



# **Market Management System for Moldelectrica**

## **Implementation Approach and Timeline**

**Proposal**

Unicorn © 2025 – Unicorn Market Systems a. s.  
Jankovcova 1037/49, CZ – 170 00 Prague 7

Project: Market Management System for  
Moldelectrica  
Project – Subject: Implementation Approach and Timeline  
Document Title: Proposal

Author: Unicorn Systems

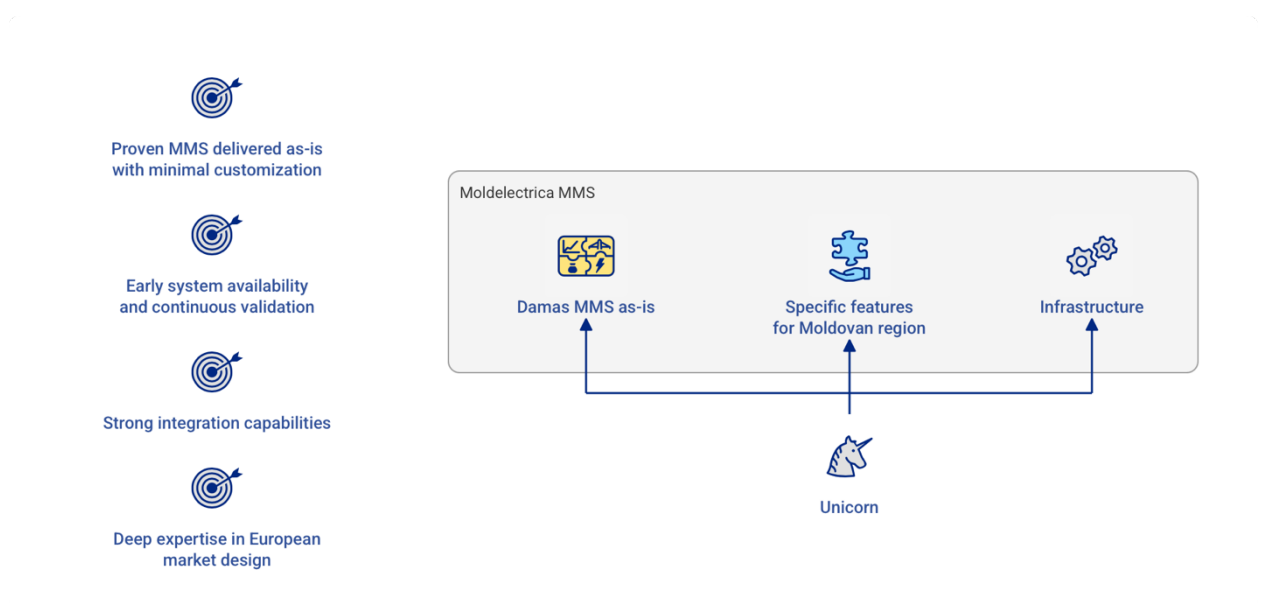
Contact: E-mail: [info@unicorn.com](mailto:info@unicorn.com)  
Tel.: (+420) 723 523 980



## 1. Executive Summary

This document represents a proposal of Unicorn Systems a.s. for Transmission System Operator **Energy Market Management Platform with implementation services** organised by **SE Moldelectrica**.

**Given our experience and references, mainly the Transelectrica Market Management system, we believe we are the best supplier for the job.**



### 1.1 About Unicorn

**Unicorn is a well-established vendor of information systems and services.** Unicorn was established in 1990 and since then, we have provided dozens of solutions for liberalised European energy markets. We have unique experience working with various energy market actors like:

- **Pan-European or international initiatives** – ENTSO-E, TERRE Group, MARI Group, eSett, Fifty, JAO, Coreso, TSCNet, Selene CC etc.
- **National TSOs** – Transelectrica, Ukrenergo, ČEPS, SEPS, Statnett, REN, Swissgrid, Amprion, Terna, Litgrid, IPTO etc.
- **Other market parties** – DSOs, Guarantees of Origin Issuing Bodies, Flexibility Aggregators, Energy Traders etc.

In relation to the scope of the Moldelectrica MMS, we believe we are particularly well-suited for this assignment due to our extensive experience in delivering market management solutions across various electricity market configurations, including for neighbouring TSOs to Moldavia. **Due to our long-term cooperation, especially with TransAmerica we are well-aware of Moldova's energy market development, its goals, time schedule and market specifics.**

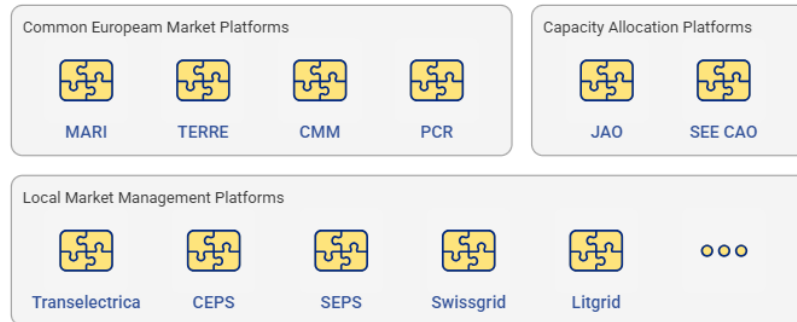


Figure 1 - Unicorn Experience

Moreover, thanks to our broad experience in developing not only national market management systems but also pan-European platforms such as LIBRA, MARI, CMM, JAO, and the ENTSO-E Transparency Platform, our solutions are designed not only to sustain the Moldovan market “as is,” but also to **support its future evolution and progressive integration into the European electricity market.**

## 1.2 Proposed Solution

Proposed solution utilizes our deep understanding of the region specifics and standard functionality of Damas MMS. Due to our experience, our product, **Damas MMS, covers all requested** areas such as Transmission services, Ancillary services, Balancing services, Settlement services, except few specific features targeting the Moldavian market. Therefore, this proposal targets to deliver Damas MMS product in as-is status, and includes specific Moldovan use cases, such as specific features regarding the Transnistrian region.

### 1.2.1 Damas MMS

In the last decade, the energy industry has become one of our major points of interest. We have designed and developed dozens of large information systems for TSOs and other market participants across Europe, and our consultants have participated in a great number of international energy integration projects. Damas MMS is a product that is continuously developed within our company for more than 25 years and has more than 15 installations across Europe for electricity and gas TSOs and HVDC operators.

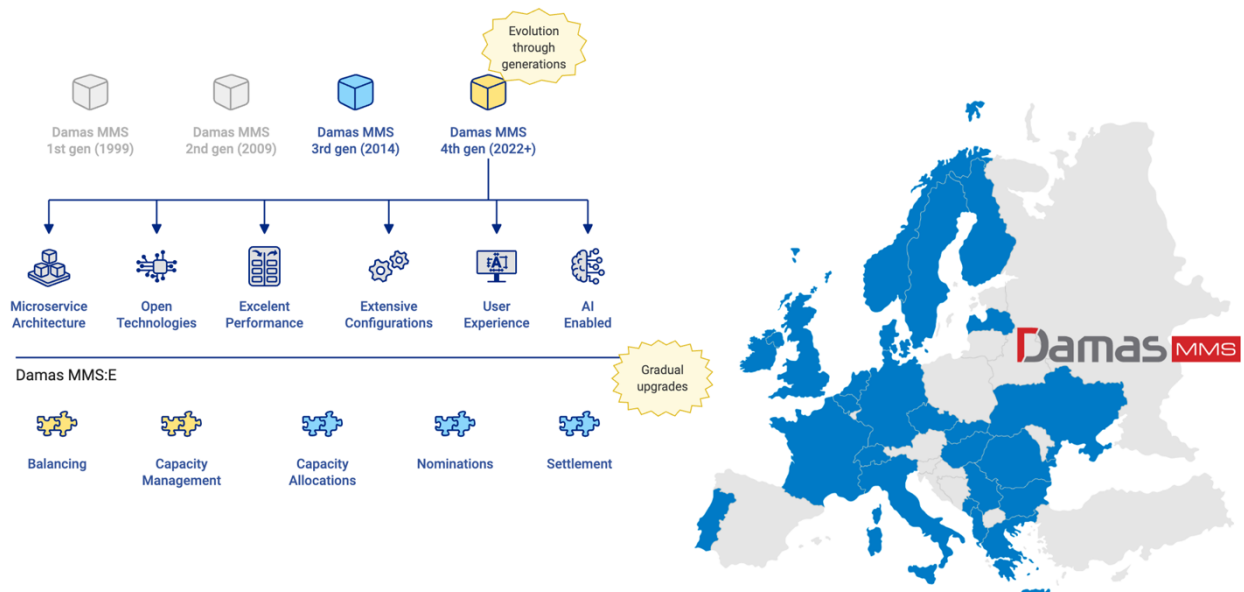


Figure 2 - Damas MMS and Its Generations in European Context

Damas MMS supports the implementation of European legislation packages in national markets and covers the following functional areas:

- System and ancillary services
- Balancing capacity market
- Balancing energy market
- Transmission capacity allocation and congestion management
- Short-term markets
- Settlement and invoicing

Damas MMS has been undergoing intergenerational upgrades and for the Moldelectrica MMS we propose our latest – **4<sup>th</sup> generation of the product, that is based on modern web technologies and utilizes microservice architecture.**

## 1.2.2 Moldelectrica MMS

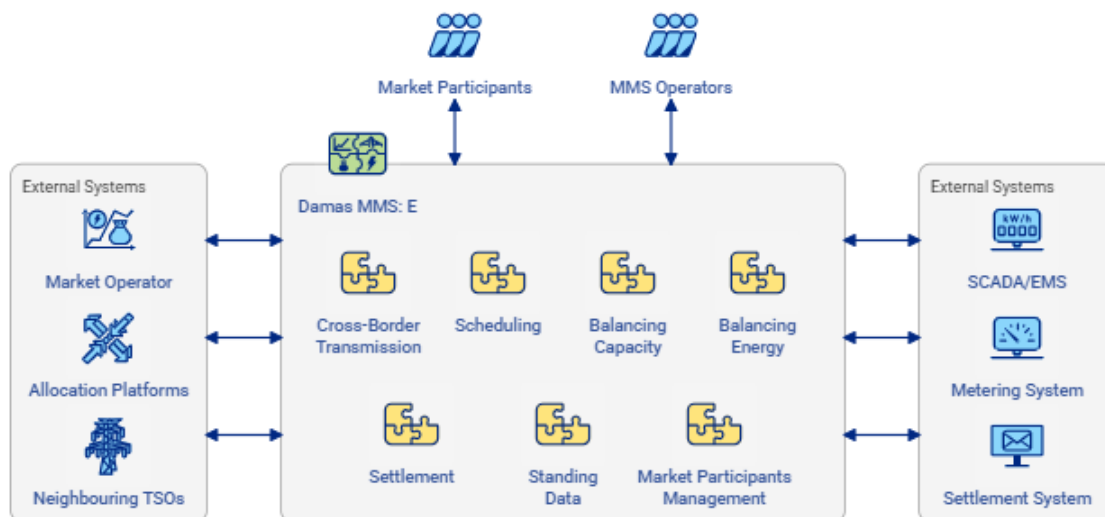


Figure 3: Moldelectrica MMS

Key features of the proposed Moldelectrica MMS:

- **Standard product Damas MMS platform along with standard business modules reflecting our experience with neighbouring TSO in Romania.**
- Functionality covering compensation schedule for Transnistrian region and procurement of transmission losses according to Moldelectrica requirements enrich standard modules functionality.
- **Standard application Enelane** for integration with internal and external systems, including many ready to use connectors for systems like MARI or PICASSO. Dataflows will be delivered with standard data exchange patterns using standard dataformats
- **Modern microservice architecture**
- **Proven and stable solution** deployed at many European TSOs

### 1.3 Delivery Approach

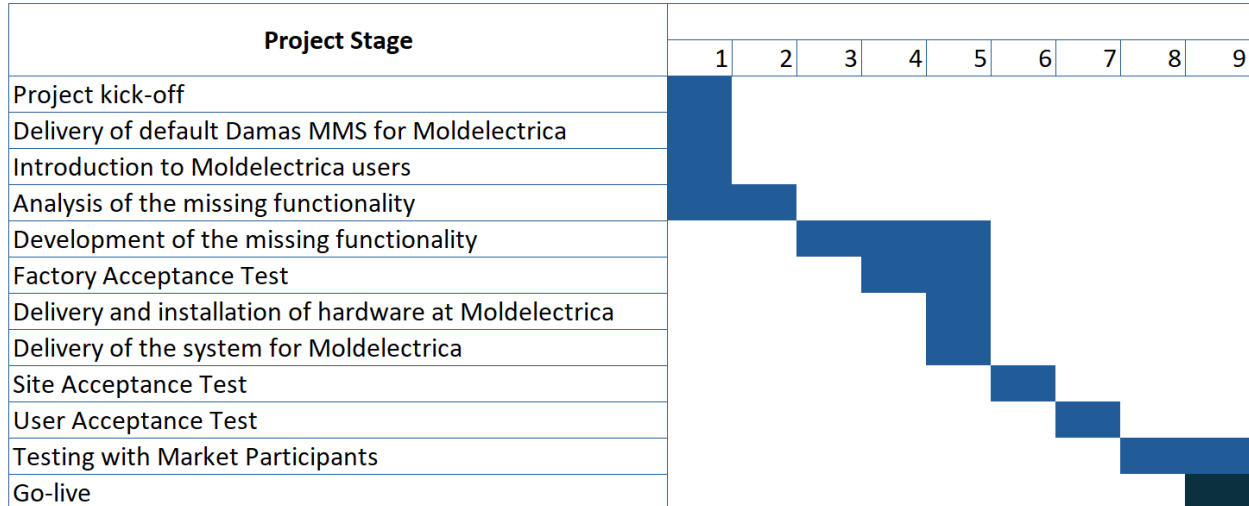


Figure 4 - Timeline of the Project

The proposed delivery approach follows a **hybrid waterfall–agile model**, combining structured upfront design with iterative development. The project starts with a dedicated analysis phase, during which business and technical requirements are elaborated and formally approved by the Customer. This ensures a stable and agreed baseline before entering the development phase, reducing uncertainty and implementation risk.

Following the analysis phase, the implementation is carried out using **4-week development sprints**, enabling incremental delivery of functionality and continuous validation. Each sprint delivers production-ready components that are progressively deployed to the testing environment and made available for Factory Acceptance Testing. While development and intermediate validation are performed iteratively, the project includes a **consolidated testing phase** and a **single coordinated go-live at the end of the project**, ensuring full end-to-end validation of the solution and a controlled transition to operations.

### 1.4 Why Unicorn?

- **Proven MMS delivered as-is with minimal customization** – We propose to deploy a fully operational Market Management System already in use at European TSOs (e.g. Romania), requiring only limited additional development specific to Moldelectrica (such as grid losses and Transnistria compensations). This approach ensures that Moldelectrica will always have a working solution available for go-live, significantly reducing delivery risk.
- **Deep expertise in European market design** – Extensive experience with balancing, capacity management and settlement processes aligned with ENTSO-E standards and evolving regulatory frameworks.
- **Early system availability and continuous validation** – Deployment of the base product early in the project enables immediate user involvement, fast feedback and validation of real system behaviour.
- **Strong integration capabilities** – Proven experience in integrating with complex energy ecosystems, including external platforms, TSOs and market participants using standard protocols and interfaces.



- **Reliable long-term partner for critical systems** – Track record of delivering and supporting mission-critical market systems with high availability, continuous evolution and 24/7 operational support.

