto	Message
1	SCADA	ANM	1-way / Auto	Available Resource List / Real Time operational Assets
2	ANM	Trading Platform	1-way / Auto	Look Ahead (Constraints List), post event execution reports
3	Trading Platform	ANM	1-way / Auto	Traded Merit Order List
4	ANM	SCADA	1-way / Auto	Execution Command / Switching Sequence List
5A	SCADA	RTU's	2-way/Auto	Manage Dispatch Start & End Signal for Curtailable Assets
5B	ANM	APIs	2-way / Auto	Manage Dispatch Start & End Signal for Non-Curtailable Assets

6	ANM	Trading Platform	1-way/Auto	Post Event Execution Report
7	Metering	Trading Platform	2-way / Auto	Volume of flexibility service provided.
8	Trading Platform	Corporate systems	1-way / Manual	Asset details verification