## 2. Content

1. Executive Summary.....	3
1.1 About Unicorn.....	3
1.2 Proposed Solution.....	4
1.2.1 Damas MMS.....	4
1.2.2 Moldelectrica MMS.....	6
1.3 Delivery Approach.....	7
1.4 Why Unicorn?.....	7
2. Content.....	9
3. Company Overview.....	12
3.1 Unicorn Introduction.....	12
3.2 Relevant Experience.....	13
4. Solution Concept.....	17
4.1 Market Participant Registration and Standing Data.....	18
4.1.1 Market Participants Management.....	18
4.2 Secure Software Development Life Cycle.....	19
4.3 OIDC and Identity Management.....	19
4.3.1 Master Data Management.....	21
4.3.2 Process Activities Management.....	27
4.4 Scheduling Process.....	28
4.4.1 Domestic Scheduling.....	28
4.4.2 Cross-border Scheduling.....	29
4.4.3 Validations.....	31
4.4.4 Matching.....	32
4.4.5 Emergency Schedules.....	34
4.4.6 Final Confirmations.....	34
4.4.7 Cross-border Schedule Reduction by TSO.....	35
4.4.8 Compensation Schedule for Transnistrian Region.....	36
4.5 Cross-border Capacity Market.....	36
4.5.1 Transmission Capacity Management.....	36
4.5.2 Capacity Allocation and Nomination Management.....	40
4.6 Balancing Market.....	43
4.6.1 Balancing Capacity Market.....	43
4.6.2 Balancing Energy Market (mFRR).....	58
4.6.3 Balancing Energy Market (aFRR).....	70
4.7 Settlement.....	70
4.7.1 Imbalance Settlement (BRP Settlement).....	71
4.7.2 Balancing Energy Settlement.....	73
4.7.3 Grid Losses Settlement.....	73
4.7.4 TSO–TSO Settlement (Cross-Border Settlement / CBT).....	73
4.8 Procurement of Grid Losses.....	74
4.9 Reporting.....	75
4.10 Integrations.....	75
4.10.1 Data Exchanges covered by the Damas MMS.....	78

4.10.2	Data exchanges to be implemented .....	79
4.11	Damas Generic Features .....	79
4.11.1	Process Management.....	79
4.11.2	Messages and Monitoring.....	81
4.11.3	User Management .....	83
5.	Solution Architecture .....	85
5.1	Architecture and Infrastructure .....	85
5.2	Logical infrastructure configuration .....	88
5.3	Application architecture layer design.....	90
5.4	Configurability.....	92
5.5	Data Management.....	95
5.6	Documentation .....	97
5.7	Identity and Access Management .....	97
5.8	Integration Capabilities.....	98
5.9	Preliminary HW Resources Sizing (IT Architecture).....	102
5.10	Software Platform / Core .....	103
5.11	Usability.....	105
6.	Hardware .....	110
7.	Delivery Project Plan .....	111
7.1	Our Approach .....	111
7.2	Project Timeline.....	112
7.3	List of Deliverables .....	114
7.4	RACI Matrix .....	115
7.5	Expected Cooperation.....	116
7.6	Risk Management .....	118
8.	Trainings.....	119
9.	Project Organization .....	120
9.1	Organization and Communication Schema.....	120
9.1.1	Customer's Project Team .....	121
9.1.2	Vendor's Integration Team .....	122
9.1.3	Vendor's Delivery Team(s).....	123
9.1.4	Maintenance and Support Organization Team.....	123
9.2	Unicorn's Experts .....	123
10.	Damas terms and conditions.....	124
11.	Working Assumptions.....	125
12.	Continuous Services .....	127
12.1	Maintenance and Support .....	127
12.1.1	SLA parameters.....	128
12.2	Helpdesk .....	129
12.3	Project Management .....	129
12.4	Incident Management.....	129
12.5	Bug-fixing and Release Management .....	130
12.6	User Support .....	130



- 13. List of Delivered Functional Use Cases ..... 131
  - 13.1 List of Standard Functional use Cases..... 131
  - 13.2 List of Custom Use cases to be Implemented for Moldelectrica ..... 147
- 14. Comments and remarks ..... 149

### 3. Company Overview

We would like to deliver the project in close cooperation with our partner Artelys. Our companies are introduced briefly in this Chapter. Additional detailed information is available on company websites.

#### 3.1 Unicorn Introduction

Unicorn Systems is a leading vendor of information systems for the European energy industry and utilities. In the last 30 years, we have successfully implemented many projects for companies from several European countries, both for national environments and for the support of international cooperation. We have acquired ample experience in the production software support, trading and its organizing in liberalized markets, technical solutions for network management support, and sophisticated solutions for energy infrastructure management. We have acquired unique know-how in the course of these projects, which we can offer now to our clients via state-of-the-art solutions, creating high added value for the energy industry and utilities.



While Unicorn Systems provides solutions for all areas of the energy industry, we specialize in organization and operation of energy markets. Most of our solutions are designed specifically for transmission and distribution system operators, energy exchanges, market operators and traders. They provide standardized features made available through our products and platforms, as well as outstanding integration and communication abilities built on state-of-the-art open technologies and standards.

The strengths of Unicorn Systems include the ability to provide a solution tailored specifically to the customer's requirements. To achieve this, we, as their systems integrator, combine the technologies most suitable for the customer's purpose or best fitting their environment. We are always ready to address highly specialized tasks through custom development, preferably with the use of proven open-source technologies. In this way, we have built, and we continue to improve our extensive libraries of energy components providing universal foundations for the architecture of modern information systems.

We also provide comprehensive services for systems integration, custom development, operation, and first- and second-line support processes. Besides that, we handle end-to-end infrastructure deliveries, or support our clients with the hosting and operation of information systems in public or private clouds.

With the unique know-how gathered from our projects, we can offer our energy and utility customers the best solutions with the highest added value. We have one of the largest European expert teams with energy industry market knowledge. We have been actively participating in the energy market liberalization and opening in many countries and are ready to support the market transformation processes further. We would like to highlight that Unicorn and Artelys have a long-term and successful cooperation.

For more details, please refer to <https://unicornsistemas.eu/>



#### References

During the 1998 Unicorn Systems delivered its first IT system in Energy sector. Until today Unicorn Systems has become well-established IT supplier for organisations and utilities in European energy market. Among the other customers from other fields, Unicorn Systems cooperates with the following energy & utilities customers:



Figure 5 - Unicorn's Key Energy Customers



We have one of the **largest European ICT expert teams** with energy industry market knowledge and can deliver even the most complex European integration projects. With the **unique know-how** gathered from our projects, we can offer our energy and utility customers the best solutions with the highest added value. We have been actively participating in the energy market liberalization and opening in many countries and are ready to **support the market transformation processes** further.





### 3.2 Relevant Experience






The proposed team gathers great expertise in short term energy assets operations optimization, markets modelling and real-time operational platforms delivery.










We would like to emphasize that recent Romanian MMS is **delivered by Unicorn**. We believe we may say that we successfully cope with related challenges, keeping strict deadlines and agreed budget:

Below is a summary of key relevant references:

Customer	Reference
	<p><b>Damas delivery for Transelectrica</b> is one of the biggest Damas installations. Covers all TSO agendas from Transmission and Scheduling Services to power grid Balancing and Settlement.</p> <ul style="list-style-type: none"> <li>• Generation and consumption planning</li> <li>• Ancillary Services Procurement</li> <li>• Continuous Balancing market and Dispatching Instructions</li> <li>• Handling power grid imbalance almost in real time</li> <li>• Second-line support</li> </ul>
	<p><b>Damas MMS for ČEPS</b></p> <p>It is the key market ICT system of Czech Transmission System Operator of electricity which 7x24 manages all important business processes and</p>

	<p>services in Czechia and abroad e.g. System services, Balancing Energy services, Settlement, Transmission services.</p> <ul style="list-style-type: none"> <li>• Ensures processes and energy services in TSO domain for 500 users over all Europe</li> <li>• Covers and automates whole process of Ancillary services – purchase, planning, nomination, settlement</li> <li>• Transmission services – ensures scheduling and cross border Intraday</li> <li>• Balancing energy – balancing market, activation and settlement</li> </ul>
	<p><b><u>Damas MMS for SEPS</u></b></p> <p>Damas is a market management system that allows SEPS to fulfil its mission and purpose as a Transmission System Operator. Damas manages key business processes and allows SEPS to fulfil requirements of European and national legislation</p> <ul style="list-style-type: none"> <li>• Ensures key business processes of Transmission System Operator</li> <li>• Transmission services, Balancing services and support of Settlement processes.</li> <li>• Central platform for participants of integrated daily market</li> <li>• Web based portal is reachable from anywhere for market participants and internal SEPS users</li> <li>• Rule based system allows to model processes in real time</li> </ul>
	<p><b><u>Damas Swissgrid</u></b> implemented Scheduling Management System (SMS) for internal, generation and cross-border scheduling. The last release also harmonized the scheduling rules with Austria, Germany and Italy. Apart of implementation, Unicorn is responsible for Maintenance &amp; Support with strict SLAs in 24x7 and continues in further development.</p>
	<p><b><u>SIME</u></b> Balancing Management Information System built upon the Damas MMS for Portuguese TSO REN. It allows to handle <b>short-term balancing markets</b>, especially organization of local mFRR and aFRR activation market and integration with MARI and PICASSO. The system integrates Optimization Module from Artelys responsible for MARI PT Clearing Engine and Disaggregation Engine to Physical Units level.</p>
	<p><b><u>Trans European Replacement Reserves for Exchange (TERRE)</u></b></p> <p>TERRE is the European implementation project for exchanging replacement reserves in line with the Guideline on Electricity Balancing. The aim of TERRE is to build the <b>Replacement Reserve (RR)</b> Platform and set up the European RR balancing energy market in order to create a harmonized market for the participants.</p> <p>Unicorn was in charge of the delivery of the <b>IT platform</b>, while Artelys was in charge of the <b>market clearing engine</b> and its integration into Unicorn platform. Both components are very robust and <b>highly available</b>.</p> <p>The solution is designed to handle up to 500 000 upward and downward balancing offers, perform the market clearing and return the results in a matter of minutes.</p> <p>The Libra platform, developed for TERRE is live since January 6<sup>th</sup> 2020 and <b>hosted by Unicorn</b>. It is operated 24/7 since the go-live and both Artelys and Unicorn are providing <b>24/7 support</b> to ensure steady operation of the system.</p>

<p style="text-align: center;"><b>MARI</b></p>	<p><b><u>Manually Activated Reserves Initiative (MARI)</u></b></p> <p>MARI is the European implementation project for the creation of the European mFRR platform. Its aim is to build a new mFRR balancing activation market by extending the Libra software solution built for the TERRE project.</p> <p>Similarly to TERRE, Unicorn is in charge of providing the market platform that includes the <b>business workflow</b> execution, the <b>market participants interface</b> and the integration to TSOs IT systems. Artelys is in charge of the <b>market clearing engine</b>.</p> <p>This system being much closer to real time than TERRE, a first preliminary study has been conducted in order to ensure feasibility of the activation market within the <b>very limited time</b> frame.</p> <p>After successful completion of this initial study, the implementation project is in progress and MARI V2 was just handed over for testing.</p>
 	<p><b><u>Common Nordic Capacity Market (aFRR, mFRR)</u></b> ensures coordinated procurement of balancing reserves for transmission system operators of the Nordic Synchronous Area. The goal is to increase socioeconomic welfare by allowing the parties to procure the most efficient balancing resources available in the whole Nordic region, taking into account network constraints.</p> <ul style="list-style-type: none"> <li>• Efficient usage of balancing resources</li> <li>• Multiple products – aFRR, mFRR</li> <li>• Cross-zonal capacity forecast</li> <li>• Bids selection optimization (FICO)</li> <li>• Public web for transparency</li> <li>• Availability 99.5%</li> </ul>
 	<p><b><u>Nordic mFRR Activation Market</u></b></p> <p>The Nordic Libra project aims at implementing a first version of <b>mFRR balancing market</b> matching the specific requirements of TSOs from Nordic region.</p> <p>Both Unicorn and Artelys are adapting the <b>Libra Platform</b> for that purpose and, in an <b>agile</b> setup, performing multiple deliveries with gradually increased scope.</p> <p>This resulted in a first implementation of the mFRR platform in less than a year. The solution is now in the process of qualification.</p>
	<p><b><u>Horizon 2020 OneNet: Traffic Lights and Flexibility Market AccessNet for TSOs, DSOs and Flexibility providers / Aggregators.</u></b></p> <p>AccessNet is solution in the Czech Republic for procurement of grid services from flexibility resources to resolve grid issues. The goal is to set-up flexibility register, detailed availability plans and outages of renewable production units, availability power, market mechanism and <b>TSO-DSO cooperation</b> scheme and involvement of active customers in the market through aggregators (small DER, DSR, BESS, EV).</p>

	Name of company	Task
	  	Definition of technical requirements Set up of market mechanism Ensure reliable operation
	 	Aggregation of small customers Provision of non frequency grid services
		Delivery of IT platform and related services
		Analysis of grid service impact
		Deployment of charging stations
	<p><b>CorNet:</b></p> <p>The CorNet program, launched jointly by Coreso and TSCNET, two Regional Coordination Centers (RCCs), aims to set up an operational security analysis platform for the European electricity network. One of the key tasks of RCCs is to coordinate exchanges between the different Transmission System Operators (TSOs) to ensure security of supply and facilitate cross border energy exchanges.</p> <p>Unicorn delivers the network modelling platform Griffin. Artelys develops and integrates the calculation engines necessary for the network security analysis within the Core, Italy North, SWE, and Hansa regions.</p>	

## 4. Solution Concept

This chapter describes target system functionality and features that fit requirements and how they are covered by already existing functionality of Damas MMS or its customisation during the project delivery. The system is called, in this document and in related documents, Moldelectrica MMS.

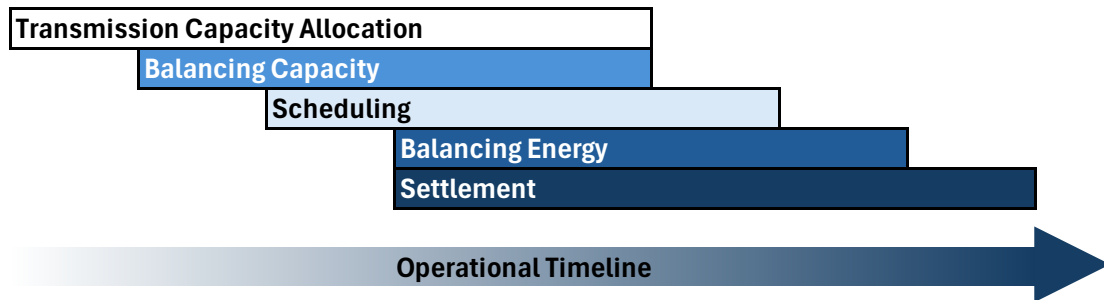


Figure 6 - Moldelectrica MMS Business Processes Coverage

We propose to deliver Moldelectrica MMS upon the Damas MMS, our commercial off-the-shelf solution designed to support business processes of Transmission System Operators and Market Operators. Damas MMS is the integrated set of general components and technologies, specifically developed for the purpose of energy/electricity market and business, but still general. Moldelectrica MMS will be based on **standardized business products** **Cross-border Transmission** module, **Scheduling** module, **Balancing Capacity** module, **Balancing Energy** module, **Settlement** module and **Standing Data** module. Specific Moldovan features will be implemented during the project and will extend current functionality. Proposed modules are detailed in the next picture.

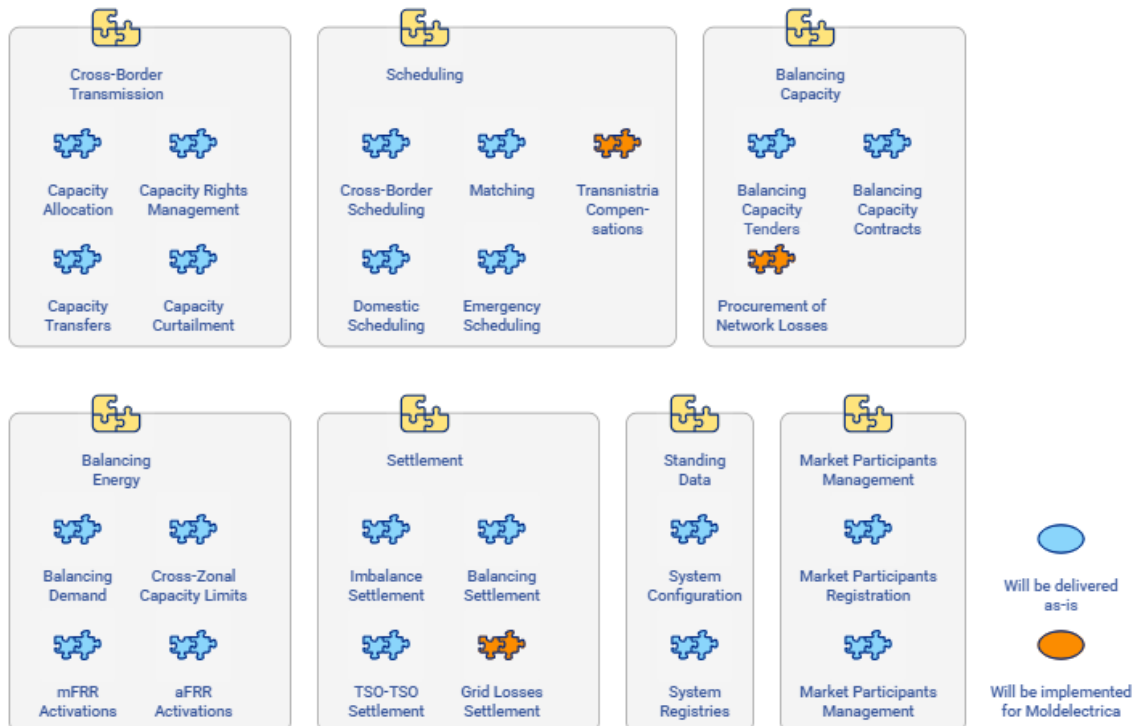


Figure 7 - Business modules overview

System is decomposed to business modules / components with clear interfaces. Together, all the modules work as a single Market Management System with unified access for internal as well as external users. Neither its users nor external systems need to be aware of the system modularity – they use a single integrated user interface and a common set of APIs.

All business processes share the common configuration which mainly covers the list of all BSPs, physical units, balancing products, borders and lines, and also more technical configuration such as process timeline, addresses of communication endpoints, certificates etc.

System will be closely integrated to European platforms. Highly reliable communication gateway will handle smooth data exchanges with BSPs via web services and with Moldelectrica's internal systems.

Each of the following chapters represents a separate module with its description including screenshots and proposed functionalities.

## 4.1 Market Participant Registration and Standing Data

Moldelectrica's requirements for Market participant registration and Standing Data management are covered by **System configuration** module of Damas MMS: E. It represents the basic, rather static configuration of the system. The configuration is then used by all other modules.

The configuration includes mainly the user management, administration of master data and also other configuration attributes which affects the behaviour of the system in different aspects.

Master data are managed using the product Entity Management which is integral part of Damas MMS. It allows to create new master data types or add specific attributes for project purposes, easily create new instance of the master data item, set master data item validity, and change values.

Master data are used in a way that allows platform to share master data items between the micro services, so each module and micro service uses the same configurations and parameters. It also allows to manage them from one route which provides transparent and user-friendly mechanism for system configuration.

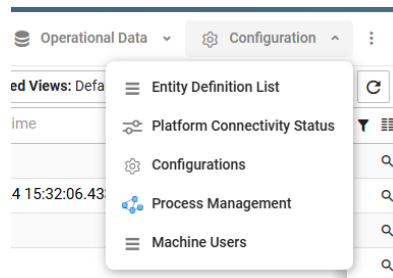


Figure 8 - Master Data Node in the System Menu

### 4.1.1 Market Participants Management

Management of Market Participants consists of two main components: Master Data Management, described in the following chapter, which enables the configuration of organizations, units, and related entities; and User Management, described in this section, which governs user access and permissions within the system.

The User Management module ensures secure, structured, and auditable administration of all internal and external users of the Moldelectrica MMS.

The module supports the full lifecycle management of users, including registration, modification, activation, suspension, and deactivation. Each user is assigned one or more roles that define access rights, functional permissions, and visibility of data within the system.

The system enables:

- Creation and maintenance of user accounts for TSO operators, market participants, and other authorized stakeholders

- Role-based access control (RBAC) with configurable permissions per module and functionality
- Assignment of users to specific organizations
- Management of authentication parameters and security policies
- Complete audit trail of user activities and configuration changes

User Management is tightly integrated with Master Data Management and all business modules, ensuring that access rights are consistently enforced across capacity markets, balancing energy markets, scheduling, settlement, and reporting.

## 4.2 Secure Software Development Life Cycle

Software security is about building software to be secure even when it is exposed to a threat or attack. As we have learned from years of practice, protecting software is much easier if the software is built with security in mind. Furthermore, security is a property and not a thing, so software security - being resistant to threat or attack - involves much more than simply adding security features like encryption or passwords to the software.

The SSDLC (Secure Software Development Life Cycle) Process used in Unicorn Systems defines how to integrate security into the software development process. A secure SDLC process ensures that security assurance activities such as design review, architecture analysis, code review, and penetration testing are an integral part of the development lifecycle:

- > More secure software as security is a continuous concern.
- > Awareness of security considerations by stakeholders.
- > Early detection of flaws in the system.
- > Cost reduction because of early detection and resolution of issues.
- > Overall reduction of intrinsic business risks for the organization.
- > Facilitation of informed executive decision-making through the application of a comprehensive risk management process promptly.
- > Documentation of important security decisions made during the development process to inform the management about security considerations during all phases of development.
- > Improved organization and customer confidence to facilitate adoption and use of systems, and improved confidence in the continued investment in government systems.

Damas MMS is resilient against cyber threats, which is ensured through regular security audits and security exercises such as vulnerability scanning and/or penetration testing. Further to the security, development and maintenance procedures are compliant with the latest security standards and industrial standards – user certificates and other access control methods including the least privilege principle, encryption of the data, validation, logging, anti-virus scans and so on.

## 4.3 OIDC and Identity Management

The user authentication processes are based on the **OAuth 2.0/OpenID Connect 1.0** (OIDC) protocols. There is an OAuth/OIDC-compliant identity provider (OIDC service) available in Damas MMS, with support of various OIDC flows and several authentication scenarios (e.g., single-factor authentication, multi-factor authentication, "remember me" cookie, single-sign-on and single-sign-out).

The OIDC service supports **internal identities**, but it can also be linked to identities from any **external identity** provider supporting OIDC or SAML federation, e.g.:

- > **social identity providers** such as Google Sign-In, Facebook Login, Microsoft Login and Apple ID are already integrated and ready to be used,
- > for corporate deployments it can be integrated with existing **corporate identity providers** (like the MS Active Directory, and KeyCloak),

> public sector deployments can utilize integrations with **national identities or bank IDs**, etc.

The **Identity Management** service is responsible for managing identities and their user settings (like preferred time zone, language etc.). Various types of identities are supported – e.g. person (real users), system (technical user) and "things" (IoT devices).

The following images show the basic screens for user management.

**Standard Users**  
List of all users

Global Actions Log [+ Create a User](#)

State active suspended X Clear filters X

State	Name	Email	uulD	Creation time	
ACTIVE	...	...	...	23. 5. 2024 14:14	⋮ >
ACTIVE	...	...	...	23. 5. 2024 14:19	⋮ >
ACTIVE	...	...	...	23. 5. 2024 14:20	⋮ >
ACTIVE	...	...	...	23. 5. 2024 13:35	⋮ >
ACTIVE	...	...	...	23. 5. 2024 14:20	⋮ >
ACTIVE	...	...	...	23. 5. 2024 13:34	⋮ >
ACTIVE	...	...	...	21. 5. 2024 11:26	⋮ >
ACTIVE	...	...	...	27. 6. 2024 10:00	⋮ >
ACTIVE	...	...	...	18. 7. 2024 08:55	⋮ >
ACTIVE	...	...	...	23. 5. 2024 13:38	⋮ >
ACTIVE	...	...	...	23. 5. 2024 13:39	⋮ >
ACTIVE	...	...	...	23. 5. 2024 14:27	⋮ >
ACTIVE	...	...	...	25. 4. 2024 15:48	⋮ >
ACTIVE	...	...	...	23. 5. 2024 13:41	⋮ >

Figure 9 - List of Users

Name	Email	State	uulD	Type	Creation time	
...	...	ACTIVE	...	uuPerson	23. 5. 2024 14:14	⋮

- Modify Basic Properties
- Modify Roles
- Suspend
- Terminate

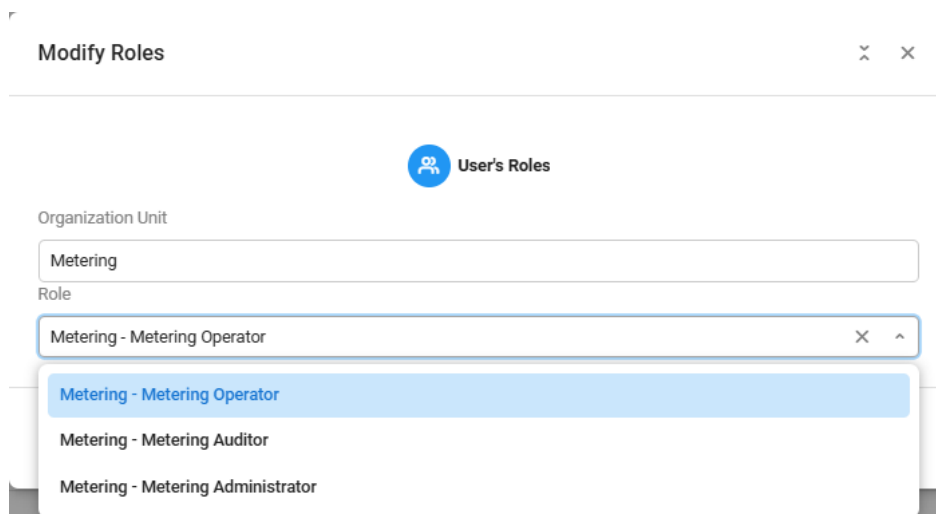
Details ^

More Information Operations Operations Log

BusinessTerritory

Access Role

Figure 10 - User Details



*Figure 11 - Assigning Roles to Users*

#### **4.3.1 Master Data Management**

Damas MMS has out of the box the following main list of master data items:

- Border
- Border Direction
- Control Area
- Common Platform
- Balancing Energy Product
- Balancing Capacity Product
- Activity planning
- Balancing Service Provider
- Unit

The picture below shows the example of the master data defined using Entity Management for the Balancing Energy Market system.

Registers EN 10972

Saved Filters Save Update

Name	Code	Description	
Connection Purpose	connectionPurpose	Event code to event group mapping code list.	
Connection Type	connectionType	Connection type code list.	
Control Area	controlArea	Control Area	
Country	country	Country	
Data Flow	dataFlowConfiguration	Data Flow	
System Configuration	entityManagementConf	System Configuration	
Exchange Rate	exchangeRate	Exchange Rate	
Group	group	Group	
Holiday	holiday	Holiday	
Intraday Auction Interval	intradayAuctionInterval	Intraday Auction Interval	
Intraday Scheduling Interval	intradaySchedulingInterval	Intraday Scheduling Interval	
Local Dispatch Center	ldc	Local Dispatch Center	
Metering Point	meteringPoint	Metering Point	
uuObc Entity Definition	obcEntityDefinition	uuObc Entity Definition	
Power Plant	powerPlant	Power Plant	
Power Station	powerStation	Power Station	
Power Unit	powerUnit	Power Unit	
Power Unit Technological Type	powerUnitTechnologicalType	Power Unit Technological Type	
Process Activities Ordering	processActivitiesOrdering	Process Activities Ordering	
Process Filter Configuration	processFilterConfiguration	Process Filter Configuration	
Power Unit - Certificated Reserve	puCertificatedReserve	Power Unit - Certificated Reserve	
Role Group	roleGroup	Role Group	
Settlement Report	settlementReport	Settlement Report	
Tariff Type	tariffType	Tariff Type	
Territorial Dispatch Centre	tdc	Territorial Dispatch Centre	
Tie-Line	tieLine	Tie-Line	

Figure 12 – Master Data management

Each project is usually extended by the specific master data items, e.g. Metering Point, Balancing Group, etc. For Moldelectrica MMS, we expect to reuse the master data elements from standard Damas MMS: E configuration and – only in case it is necessary – to extend the master data items with the attributes specific for Moldavian market (e.g. special configuration for Transnistrian region compensation schedule).

The picture below shows the example of created instances of the Balancing Capacity Product.


Code Tables > Balancing Capacity Product Configuration List + Create


**Balancing Capacity Product Configuration List**

Code	Valid From	Valid To	Product Resolution	Direction Up	Direction Down	Direction Up and Down	Price step	Power step	Maximum power [MW]	Maximum price [€/MW]	
FCR-D-DOWN	01.01.2020	31.12.2099	PT15M	true	–	–	0.01	1	9999	9999	🗑️ 🔍
FCR-D-UP	01.01.2020	31.12.2099	PT15M	true	–	–	0.01	1	9999	9999	🗑️ 🔍
FCR-N	01.01.2020	31.12.2099	PT15M	–	–	true	0.01	1	9999	9999	🗑️ 🔍
FFR	01.01.2020	31.12.2099	PT15M	–	–	true	0.01	1	9999	9999	🗑️ 🔍
aFRR	01.04.2025	30.04.2025	PT15M	true	true	–	0.01	1	999	999	🗑️ 🔍
mFRR	01.01.2020	31.12.2099	PT15M	true	true	–	0.01	1	9999	9999	🗑️ 🔍

Figure 13 – Balancing Capacity product management

And each instance has list of defined parameters as presented on the next screen which are configurable by the System Operator directly from the GUI.

Master Data Item • mFRR Down EN 

**Basic info** 

Code	mFRRDown
Date Interval	1. 1. 2009 - 31. 12. 2099
Service Type	mFRR
Service Direction	down
XML Code	X04
Name	mFRR Down
Maximum Price	1000
Minimum Quantity	1
Maximum Quantity	9999
Maximum no. of bids	10
Minimum Selected Quantity	1
Maximum Selected Quantity	9999
Delivery Day Deadline Offset for ANS Transfer	60
ANS Transfer Deadline Offset	120
Market Product Type	standard
Report to ETP	Yes
Business Type Code	B95
Process Type Code	A47

*Figure 14 – Master Data Item Details*

Those parameters are used for different purposes, e.g. validation of incoming bids against price caps, maximum number of possible bids, possibility to send reporting to ETP.

For more details about the Capacity Market configurations, please refer to the dedicated chapter Configuration.

The following picture shows an example of the Balancing Energy Product code list with its parameters.

Basic info	
Code	mFRR
Date Interval	29. 12. 1999 - 28. 12. 2050
Short Name	mFRR
Activation Manner	manual
Auction	AUCTION-mFRR
Process Type Code	A47
Common Platform	MARI
Product Resolution	PT15M
Standard Activation	No
Scheduled Activation	Yes
Direct Activation	No
Scheduled and Direct Activation	Yes
Bids Activation Type Changing Allowed	No
Bids Local Activation Allowed	No
Direction Down	Yes
Direction Up	Yes
Divisibility	Yes
Availability Changing After Gate Closure Allowed	Yes
Use Unit	Yes
Demand Allowed	Yes
Granularity	1
Price Resolution	0.01
Default Currency	eur
Reference Currency	
Up Minimum Power	0
Down Minimum Power	0
Up Maximum Power	9999
Down Maximum Power	9999
Up Minimum Price	-15000
Down Minimum Price	-15000
Up Maximum Price	15000

*Figure 15 - Master Data Item Details*

Picture below shows the screen, from which operator can easily change parameters of the master data item on the example of the Balancing Energy Product.

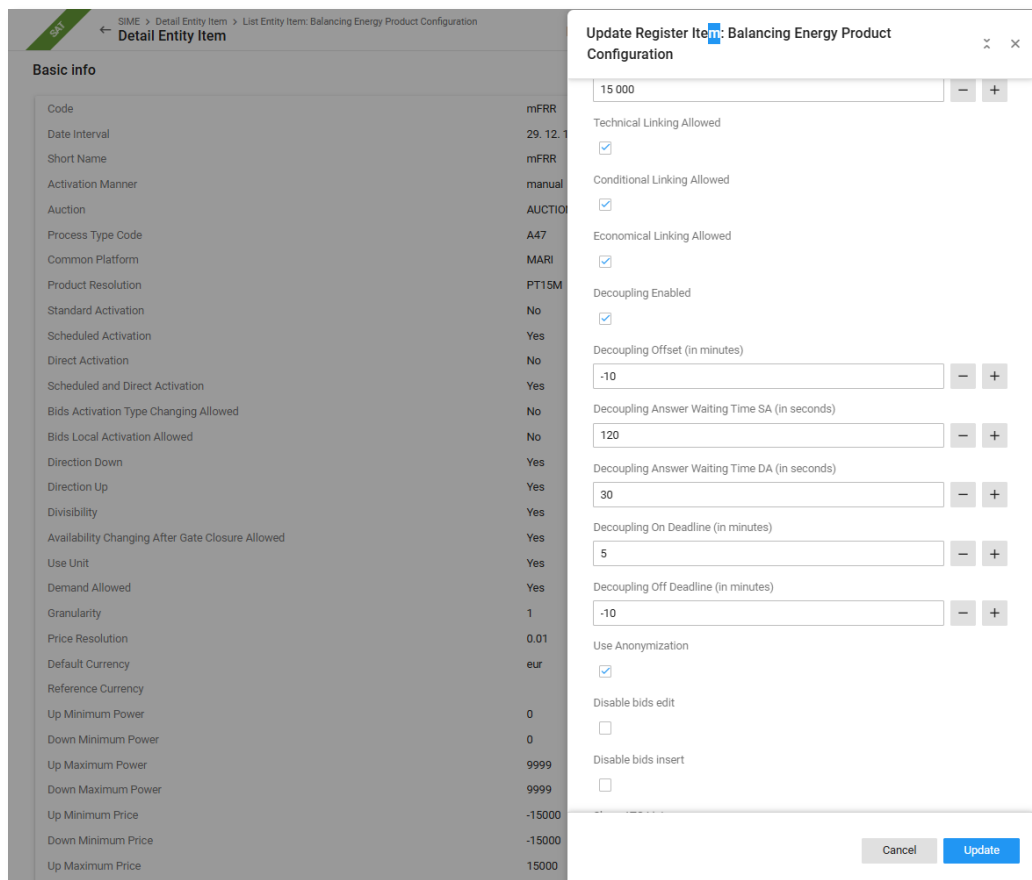


Figure 16 – Master Data Item Edit

As it was mentioned above, each master data item can be configured in order to have project specific attributes. Such attributes for Moldelectrica MMS will be defined during analysis phase and implemented in the system.

For each master data item, it is possible to create new instance directly from the GUI by the operator. Picture below shows example of creation of the new Unit.

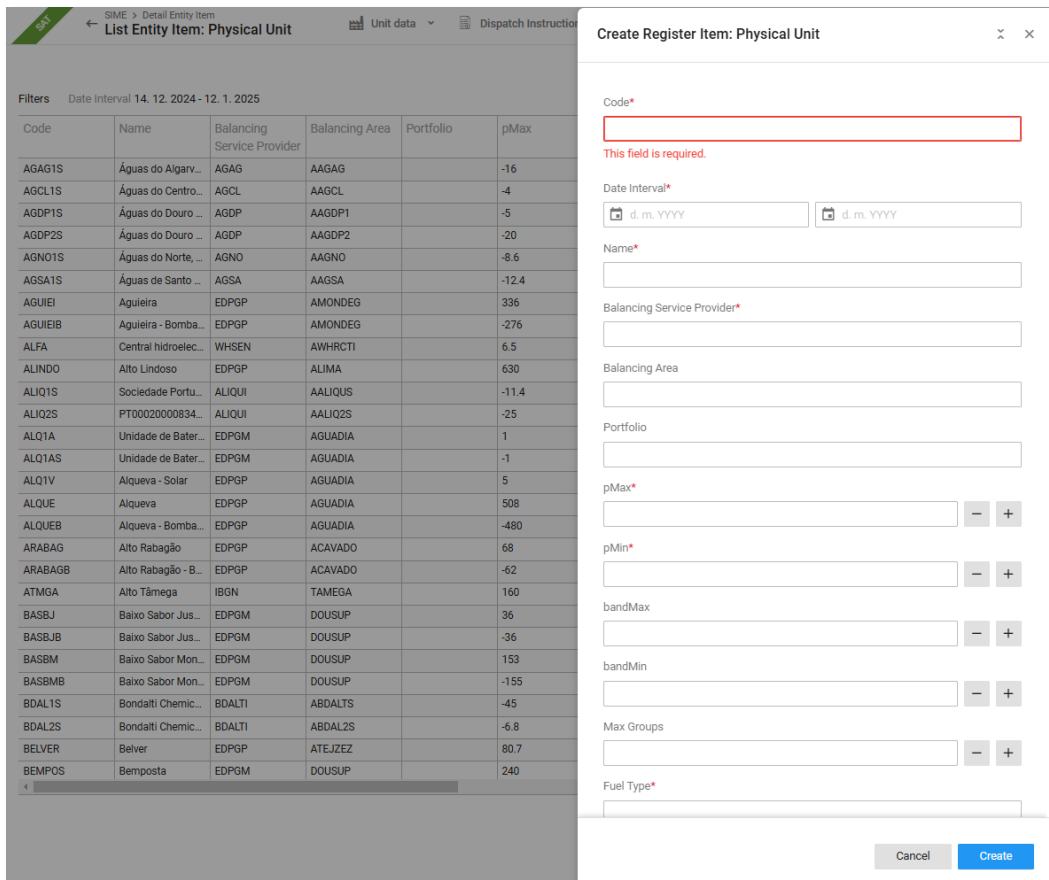


Figure 17 – Master Data Item Create

Picture below shows configuration of the market participants with possibility to configure parameters by the operator.

Participants EN 1096825 +2U

Create
Saved Filters
Save
Update

Name	EIC	Email	Phone	Role groups	Validity	
A+++ Stream Energy and Gas	30XRO-A-STREAM-6			BRP, CBT Participant...	9. 8. 2022 - 30. 12. ...	🔍
AB ENERGO BEograd	34X-0000000048-Y			CBT Participant – Re...	1. 6. 2015 - 30. 12. ...	🔍
ACM ENERGY OOD	32X001100100884Y				1. 6. 2015 - 30. 12. ...	🔍
ACTAENERGYEL	64XACTLENERG-F4Q				17. 8. 2023 - 30. 12. ...	🔍
ACV SOLAR ENERGY	30XROACVSENERGYU			BRP	4. 10. 2023 - 30. 12. ...	🔍
ACV SOLAR TEHNOLOGY	30XROACVSOLAR--2			FC Participant	28. 9. 2023 - 30. 12. ...	🔍
AFRR_PLATFORM	10X1001C--00010W			External Systems	1. 1. 2023 - 30. 12. ...	🔍
AIK ENERGY	55XAIKTRADING017			CBT Participant – Re...	1. 4. 2019 - 30. 12. ...	🔍
AIK ENERGY ROMANIA	60X0000000000648			CBT Participant – Re...	14. 5. 2021 - 30. 12. ...	🔍
ALDGATE SOLAR	30XROALDGATESOL3			BRP	24. 8. 2023 - 30. 12. ...	🔍
ALEGFURNIZORUL CONSULTING	30XROALFURNIZORQ			BRP, CBT Participant...	18. 2. 2021 - 30. 12. ...	🔍
ALIVE CAPITAL SRL	30XROALIVECAP--Q			CBT Participant – Re...	27. 5. 2020 - 30. 12. ...	🔍
ALIVE SUN POWER ONE	30XROASPO-----W			FC Participant	1. 1. 2024 - 30. 12. ...	🔍
ALIVE WIND POWER ONE	30XRO-AWPO----D			FC Participant	25. 5. 2024 - 30. 12. ...	🔍
ALIZEU EOLIAN	30XROALIZEU----8			FC Participant	1. 2. 2014 - 30. 12. ...	🔍
ALLIANSO PARK MANAGEMENT	30XROALLPMG----F			BRP	1. 3. 2014 - 30. 12. ...	🔍
Alphataraxia Europium	48X000000000219S				31. 12. 2018 - 30. 1. ...	🔍
ALPHATARAXIA_XEN	23X--230615-AX-V				1. 4. 2024 - 30. 12. ...	🔍

Figure 18 - Market Participants

### 4.3.2 Process Activities Management

Another important part of the system configurations is the possibility to define parameters of the activities for the process management. This allows the operator to change such important parameters as timing of the opening/closing of the gates for bidding, timing of sending data to central platforms, etc.

Picture below shows configuration of the balancing energy market timings.

Register • Balancing Activity Planning Configuration

EN 1096857

+ Create Register Item

Filters Date Interval 14. 12. 2024 - 12. 1. 2025 Saved Filters Save Update

Code	Process Definition Code	Activity Code	Timing Offset	Initial State	Product code	Date Interval	
B100001	BALANCING-MARKET	BM-OPEN-GATE-BID	-10080	planned	aFRR	13. 8. 2024 - 31. 1...	
B100029	BALANCING-MARKET	BM-OPEN-GATE-BID	-10080	planned	mFRR	13. 8. 2024 - 31. 1...	
B100092	BALANCING-MARKET	BM-OPEN-SA-DEMA...	-1440	noOperation	mFRR	1. 1. 2020 - 31. 12...	
B100002	BALANCING-MARKET	BM-CLOSE-GATE-BID	-25	planned	aFRR	13. 8. 2024 - 31. 1...	
B100030	BALANCING-MARKET	BM-CLOSE-GATE-BID	-25	planned	mFRR	13. 8. 2024 - 31. 1...	
B100005	BALANCING-MARKET	BM-SEND-PLATFOR...	-24	noOperation	aFRR	1. 1. 2020 - 31. 12...	
B100033	BALANCING-MARKET	BM-SEND-PLATFOR...	-24	noOperation	mFRR	1. 1. 2020 - 31. 12...	
B100085	BALANCING-MARKET	BM-SEND-SCADA-BID	-24	planned	aFRR	13. 8. 2024 - 31. 1...	
B100086	BALANCING-MARKET	BM-SEND-SCADA-BID	-24	noOperation	mFRR	1. 1. 2020 - 31. 12...	
B100095	BALANCING-MARKET	BM-CALCULATE-ATC	-13	planned	mFRR	13. 8. 2024 - 31. 1...	
B100032	BALANCING-MARKET	BM-SEND-PLATFOR...	-12	noOperation	mFRR	1. 1. 2020 - 31. 12...	
B100035	BALANCING-MARKET	BM-SEND-PLATFOR...	-12	noOperation	mFRR	1. 1. 2020 - 31. 12...	
B100031	BALANCING-MARKET	BML-GENERATE-LM...	-10	planned	mFRR	13. 8. 2024 - 31. 1...	
B100094	BALANCING-MARKET	BM-CALCULATE-ATC	-8	planned	aFRR	13. 8. 2024 - 31. 1...	
B100053	BALANCING-MARKET	BM-OPEN-DA-GATE	-7.5	planned	mFRR	13. 8. 2024 - 31. 1...	
B100008	BALANCING-MARKET	BM-SEND-SCADA-ATC	-7	planned	aFRR	13. 8. 2024 - 31. 1...	
B100034	BALANCING-MARKET	BM-REC-ATC	-7	noOperation	mFRR	1. 1. 2020 - 31. 12...	

Figure 19 – Activities scheduling

The picture below shows configuration of the reporting timings.

Register • Activity Planning

EN 1096826

+ Create Register Item

Filters Date Interval 14. 12. 2024 - 12. 1. 2025 Saved Filters Save Update

Code	Process Definition Code	Activity Definition Code	Initial State	Planned Time Offset	Timezone	Border	Border Direction	Intr Auc
C101880	REPORTING-AC...	REP-PRODUCE-...	planned	+1D 00:00	eet			
C101881	REPORTING-AC...	REP-PRODUCE-...	planned	+1D 00:00	eet			
C101882	REPORTING-AC...	REP-PRODUCE-...	planned	+1D 00:00	eet			
C101883	REPORTING-AC...	REP-PRODUCE-...	planned	+1D 00:00	eet			
C101884	REPORTING-AC...	REP-PRODUCE-...	planned	+1D 00:00	eet			
C101885	REPORTING-AC...	REP-PRODUCE-...	planned	0D 00:20	eet			
C101886	REPORTING-AC...	REP-PRODUCE-...	planned	0D 00:20	eet			
C101887	REPORTING-AC...	REP-PRODUCE-...	planned	0D 00:20	eet			
C101888	REPORTING-AC...	REP-PRODUCE-...	planned	+1D 00:00	eet			
C101889	REPORTING-AC...	REP-PRODUCE-...	planned	0D 00:20	eet			
C101890	REPORTING-AC...	REP-PRODUCE-...	planned	+1D 00:00	eet			
C101891	REPORTING-AC...	BS-SEND-ETP-D...	manual		eet			
C101892	REPORTING-AC...	BS-SEND-DALO...	planned	+1D 00:00	eet			
C101893	REPORTING-AC...	REP-SEND-DAM...	planned	+1D 00:00	eet			
C101894	REPORTING-AC...	REP-PRODUCE-...	planned	+1D 00:00	eet			

Figure 20 - Activities configuration

Each module of the system has its own process management with specific list of activities that will be extended based on the Moldelectrica's needs.

## 4.4 Scheduling Process

The Scheduling Process within Moldelectrica MMS is implemented based on the Damas MMS: E Scheduling module, which is compliant with the latest ENTSO-E ESS (Electronic Scheduling System) standards and aligned with the Harmonised Electricity Market Role Model (HEMRM).

The module supports complete nomination lifecycle management for:

- BRP domestic scheduling
- BRP cross-border scheduling
- TSO-TSO scheduling
- Emergency scheduling.

The scheduling module ensures structured receipt, validation, matching, confirmation, and publication of schedules, fully integrated with capacity management, balancing markets, and settlement.

We expect to reuse the existing functionality of Damas MMS: E – Scheduling mostly as-is with exception to the compensation schedules for Transnistrian region, which need to be implemented according to WEM rules. The following chapters contain the description of the proposed solution.

### 4.4.1 Domestic Scheduling

Domestic scheduling covers the management of energy nominations submitted by Balance Responsible Parties (BRPs), Balancing Service Providers (BSPs), Distribution System Operators (DSOs), and the Market Operator.

The domestic scheduling process includes:

- Receipt of the availability declarations and schedules from Market Participants (BRPs, BSPs, DSOs)
- Receipt of the schedules from Market Operator
- Validation of received schedules
- Schedules matching
- Distribution of the confirmations.

We expect that the format of all messages, except those that are already implemented for communication with neighbouring TSOs and Market Operator, will be defined by Unicorn in line with ENTSO-E standards.

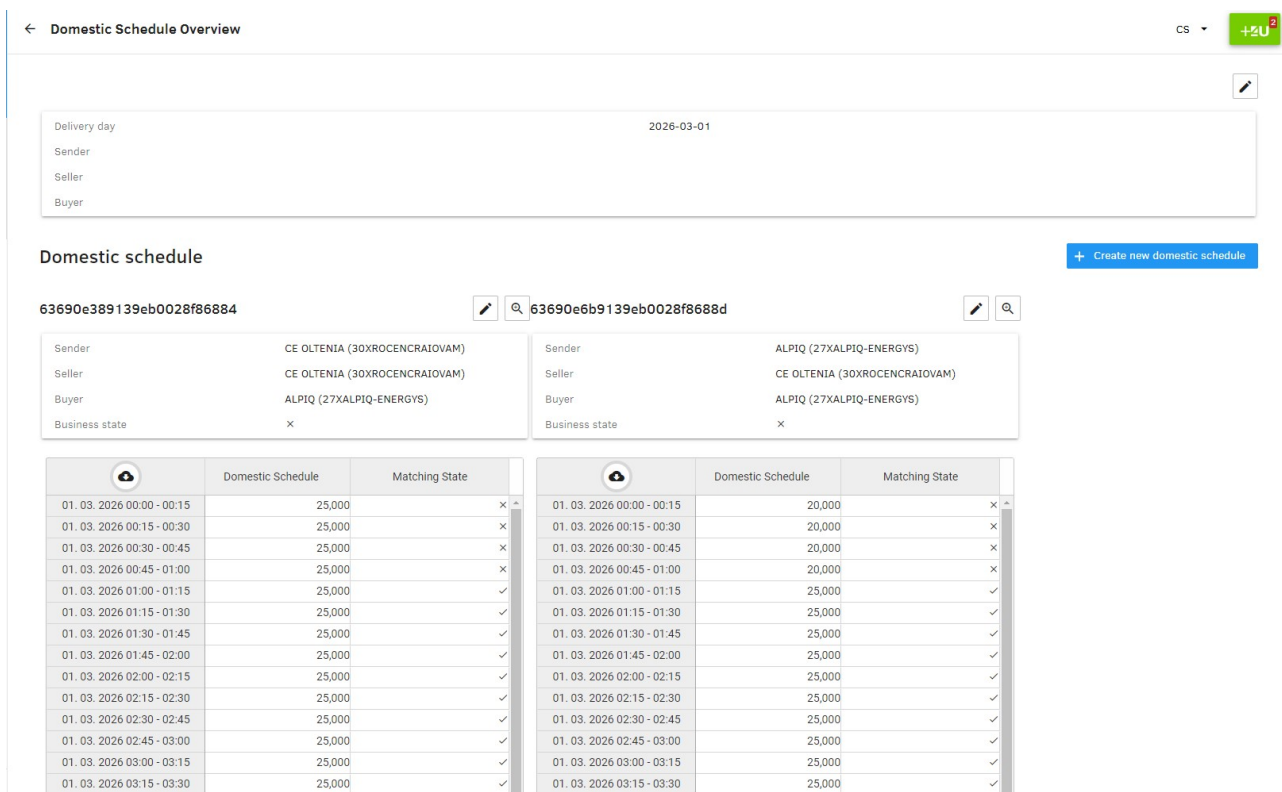


Figure 21 - Domestic Schedule Detail

#### 4.4.2 Cross-border Scheduling

The Cross-border Scheduling process supports nominations and schedule exchange between Moldelectrica and neighbouring TSOs in full compliance with ENTSO-E ESS standards and RG CE scheduling policies.

The process includes:

- Submission and exchange of cross-border schedules (import/export) via XML/EDI messages
- Validation of schedules against ATC/NTC limits and allocated transmission rights (PTRs)
- Time-series validation (structure, granularity, completeness)
- Confirmation and publication of schedules following gate closure

Schedules are managed in quarter-hour or hourly granularity, configurable per border and time zone.

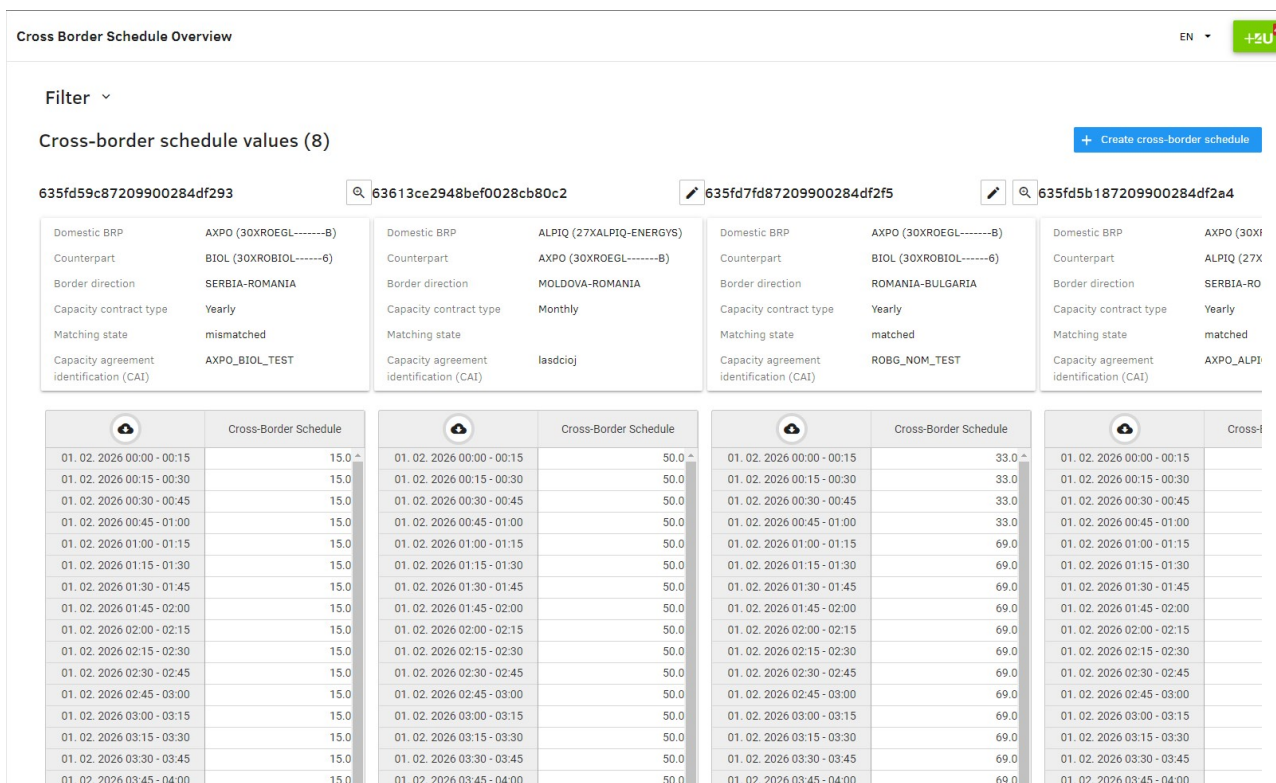


Figure 22 - Example of Cross-Border Schedules Management


The Damas platform provides advanced functionality for:

- **Gate-based process management**, including configurable nomination windows, deadlines, and process phases
- **Validation framework**, ensuring compliance of schedules with capacity limits and market rules
- **Versioning and full audit trail** of all submitted and confirmed schedules
- **Support for ENTSO-E compliant schedule exchange formats and document structures**
- **Manual operation mode**, allowing TSO operators to create, adjust, or override schedules where required

Cross-border scheduling is tightly integrated with the Transmission Capacity Management module to ensure:

- Prevention of over-nomination beyond available capacity
- Automatic update of remaining ATC after schedule submission
- Consistency between scheduled exchanges and available transmission capacity
- Support for schedule adjustments in case of curtailment or emergency situations

The functionality is delivered using the standard Damas scheduling framework, with configuration aligned to Moldelectrica-specific market rules and cross-border agreements.

Filter Recapitulation 

Delivery Day	1. 2. 2026
Border	ROMANIA_SERBIA, ROMANIA_BULGARIA, ROMANIA_HUNGARY, ROMANIA_UKRAINE, ROMANIA_MOLDOVA, ROMANIA_V_Brauwallar
Domestic BRP	ALPIQ (27XALPIQ-ENERGYS), AXPO (30XROEGL-----B)
Capacity Contract Type	Yearly, Monthly, Weekly, Daily, Emergency help, Bilateral compensations, TSOs compensations, Intraday

	Export [MW]	Import [MW]	Balance [MW]
01. 02. 2026 00:00 - 00:15	81.000	183.000	-102.0
01. 02. 2026 00:15 - 00:30	81.000	183.000	-102.0
01. 02. 2026 00:30 - 00:45	81.000	183.000	-102.0
01. 02. 2026 00:45 - 01:00	81.000	183.000	-102.0
01. 02. 2026 01:00 - 01:15	81.000	219.000	-138.0
01. 02. 2026 01:15 - 01:30	81.000	219.000	-138.0
01. 02. 2026 01:30 - 01:45	81.000	219.000	-138.0
01. 02. 2026 01:45 - 02:00	81.000	219.000	-138.0
01. 02. 2026 02:00 - 02:15	81.000	69.000	12.0
01. 02. 2026 02:15 - 02:30	81.000	69.000	12.0
01. 02. 2026 02:30 - 02:45	81.000	69.000	12.0
01. 02. 2026 02:45 - 03:00	81.000	69.000	12.0
01. 02. 2026 03:00 - 03:15	81.000	69.000	12.0
01. 02. 2026 03:15 - 03:30	81.000	69.000	12.0
01. 02. 2026 03:30 - 03:45	81.000	69.000	12.0
01. 02. 2026 03:45 - 04:00	81.000	69.000	12.0
01. 02. 2026 04:00 - 04:15	81.000	69.000	12.0
01. 02. 2026 04:15 - 04:30	81.000	69.000	12.0
01. 02. 2026 04:30 - 04:45	81.000	69.000	12.0
01. 02. 2026 04:45 - 05:00	81.000	69.000	12.0
01. 02. 2026 05:00 - 05:15	81.000	69.000	12.0
01. 02. 2026 05:15 - 05:30	81.000	69.000	12.0
01. 02. 2026 05:30 - 05:45	81.000	69.000	12.0

Figure 23 - Example of Cross-Birder Balance File

### 4.4.3 Validations

Each received schedule undergoes:

- Technical validation (XSD compliance, sender authorization, format validation)
- Business validation (portfolio consistency, unit eligibility, product compatibility, time resolution checks)
- Capacity validation (available transmission capacity where relevant)

Validation rules are configurable and may be extended based on Moldelectrica-specific requirements.

In case of rejection, a structured acknowledgement message is automatically returned to the sender.

For the Moldelectrica MMS, we propose to reuse the same validation logic and rule set as implemented in standard Damas MMS: E and used for Transelectrica, ensuring consistency, reliability, and regulatory alignment.

TSO operators will be able to configure selected parameters of predefined validation rules (e.g., thresholds, limits, timelines, portfolio constraints) directly via the system configuration interface. However:

- The validation framework itself will remain centrally defined within the system.
- Operators will not be able to create new validation types independently.
- Structural validation logic cannot be modified without controlled system development and release management procedures.

This approach ensures operational flexibility while preserving system integrity, regulatory compliance, and auditability.

#### 4.4.4 Matching

Damas MMS provides comprehensive functionality for matching of schedules in accordance with Moldelectrica requirements for the Scheduling Process, including bilateral matching with neighbouring TSOs and validation of submitted schedules. This functionality is part of the standard Damas MMS platform and will be delivered as-is, with configuration adapted to Moldelectrica market rules.

#### Overview of Matching within Scheduling Process

In line with the Scheduling Process defined by Moldelectrica, matching represents a mandatory step following schedule submission, ensuring:

- Consistency of schedules between counterparties
- Alignment of cross-border nominations with neighbouring TSOs
- Preparation of schedules for final confirmation and further processing

The Damas MMS supports both domestic schedule matching and cross-border schedule matching with neighbouring TSOs in full compliance with ENTSO-E ESS standards and scheduling processes.

← Matching Detail
CS ▾
+20

---

**Basic Info**

Delivery day	1. 2. 2026
Domestic BRP	AXPO (30XROEGL-----B)
Counterpart	BIOL (30XROBIOL-----6)
Border direction	SERBIA-ROMANIA
Capacity contract type	Yearly
CAI	AXPO_BIOL_TEST
Matching state	×

**Document Info**

(Home TSO) Document identification	2026-02-01_10XCS-SERBIATS08
(Home TSO) Document version	1
(Foreign TSO) Document identification	2026-02-01_10XCS-SERBIATS08
(Foreign TSO) Document version	2

**Matching Detail**

Time series identification	CAS (Home TSO)	CAS (Foreign TSO)	Matching state
	cbs_812	cbs_812	
Time series version	1	1	
01. 02. 2026 00:00 - 00:15	15,000	5,000	×
01. 02. 2026 00:15 - 00:30	15,000	5,000	×
01. 02. 2026 00:30 - 00:45	15,000	5,000	×
01. 02. 2026 00:45 - 01:00	15,000	5,000	×
01. 02. 2026 01:00 - 01:15	15,000	15,000	✓
01. 02. 2026 01:15 - 01:30	15,000	15,000	✓
01. 02. 2026 01:30 - 01:45	15,000	15,000	✓
01. 02. 2026 01:45 - 02:00	15,000	15,000	✓
01. 02. 2026 02:00 - 02:15	15,000	15,000	✓
01. 02. 2026 02:15 - 02:30	15,000	15,000	✓

Figure 24 - Example of CAS Matching

#### Matching Process Description

The matching process is executed automatically by the system and consists of the following steps:

1. Reception and validation of schedules

Schedules are received from market participants (e.g. BRPs) and external systems or neighbouring TSOs. The system performs format validation, completeness checks and validation of time resolution (e.g. 15-minute or hourly granularity). Only validated schedules proceed to matching.

## 2. Matching execution


Matching is performed using standard Damas mechanisms delivered as-is, supporting bilateral matching of schedules between counterparties. Matching is executed per border, direction, time interval and scheduling unit. The system compares corresponding nominations from both sides and determines matched schedules, mismatched schedules and missing counterpart schedules.

## 3. Matching rules and resolution logic

In accordance with Moldelectrica requirements for matching and validation, the system applies predefined rules for resolving discrepancies, including:

- Minimum value principle (matched value equals the lower of the two nominations)
- Handling of one-sided nominations (configurable acceptance or rejection)
- Identification and flagging of inconsistencies

These rules are configurable but rely on standard Damas functionality delivered as-is.

← Sax Matching Detail EN 

**Basic Info**

Delivery Day	14. 11. 2022
Border Direction	ROMANIA-HUNGARY
Timescale	dayAhead
Scheduling Group	commercial
Home SAX Document Identification	20221114_SAX_TEL_MDS
Home SAX Document Version	1
SAX CNF Document Identification	221114_10XRO-TEL-----2_TST
SAX CNF Document Version	9
Matching State	matched

	Home SAX	Home SAX CNF	Foreign SAX CNF	Matching state
11/14/2022 00:00 - 00:15	0.000	0.000	0.000	✓
11/14/2022 00:15 - 00:30	0.000	0.000	0.000	✓
11/14/2022 00:30 - 00:45	0.000	0.000	0.000	✓
11/14/2022 00:45 - 01:00	0.000	0.000	0.000	✓
11/14/2022 01:00 - 01:15	10.000	0.000	0.000	✓
11/14/2022 01:15 - 01:30	10.000	0.000	0.000	✓
11/14/2022 01:30 - 01:45	10.000	0.000	0.000	✓
11/14/2022 01:45 - 02:00	10.000	0.000	0.000	✓
11/14/2022 02:00 - 02:15	10.000	0.000	0.000	✓
11/14/2022 02:15 - 02:30	10.000	0.000	0.000	✓
11/14/2022 02:30 - 02:45	10.000	0.000	0.000	✓
11/14/2022 02:45 - 03:00	10.000	0.000	0.000	✓
11/14/2022 03:00 - 03:15	10.000	0.000	0.000	✓
11/14/2022 03:15 - 03:30	10.000	0.000	0.000	✓
11/14/2022 03:30 - 03:45	10.000	0.000	0.000	✓
11/14/2022 03:45 - 04:00	10.000	0.000	0.000	✓
11/14/2022 04:00 - 04:15	10.000	0.000	0.000	✓
11/14/2022 04:15 - 04:30	10.000	0.000	0.000	✓
11/14/2022 04:30 - 04:45	10.000	0.000	0.000	✓

Figure 25 - Example of SAX Matching

## Handling of Mismatches and Exceptions

The system ensures full support for mismatch handling, including:

- Detection of mismatches at the level of individual time intervals
- Automatic or operator-assisted resolution
- Logging of original submitted values, matched values and applied resolution rules

All matching outcomes (matched, mismatched, rejected) are recorded and fully traceable.

## Integration with Validation and Capacity Constraints

In accordance with Moldelectrica requirements, the matching functionality is tightly integrated with:

- Validation mechanisms ensuring compliance with market rules before and after matching
- Transmission capacity constraints (ATC/NTC), preventing over-nomination beyond available capacity
- Schedule reduction processes, enabling TSO-driven reduction of cross-border schedules when necessary

These capabilities are part of standard Damas MMS functionality and will be delivered as-is.

## Compliance

The matching functionality complies with ENTSO-E ESS scheduling standards, relevant implementation guides and Moldelectrica Scheduling Process requirements.

The matching functionality is part of the standard Damas MMS platform and will be delivered as-is, based on proven implementations in European TSO environments, with configuration adapted to Moldelectrica-specific market rules.

### 4.4.5 Emergency Schedules

Damas MMS already supports the full processing of emergency help (counter-supply) external schedules exchanged with neighbouring TSOs. This functionality will be delivered to Moldelectrica **as-is**, based on the existing and production-proven implementation.

The system supports:

- Sending, receiving, validation, and reconciliation of emergency cross-border schedules in accordance with the principles of **Intraday External (Cross-Border) Schedules**.
- Automatic integration of emergency imports and exports into the balancing mechanism and settlement procedures:
  - Emergency export (electricity delivered to neighbouring TSO) is treated as a TSO shortage.
  - Emergency import (electricity received from neighbouring TSO) is treated as a TSO surplus.
- Manual operation mode for all emergency scheduling processes.
- Adjustment of external schedules directly by the TSO MMS operator, with full audit trail.
- Configuration of all field attributes in exchanged documents, including the possibility to define separate document settings for each neighbouring TSO.

This functionality is fully integrated with scheduling, balancing, and settlement modules and complies with ENTSO-E scheduling principles.

### 4.4.6 Final Confirmations

After completion of validation, matching, and potential re-nomination cycles, the system generates Final Confirmations.

Final Confirmations include:

- Confirmed domestic schedules
- Confirmed cross-border matched schedules
- Adjusted schedules due to emergency actions.

The final confirmed schedules are:

- Distributed to market participants

- Sent to neighbouring TSOs (if applicable)
- Made available for balancing market processes
- Provided to settlement and invoicing modules.

The system ensures:

- Versioning of schedules
- Full traceability of changes
- Archiving in accordance with regulatory requirements.

Final confirmations serve as the official basis for:

- Imbalance calculation
- Settlement processes
- Reporting to regulatory bodies.

#### **4.4.7 Cross-border Schedule Reduction by TSO**

The functionality for cross-border schedule reduction by TSO, as described in section 3.9 of the Technical Specification, is not fully available in the Romanian implementation and will therefore be implemented specifically for Moldelectrica within the MMS project.

The solution will support the full reduction process of external (cross-border) schedules in case of force majeure or emergency situations, in compliance with ENTSO-E RG CE requirements and Moldovan market rules.

The implementation will include:

- Reduction of external schedules at all required stages:
  - Before expiry of long-term PTR nomination deadline
  - Between long-term and short-term nomination gates
  - After short-term nomination gate closure.
- Reduction of already confirmed external trade schedules in emergency situations.
- Configurable reduction logic:
  - Priority-based reduction (e.g. daily -> monthly -> annual PTRs)
  - Pro-rata reduction within priority groups
  - Non-priority pro-rata reduction across all schedules
  - Configurable reduction method per neighbouring TSO.
- Automated generation of all required reduction documents and EDI messages.
- Full integration with:
  - Capacity management module (PTR handling)
  - Scheduling module
  - Settlement module (for compensation calculations)
- Manual operation mode for all reduction steps.

This functionality will be implemented using the existing Damas scheduling and capacity framework, ensuring consistency with other MMS modules and preserving system integrity and auditability.

#### **4.4.8 Compensation Schedule for Transnistrian Region**

The compensation schedule mechanism for the Transnistrian region (section 8.5.2 of the Technical Specification) is not part of the standard DUROM solution and will be implemented specifically for Moldelectrica.

The system will support the in-kind imbalance compensation mechanism between the two designated BRPs. It will:

- Calculate compensation schedules based on the Transnistrian BRP net position and metering data
- Generate and distribute compensation schedules to both BRPs and the MMS operator
- Integrate the results into imbalance settlement
- Ensure full audit trail and controlled manual adjustment capability

The functionality will be implemented as an extension of the Scheduling and Settlement modules, ensuring compliance and traceability.

### **4.5 Cross-border Capacity Market**

#### **4.5.1 Transmission Capacity Management**

Transmission Capacity Management within MMS supports the full lifecycle of cross-border capacity calculation, agreement, and publication for explicit allocation processes.

The module enables Moldelectrica to:

- Calculate NTC/ATC values
- Exchange capacity values with neighbouring TSOs
- Determine common offered capacity
- Publish offered capacity to Allocation Platforms
- Support future transition to coordinated and flow-based methodologies

The process reflects current Moldovan practice and is fully aligned with ENTSO-E ECAN principles.

##### **4.5.1.1 Capacity Calculation Process (NTC-Based)**

This process covers the bilateral agreement of transmission capacity between Moldelectrica and neighbouring TSOs.

The system supports:

- Storage and maintenance of input parameters per border and direction:
  - TTC (Total Transfer Capacity)
  - TRM (Transfer Reliability Margin)
  - Already Allocated Capacity (AAC)
- Configurable calculation of:
  - NTC values
  - ATC values
- Time-series based calculation for all relevant auction periods (yearly, monthly, daily).
- Full traceability and versioning of calculated values.

Filter recapitulation

Date from - to

4. 11. 2022 - 10. 11. 2022

Border direction

ROMANIA-HUNGARY

Capacity Limits

	TTC	TRM	NTC actual	NTC long-term	NTC day-ahead	NTC intraday
04. 11. 2022 00:00 - 01:00	2 000,000	100,000	1 000,000			
04. 11. 2022 01:00 - 02:00	2 000,000	100,000	1 000,000			
04. 11. 2022 02:00 - 03:00	2 000,000	100,000	1 000,000			
04. 11. 2022 03:00 - 04:00	2 000,000	100,000	1 000,000			
04. 11. 2022 04:00 - 05:00	2 000,000	100,000	1 000,000			
04. 11. 2022 05:00 - 06:00	2 000,000	100,000	1 000,000			
04. 11. 2022 06:00 - 07:00	2 000,000	100,000	1 000,000			
04. 11. 2022 07:00 - 08:00	2 000,000	100,000	1 000,000			
04. 11. 2022 08:00 - 09:00	2 000,000	100,000	1 000,000			
04. 11. 2022 09:00 - 10:00	2 000,000	100,000	1 000,000			
04. 11. 2022 10:00 - 11:00	2 000,000	100,000	1 000,000			
04. 11. 2022 11:00 - 12:00	2 000,000	100,000	1 000,000			
04. 11. 2022 12:00 - 13:00	2 000,000	100,000	1 000,000			
04. 11. 2022 13:00 - 14:00	2 000,000	100,000	1 000,000			
04. 11. 2022 14:00 - 15:00	2 000,000	100,000	1 000,000			
04. 11. 2022 15:00 - 16:00	2 000,000	100,000	1 000,000			
04. 11. 2022 16:00 - 17:00	2 000,000	100,000	1 000,000			
04. 11. 2022 17:00 - 18:00	2 000,000	100,000	1 000,000			
04. 11. 2022 18:00 - 19:00	2 000,000	100,000	1 000,000			
04. 11. 2022 19:00 - 20:00	2 000,000	100,000	1 000,000			
04. 11. 2022 20:00 - 21:00	2 000,000	100,000	1 000,000			
04. 11. 2022 21:00 - 22:00	2 000,000	100,000	1 000,000			
04. 11. 2022 22:00 - 23:00	2 000,000	100,000	1 000,000			
04. 11. 2022 23:00 - 00:00	2 000,000	100,000	1 000,000			

Figure 26 - Capacity Overview Screen

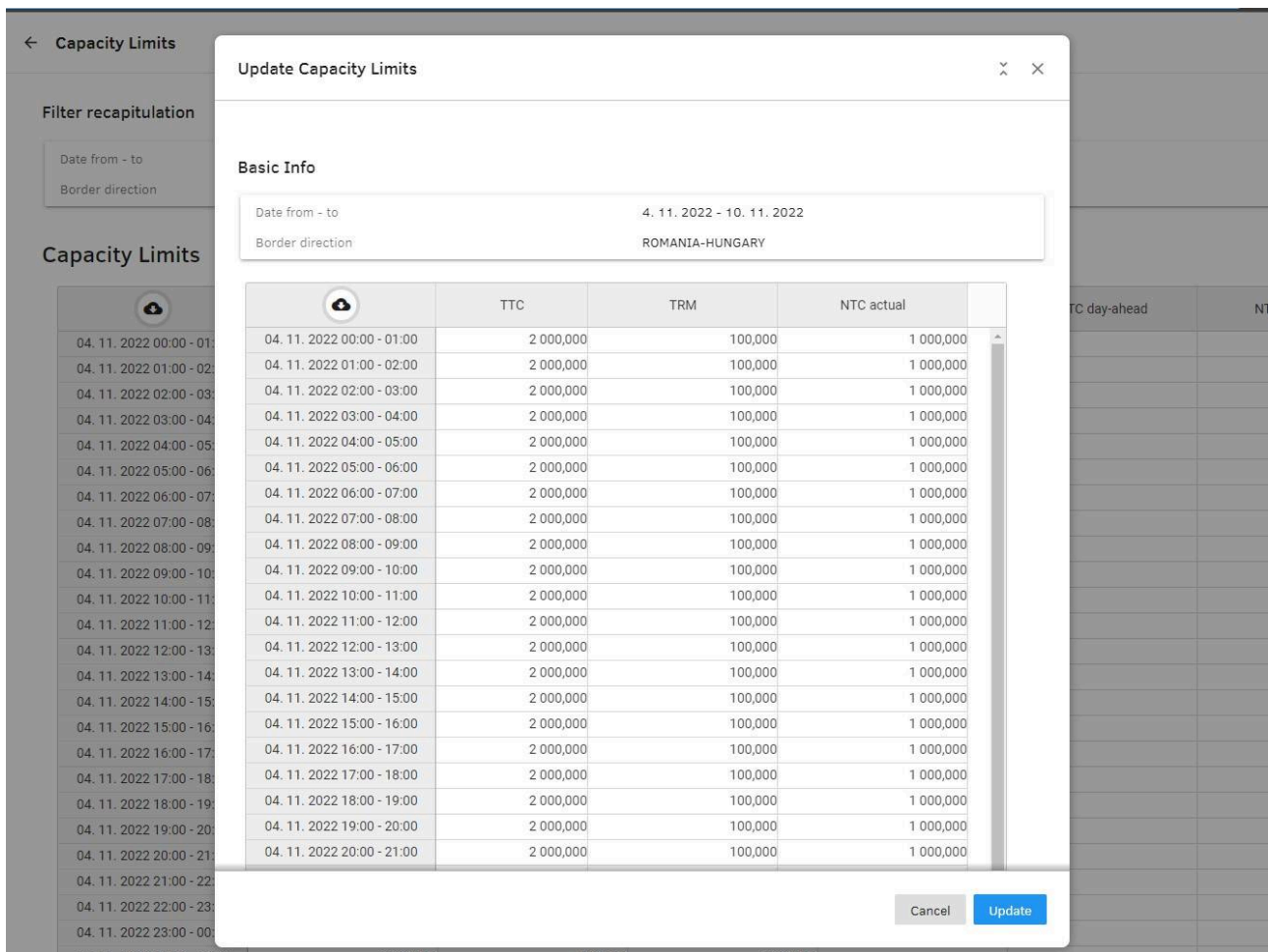


Figure 27 - Capacity Entry Screen

#### 4.5.1.2 TSO-TSO Capacities Alignment

After individual capacity calculation:

- MMS generates capacity documents for exchange with neighbouring TSOs.
- Received capacity documents are automatically processed.
- A configurable rule (e.g. minimum value principle) is applied to determine the final common NTC.
- The agreed NTC is used as the basis for ATC calculation.

The rule for determining the final common capacity is configurable per border.

#### 4.5.1.3 Publication of Offered Capacity

Once common ATC values are established:

- MMS prepares and sends offered capacity to the relevant Allocation Platform.
- Capacity values are structured according to required EDI formats.
- Separate configuration is supported per border and per Allocation Platform.
- Full audit trail of published capacity is maintained.

The module supports:

- Yearly, monthly, daily (and intraday where applicable) timeframes.
- Different neighbouring TSOs with separate configuration profiles.

#### **4.5.1.4 Support for Coordinated Capacity Calculation (Future Model)**

The solution supports future migration to a Coordinated Capacity Calculation (CCC) model.

In this scenario, MMS will:

- Receive Cross-Zonal Capacity (CZC) values from a regional Capacity Coordinator or internal system.
- Store and validate received values.
- Integrate CZC values into allocation processes.
- Support transition from NTC-based to flow-based methodology.

The architecture ensures that switching between bilateral NTC and coordinated methodologies does not require structural redesign of the system.

#### **4.5.1.5 Transmission Capacity for Balancing Energy Markets**

The transmission capacity for balancing energy markets, namely mFRR and aFRR, will be determined based on the inputs provided and data from previous time horizons. The inputs for this process include:

- Day-ahead and intraday capacities identified earlier (refer to chapter TSO-TSO Capacities).

#### **4.5.1.6 Cross-border schedules, (refer to chapter TSO-TSO Capacities Alignment)**

After individual capacity calculation:

- MMS generates capacity documents for exchange with neighbouring TSOs.
- Received capacity documents are automatically processed.
- A configurable rule (e.g. minimum value principle) is applied to determine the final common NTC.
- The agreed NTC is used as the basis for ATC calculation.

The rule for determining the final common capacity is configurable per border.

#### **4.5.1.7 Publication of Offered Capacity**

Once common ATC values are established:

- MMS prepares and sends offered capacity to the relevant Allocation Platform.
- Capacity values are structured according to required EDI formats.
- Separate configuration is supported per border and per Allocation Platform.
- Full audit trail of published capacity is maintained.

The module supports:

- Yearly, monthly, daily (and intraday where applicable) timeframes.
- Different neighbouring TSOs with separate configuration profiles.

#### **4.5.1.8 Support for Coordinated Capacity Calculation (Future Model)**

The solution supports future migration to a Coordinated Capacity Calculation (CCC) model.

In this scenario, MMS will:

- Receive Cross-Zonal Capacity (CZC) values from a regional Capacity Coordinator or internal system.
- Store and validate received values.

- Integrate CZC values into allocation processes.
- Support transition from NTC-based to flow-based methodology.

The architecture ensures that switching between bilateral NTC and coordinated methodologies does not require structural redesign of the system.

- )
- Foreign power trades between TSOs (Transmission System Operators).
- Updated mFRR transfers updated based on activations (refer to chapter Energy Bid Activation)
- Transmission line capacity limitations, including:
  - Constraints on transmission lines.
  - Utilization of transmission lines during the previous and subsequent quarter hours.
  - Border capacity reservations in the aFRR and mFRR capacity markets.

## **4.5.2 Capacity Allocation and Nomination Management**

This chapter describes how MMS interacts with external allocation platforms and processes market results.

### **4.5.2.1 Business Objective**

The Capacity Allocation & Nomination Management module supports Moldelectrica's role in explicit cross-border capacity allocation by enabling structured interaction with Allocation Platforms and ensuring consistent integration of allocation results into scheduling and settlement processes.

### **4.5.2.2 Cooperation with Allocation Platforms**

The system supports integration with:

- Ukrenergo Allocation Platform
- Transelectrica Allocation Platform
- Future JAO Single Allocation Platform

The module enables:

- Sending offered capacity
- Receiving auction specifications
- Receiving allocation results
- Processing nominations
- Managing curtailment events

Configuration is maintained separately per border and per Allocation Platform.

### **4.5.2.3 Auction Specification Processing**

MMS supports:

- Receiving auction parameters and product definitions
- Validation of received auction data
- Storage and versioning of auction specifications
- Audit trail of changes

Supported timeframes:

- Annual
- Monthly
- Daily

- Intraday (where applicable)

Basic info ^

Auction ID	RSRO-M-2023-01-01-001263
Border Direction	SERBIA-ROMANIA
Capacity Contract Type	Monthly
Auction product	PEAK
Auction type	Explicit
Auction period	1. 1. 2023 0:00 - 31. 1. 2023 0:00
Auction state	scheduled
Available offered capacity	800
Auction offered capacity	200

Auction bids overview

Auction participant	CE OLTENIA (30XR0CENCRAIOVAM)
---------------------	-------------------------------

Filters

Bid number	Requested capacity	Bid price	Bid evaluation state	Auction price	Saved Filters ▾	Save ▾	Update
------------	--------------------	-----------	----------------------	---------------	-----------------	--------	--------



Nothing to display

Auction Process Timing ▾

Auction Configuration ▾

#### 4.5.2.4 Allocation Results Processing

After auction clearing:

- MMS receives allocated capacity per participant
- Updates Already Allocated Capacity (AAC)
- Registers capacity rights (PTRs)
- Makes allocation results available for nomination
- Ensures consistency with scheduling validation

All allocation data is versioned and auditable.

Time interval	3. 1. 2026 0:00 - 4. 1. 2026 0:00
Capacity Contract Type	Daily
Border Direction	ROMANIA-SERBIA
Auction	RORS-D-03012026-000768
Market Participant	DANSKECOM (11XDANSKECOM---P)

	Total allocated capacity [MW]	Allocated in auctions [MW]	Transferred capacity [MW]	Curtailed capacity [MW]
03. 01. 2026 00:00 - 00:15	300,000	300,000		
03. 01. 2026 00:15 - 00:30	300,000	300,000		
03. 01. 2026 00:30 - 00:45	300,000	300,000		
03. 01. 2026 00:45 - 01:00	300,000	300,000		
03. 01. 2026 01:00 - 01:15	250,000	250,000		
03. 01. 2026 01:15 - 01:30	250,000	250,000		
03. 01. 2026 01:30 - 01:45	250,000	250,000		
03. 01. 2026 01:45 - 02:00	250,000	250,000		
03. 01. 2026 02:00 - 02:15	201,000	201,000		
03. 01. 2026 02:15 - 02:30	201,000	201,000		
03. 01. 2026 02:30 - 02:45	201,000	201,000		
03. 01. 2026 02:45 - 03:00	201,000	201,000		
03. 01. 2026 03:00 - 03:15	201,000	201,000		
03. 01. 2026 03:15 - 03:30	201,000	201,000		
03. 01. 2026 03:30 - 03:45	201,000	201,000		
03. 01. 2026 03:45 - 04:00	201,000	201,000		
03. 01. 2026 04:00 - 04:15	201,000	201,000		
03. 01. 2026 04:15 - 04:30	201,000	201,000		
03. 01. 2026 04:30 - 04:45	201,000	201,000		
03. 01. 2026 04:45 - 05:00	201,000	201,000		
03. 01. 2026 05:00 - 05:15	201,000	201,000		
03. 01. 2026 05:15 - 05:30	201,000	201,000		
03. 01. 2026 05:30 - 05:45	201,000	201,000		

Figure 28 - Example of Allocated Capacity Overview

#### 4.5.2.5 Nomination Management

The module supports:

- Validation of nominations against allocated PTRs
- Integration with cross-border scheduling module
- Handling of nomination deadlines (long-term and short-term)
- Reconciliation with Allocation Platform data

This ensures strict compliance between allocated rights and scheduled energy.

#### 4.5.2.6 Curtailment Management

The system supports curtailment processes in accordance with allocation rules:

- Processing curtailment instructions from Allocation Platform
- Pro-rata or rule-based reduction of allocated capacity
- Adjustment of PTRs and related nominations
- Notification to affected market participants
- Impact integration into settlement calculations
- Manual override capability (with full audit trail)

Curtailment rules can be configured per border.

### Capacity Curtailment

Border direction	HUNGARY-ROMANIA
State	final
Period	3. 2. 2026 0:00 - 28. 2. 2026 0:00
Product	PEAK

### Curtailment parameters

Date:

Reason:

Reason code\*:

[Load curtailment requirements](#)

### Curtailment requirements

	Allocated capacity [MW]	Target capacity [MW]	Relative target capacity [%]
03. 02. 2026 15:00 - 16:00	0,000	0,000	0,00%
03. 02. 2026 16:00 - 17:00	205,000	100,000	48,78%
03. 02. 2026 17:00 - 18:00	205,000	100,000	48,78%
03. 02. 2026 18:00 - 19:00	205,000	100,000	48,78%
03. 02. 2026 19:00 - 20:00	205,000	100,000	48,78%
03. 02. 2026 20:00 - 21:00	205,000	100,000	48,78%
03. 02. 2026 21:00 - 22:00	0,000	0,000	0,00%

[Re-calculate curtailment values](#)

[Cancel Curtailment](#)
[Confirm Curtailment](#)

Figure 29 - Example of Curtailment Management

## 4.6 Balancing Market

### 4.6.1 Balancing Capacity Market

This module stands for the managing of the capacity market including receiving of the bids, receiving or calculation of the capacity demand, managing the auctions workflow and market clearing.

It also includes possibility to create capacity transfer between the BSPs with respective list of functionalities such as validations and notifications.

This module includes the following functionalities:

- Manually enter capacity demand
- Receive bids from BSPs
- Clear the market
- Send results to the BSP
- Send results to the transparency platform(s)

#### 4.6.1.1 Capacity Auction

For each supported product (FFR, FCR, aFRR, mFRR or others), one or more markets may be configured. The configuration consists of two basic parts:

- Configuration of product,
- Configuration of market.

Product includes the product-specific features which are common for all markets assigned to the given product. The main characteristics of the product are product resolution (15 or 60 minutes), supported directions (up, down or symmetric up/down) or quantity and price steps.

In the second step, the markets are configured whereas each market is assigned to a product. Multiple capacity markets may be created for the same product. Markets include mainly the configuration of the timeline (bidding gate open/close etc.).

The auction timeline may be configured per auction. It usually includes gate opening time, gate closing time and results publication time. The clearing time does not have specific configured time, it is run always right after the bidding gate closure. In the case of externalized clearing, the bids are sent automatically to the external system right after the gate closure.

Code Tables > Balancing Capacity Product Configuration List + Create

Code	Valid From	Valid To	Product Resolution	Direction Up	Direction Down	Direction Up and Down	Price step	Power step	Maximum power [MW]	Maximum price [€/MW]	
FCR-D-DOWN	01.01.2020	31.12.2099	PT15M	true	–	–	0.01	1	9999	9999	
FCR-D-UP	01.01.2020	31.12.2099	PT15M	true	–	–	0.01	1	9999	9999	
FCR-N	01.01.2020	31.12.2099	PT15M	–	–	true	0.01	1	9999	9999	
FFR	01.01.2020	31.12.2099	PT15M	–	–	true	0.01	1	9999	9999	
aFRR	01.04.2025	30.04.2025	PT15M	true	true	–	0.01	1	999	999	
mFRR	01.01.2020	31.12.2099	PT15M	true	true	–	0.01	1	9999	9999	

Figure 30 - Capacity Product Overview

**Edit mFRR (Balancing Capacity Product Configuration)**

Valid Interval: 01.01.2020 - 31.12.2099

Name: mFRR

Product Resolution: PT15M, PT1H, PID

Direction Up:  Direction Up,  Direction Up and Down

Direction Down:  Direction Down

Price step: 0,01

Power step: 1

Minimum power [MW]: -9 999

Maximum power [MW]: 9 999

Minimum price [€/MW]: -9 999

Maximum price [€/MW]: 9 999

Bidding open offset [Days]: -1

Bidding open time [HH:MM] UTC: 10:00

Bidding close offset [Days]: 0

Bidding close time [HH:MM] UTC: 22:00

Market clear offset [Days]: 0

Market clear time [HH:MM] UTC: 23:45

Auction create offset [Days]: -2

Auction create time [HH:MM] UTC: 00:00

Order N: 6

Buttons: Cancel, Confirm

Figure 31 - Capacity Auction Configuration

One local clearing algorithm for all products is used in the default configuration. It can run in:

- Marginal price mode.
- “Pay as bid” mode.

The clearing is generally repeatable. If the operator decides to repeat the clearing, he/she can reject the clearing result and the auction workflow returns back before the clearing. The operator can also modify the results.

It is also possible to create the whole accepted bid manually, which can be used for the procurement of the capacity outside auction (direct procurement).

The accepted bids and the overall results of the auction are reported to ENTSO-E transparency. The submission can be disabled for the given auction if external system is responsible for that submission.

The accepted bids (trades) are also automatically sent to settlement module. We assume using the standard XML format, like ENTSO-E Reserve Allocation Document or ENTSO-E Energy Account Report.

Picture below shows the list of the Balancing capacity auctions in the system.

Tender List EN +2

**ANS Tender List** + Create Tender

Filters: Tender number 110\_2022, 111\_2022, 121\_2022, 122\_2022, 123\_2022 Saved Filter: Auto saved - 17. 10. 20... Save Update

Tender number	Time interval	State	Services	
123_2022	1. 12. 2022 0:00 - 2. 12. 2022 0:00	Tender Cancelled	mFRUp, mFRDown	🔍 ⋮
122_2022	1. 12. 2022 0:00 - 2. 12. 2022 0:00	Tender Evaluated	mFRUp, mFRDown	🔍 ⋮
121_2022	1. 12. 2022 0:00 - 8. 12. 2022 0:00	Tender Evaluated	mFRUp, mFRDown	🔍 ⋮
111_2022	1. 12. 2022 0:00 - 2. 12. 2022 0:00	Tender Evaluated	mFRUp	🔍 ⋮
110_2022	1. 12. 2022 0:00 - 2. 12. 2022 0:00	Tender Evaluated	mFRUp, mFRDown	🔍 ⋮

Figure 32 – Balancing Capacity Auctions List

From this screen operator can be redirected to the overview of the bids, update auction parameters, manage processes, overview auction statistics and cancel auction. It is possible to see common information in form of chart or graph.

← ANS Tender Details
EN

**Tender basic parameters**

Tender number	110_2022
Time interval	1. 12. 2022 0:00 - 2. 12. 2022 0:00
State	Tender Evaluated
Timestamp	10. 10. 2022 8:12

**Tender activities**

Tender publishing	30. 11. 2022 8:45
Bidding opened	30. 11. 2022 9:15
Bidding closed	30. 11. 2022 12:15
Tender evaluation	30. 11. 2022 14:15
Tender results publishing	30. 11. 2022 15:15

**Tender evaluation versions** Create new version

Version	Timestamp	Final	Algorithm	Parameter	Total tender cost	⌵ ⌲ ⌵
1	2022-10-10T08:33:04.708Z	Yes	Needs	100	255	🔍

**Tender demand parameters**

	mFRRUp [MW]	mFRRDown [MW]
12/01/2022 00 - 01	10.000	10.000
12/01/2022 01 - 02	10.000	10.000
12/01/2022 02 - 03	10.000	10.000
12/01/2022 03 - 04	10.000	10.000
12/01/2022 04 - 05	10.000	10.000
12/01/2022 05 - 06	10.000	10.000
12/01/2022 06 - 07	10.000	10.000

Figure 33 - Auction Details

After user click on the “Create new auction” modal window appears where user can define all necessary parameters of the auction such as: time interval, price scheme, timings and services.

### Tender Services - Create ✕

Time interval\*

---

Tender activities timing

Tender publishing\*

Bidding opened\*

Bidding closed\*

Tender evaluation\*

Tender results publishing\*

---

Tender services

Service	Select for tender	Allow indivisible bids
aFRR Down	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
aFRR Up	<input checked="" type="checkbox"/>	<input type="checkbox"/>
mFRR Down	<input type="checkbox"/>	<input type="checkbox"/>
mFRR Up	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

*Figure 34 - Create New Capacity Auction*

After the clearing algorithm is completed in the statistics it is possible to overview the results.

## Tender basic parameters

Tender number	127_2022
Time interval	1. 12. 2022 0:00 - 2. 12. 2022 0:00
State	Tender Evaluated
Timestamp	26. 10. 2022 9:52

## Tender activities

Tender publishing	30. 11. 2022 10:30
Bidding opened	30. 11. 2022 11:00
Bidding closed	30. 11. 2022 14:00
Tender evaluation	30. 11. 2022 16:00
Tender results publishing	30. 11. 2022 17:00

## Tender statistics

mFRR Up				
	Tender demand [MW]	Tender satisfied dem...	Tender price [L/E]	
01. 12. 2022 00 - 01	20,000	N/A	N/A	
01. 12. 2022 01 - 02	20,000	N/A	N/A	
01. 12. 2022 02 - 03	20,000	N/A	N/A	
01. 12. 2022 03 - 04	20,000	N/A	N/A	
01. 12. 2022 04 - 05	20,000	N/A	N/A	
01. 12. 2022 05 - 06	20,000	N/A	N/A	
01. 12. 2022 06 - 07	20,000	N/A	N/A	
01. 12. 2022 07 - 08	20,000	N/A	N/A	
01. 12. 2022 08 - 09	20,000	N/A	N/A	
01. 12. 2022 09 - 10	20,000	N/A	N/A	
01. 12. 2022 10 - 11	20,000	N/A	N/A	

Figure 35 – Auction Statistics

It is possible to create also new round of the auction clearing by selecting “Create new version” in the auction details.

#### 4.6.1.2 Capacity Demand

Set of the views and background processes is available for the administration of capacity demands.

The demands are administered separately for each product (like aFRR, mFRR), and also direction if applicable (up, down). The demands are often entered in long-term, for the longer validity in the future. On the second level, it is possible to define the weekly exceptions, e. g. the Monday profile may be different from the default. Finally, the demands can be defined on daily level.

The time granularity may be hour, quarter-hour or any other common time resolution.

The incoming or manually entered data is validated. The standard validations are against minimum/maximum value or other simple validations like this.

The following image shows how the operator is able to insert demand manually to the table with excel-like appearance with possibility to drag-n-drop values, copy-paste from/to excel, etc.

Update Tender demands ×


	FRRUp [MW]	aFRRDown [MW]	mFRRUp [MW]
11/09/2022 00 - 01	10.000	5.000	
11/09/2022 01 - 02	10.000	5.000	
11/09/2022 02 - 03	10.000	5.000	
11/09/2022 03 - 04	10.000	5.000	
11/09/2022 04 - 05	10.000	5.000	
11/09/2022 05 - 06	10.000	5.000	
11/09/2022 06 - 07	10.000	5.000	
11/09/2022 07 - 08	10.000	5.000	
11/09/2022 08 - 09	10.000	5.000	
11/09/2022 09 - 10	10.000	5.000	
11/09/2022 10 - 11	10.000	5.000	
11/09/2022 11 - 12	10.000	5.000	
11/09/2022 12 - 13	10.000	5.000	
11/09/2022 13 - 14	10.000	5.000	
11/09/2022 14 - 15	10.000	5.000	
11/09/2022 15 - 16	10.000	5.000	
11/09/2022 16 - 17	10.000	5.000	
11/09/2022 17 - 18	10.000	5.000	
11/09/2022 18 - 19	10.000	5.000	
11/09/2022 19 - 20	10.000	5.000	
11/09/2022 20 - 21	10.000	5.000	
11/09/2022 21 - 22	10.000	5.000	
11/09/2022 22 - 23	10.000	5.000	
11/09/2022 23 - 00	10.000	5.000	

Figure 36 - Insert/update Capacity Demand

### 4.6.1.3 Capacity Bid

After gates are opened, each certified BSP can provide bids using the using ENTSO-E Reserve Bid Document or insert it manually directly into the GUI. When the new file is received or the bid is created using the GUI, it is validated against standard validations such as min/max volumes (against portfolio or global limits of the given market), possibility to have divisible bid, linkage, price caps, etc. Those validations are configurable either during creation of the auction (e.g. divisibility of the bid or possible services) or by configuring the master data item "Balancing capacity product" where it is possible to define minimum and maximum quantities, prices, etc. (see chapter Market Participants Management

Management of Market Participants consists of two main components: Master Data Management, described in the following chapter, which enables the configuration of organizations, units, and related entities; and User Management, described in this section, which governs user access and permissions within the system.

The User Management module ensures secure, structured, and auditable administration of all internal and external users of the Moldelectrica MMS.

The module supports the full lifecycle management of users, including registration, modification, activation, suspension, and deactivation. Each user is assigned one or more roles that define access rights, functional permissions, and visibility of data within the system.

The system enables:

- Creation and maintenance of user accounts for TSO operators, market participants, and other authorized stakeholders
- Role-based access control (RBAC) with configurable permissions per module and functionality
- Assignment of users to specific organizations
- Management of authentication parameters and security policies
- Complete audit trail of user activities and configuration changes

User Management is tightly integrated with Master Data Management and all business modules, ensuring that access rights are consistently enforced across capacity markets, balancing energy markets, scheduling, settlement, and reporting.

## 4.7 Secure Software Development Life Cycle

Software security is about building software to be secure even when it is exposed to a threat or attack. As we have learned from years of practice, protecting software is much easier if the software is built with security in mind. Furthermore, security is a property and not a thing, so software security - being resistant to threat or attack - involves much more than simply adding security features like encryption or passwords to the software.

The SSDLC (Secure Software Development Life Cycle) Process used in Unicorn Systems defines how to integrate security into the software development process. A secure SDLC process ensures that security assurance activities such as design review, architecture analysis, code review, and penetration testing are an integral part of the development lifecycle:

- > More secure software as security is a continuous concern.
- > Awareness of security considerations by stakeholders.
- > Early detection of flaws in the system.
- > Cost reduction because of early detection and resolution of issues.
- > Overall reduction of intrinsic business risks for the organization.
- > Facilitation of informed executive decision-making through the application of a comprehensive risk management process promptly.
- > Documentation of important security decisions made during the development process to inform the management about security considerations during all phases of development.
- > Improved organization and customer confidence to facilitate adoption and use of systems, and improved confidence in the continued investment in government systems.

Damas MMS is resilient against cyber threats, which is ensured through regular security audits and security exercises such as vulnerability scanning and/or penetration testing. Further to the security, development and maintenance procedures are compliant with the latest security standards and industrial standards – user certificates and other access control methods including the least privilege principle, encryption of the data, validation, logging, anti-virus scans and so on.

## 4.8 OIDC and Identity Management

The user authentication processes are based on the OAuth **2.0/OpenID Connect 1.0** (OIDC) protocols. There is an OAuth/OIDC-compliant identity provider (OIDC service) available in Damas MMS, with support of various

OIDC flows and several authentication scenarios (e.g., single-factor authentication, multi-factor authentication, "remember me" cookie, single-sign-on and single-sign-out).

The OIDC service supports internal **identities**, **but** it can also be linked to identities from any external **identity provider** supporting OIDC or SAML federation, e.g.:

- > **social identity providers such** as Google Sign-In, Facebook Login, Microsoft Login and Apple ID are already integrated and ready to be used,
- > for corporate deployments it can be integrated with existing corporate **identity providers** (like the MS Active Directory, and KeyCloak),
- > public sector deployments can utilize integrations with national **identities or bank IDs**, etc.

The Identity **Management service** is responsible for managing identities and their user settings (like preferred time zone, language etc.). Various types of identities are supported – e.g. person (real users), system (technical user) and "things" (IoT devices).

The following images show the basic screens for user management.

The screenshot shows a web interface for managing users. At the top, there's a title 'Standard Users' and a subtitle 'List of all users'. On the right, there are icons for search, filter, and a 'Global Actions Log' button, along with a '+ Create a User' button. Below the header, there are filter buttons for 'State' (active, suspended) and a 'Clear filters' button. The main content is a table with the following columns: State, Name, Email, uid, and Creation time. Each row represents a user, with a green 'ACTIVE' label in the State column and a three-dot menu icon in the rightmost column.

State	Name	Email	uid	Creation time
ACTIVE	[blurred]	[blurred]	[blurred]	23. 5. 2024 14:14
ACTIVE	[blurred]	[blurred]	[blurred]	23. 5. 2024 14:19
ACTIVE	[blurred]	[blurred]	[blurred]	23. 5. 2024 14:20
ACTIVE	[blurred]	[blurred]	[blurred]	23. 5. 2024 13:35
ACTIVE	[blurred]	[blurred]	[blurred]	23. 5. 2024 14:20
ACTIVE	[blurred]	[blurred]	[blurred]	23. 5. 2024 13:34
ACTIVE	[blurred]	[blurred]	[blurred]	21. 5. 2024 11:26
ACTIVE	[blurred]	[blurred]	[blurred]	27. 6. 2024 10:00
ACTIVE	[blurred]	[blurred]	[blurred]	18. 7. 2024 08:55
ACTIVE	[blurred]	[blurred]	[blurred]	23. 5. 2024 13:38
ACTIVE	[blurred]	[blurred]	[blurred]	23. 5. 2024 13:39
ACTIVE	[blurred]	[blurred]	[blurred]	23. 5. 2024 14:27
ACTIVE	[blurred]	[blurred]	[blurred]	25. 4. 2024 15:48
ACTIVE	[blurred]	[blurred]	[blurred]	23. 5. 2024 13:41

Figure 9 - List of Users



Figure 10 - User Details

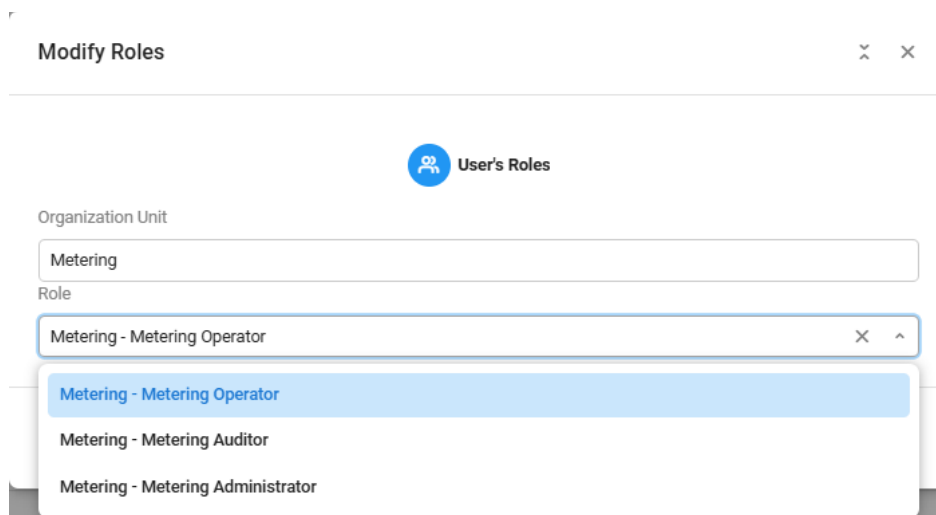


Figure 11 - Assigning Roles to Users

Master Data ).

The market participant can send bids by data flow or create bids directly in the GUI by clicking “Create bid”.

### Create Tender Bid

**Tender basic info**

Tender number: 7/2022

Time interval: 01.04.2022 - 30.04.2022

Tender state: Bidding Open

Timestamp: 2022-01-01T12:29:36Z

**Tender bid basic info**

Participant:

Service:

Bid tme interval:

Divisible:

[Show data](#)

**Tender bid values**

Delivery day:

[Add bid](#)

Time interval 01.04.2022		Demanded power [MW]	Bid 1 <span style="color: red; font-weight: bold;">X Remove</span>		Bid 2 <span style="color: red; font-weight: bold;">X Remove</span>	
Date	MTU		Offered power [MW]	Offered price [LEI/MWh]	Offered power [MW]	Offered price [LEI/MWh]
01.04.2022	01:00 - 02:00	100	10	5,0	20	5,1
01.04.2022	02:00 - 03:00	100	10	5,0	20	5,1
01.04.2022	03:00 - 04:00	100	10	5,0	20	5,1
01.04.2022	04:00 - 05:00	100	10	5,0	20	5,1
01.04.2022	05:00 - 06:00	100	10	5,0	20	5,1
01.04.2022	06:00 - 07:00	100	10	5,0	20	5,1
01.04.2022	07:00 - 08:00	100	10	5,0	20	5,1
...						
<b>Total</b>		<b>700</b>	<b>70</b>		<b>140</b>	

[Save](#)

Figure 37 - Create Capacity Bid

And insert offered quantity and prices. It is possible to create one or several bids with different quantities and prices.

Each bid is validated against the validation rules and in case of failure error is presented on the screen. Same validation rules are applicable for bid received by the data flow or inserted by the GUI.

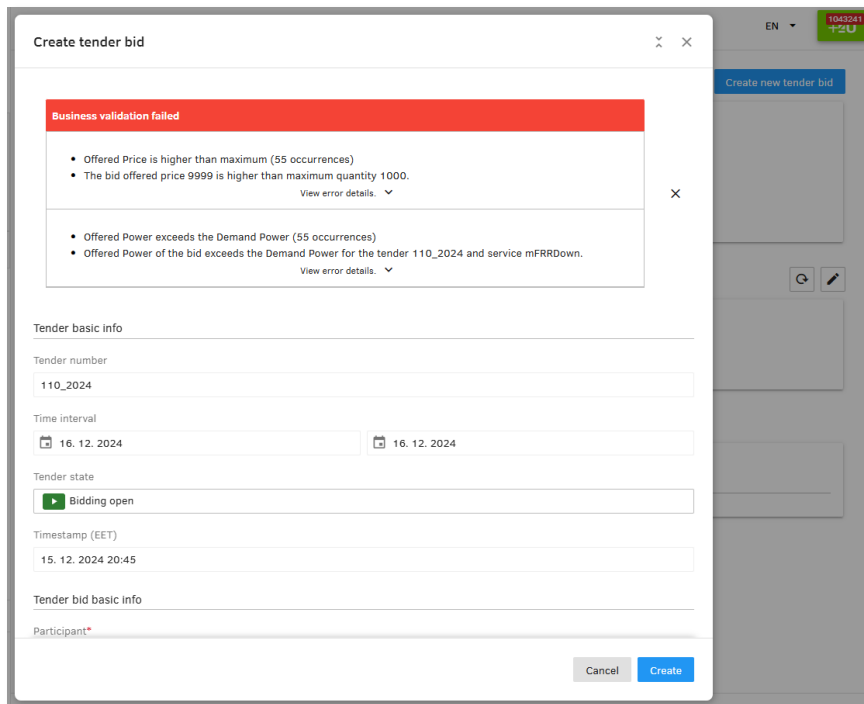


Figure 38 - Bid Validation Error

Bids table supports also exporting to the excel file so the user can manage it directly in excel and then copy-paste back to the system.

#### 4.8.1.1 Capacity Market Clearing

The local capacity market clearing is performed by in-built algorithm that determines the results based on balancing capacity demand, bid volume and bid price.

The Tender is evaluated based on the price scheme selected during the Tender creation. The price schemes are applied as follows:

- marginal price principle - the price of the last accepted bid is applied for all accepted bids. As a result, the price for the given Tender and Tender Evaluation Version will be the same marginal price.
- pay as bid principle - the offered price of the accepted bid is applied. As a result, the price for the given Tender and Tender Evaluation Version will be the average price of accepted offers.

#### 4.8.1.2 Capacity Contracts (Trades)

After the auction is finished, the contracts are created from the accepted bids and it is also possible to create the contract (trade) in the system manually by the operator. The contracts are represented in the system from the dashboard or in a separate menu. There are different types of contracts are possible: "Tender" – based on the results of the auctions, "Transfer" – for the capacity transfers, "Regulated" – for specific regulations of the contracted capacities.

**ANS contract administration** EN 1043295 +ZU

Organization: TEL  
User: Super User (8354-6518-6710-200)  
Environment: TEST  
Time: 21:02:11 EET

Filters: Time interval 15. 12. 2023 - 13. 1. 2025 Tender number 31\_2024, 53\_2024

Buttons: + Create new contract, Saved Filters, Save, Update

Participant	Tender number	Contract annex number	Contract type	Service	Total contracted power [MW]	
CETARAD	31_2024	30XROCETARAD--5...	Transfer	mFRR Down	0	
CETARAD	31_2024	30XROCETARAD--5...	Transfer	mFRR Down	0	
ELCEN (30XROELCEN-...	31_2024	30XROELCEN----D-m...	Transfer	mFRR Down	0	
CE OLTENIA (30XROC...	31_2024	31_2024-30XROCE...	Tender	mFRR Down	240	
CE OLTENIA (30XROC...	53_2024	30XROCECRAIOVAM...	Transfer	aFRR Up	0	
HIDROELECTRICA (30...	53_2024	30XROHIDRO----1-a...	Transfer	aFRR Down	240	
AOT (30XROAOTE...)	53_2024	53_2024-30XROAOTE...	Tender	FCR	288	
AOT (30XROAOTE...)	53_2024	53_2024-30XROAOTE...	Tender	mFRR Up	840	
BEPCO (30XROBEPCO...	53_2024	53_2024-30XROBEPC...	Tender	aFRR Up	189	
BEPCO (30XROBEPCO...	53_2024	53_2024-30XROBEPC...	Tender	aFRR Up	239	
CE OLTENIA (30XROC...	53_2024	53_2024-30XROCE...	Tender	aFRR Down	480	
CE OLTENIA (30XROC...	53_2024	53_2024-30XROCE...	Tender	aFRR Up	480	
CE OLTENIA (30XROC...	53_2024	53_2024-30XROCE...	Tender	mFRR Down	1440	
CE OLTENIA (30XROC...	53_2024	53_2024-30XROCE...	Tender	mFRR Down	600	
CE OLTENIA (30XROC...	53_2024	53_2024-30XROCE...	Tender	mFRR Up	2400	
CE OLTENIA (30XROC...	53_2024	53_2024-30XROCE...	Tender	mFRR Up	1040	
HIDROELECTRICA (30...	53_2024	53_2024-30XROHIDR...	Tender	aFRR Up	1200	
HIDROELECTRICA (30...	53_2024	53_2024-30XROHIDR...	Tender	aFRR Up	192	
HIDROELECTRICA (30...	53_2024	53_2024-30XROHIDR...	Tender	aFRR Up	100	

Figure 39 - Contracts Overview

The screenshot below shows details of the trades generated based on the auction clearing results.

← ANS Contract Detail EN +ZU

Basic info Cancel Contract

Time interval	26. 9. 2022 0:00 - 30. 9. 2022 0:00
Participant	CE_OLTENIA
Contract number	5
Contract type	regulated
Service	aFRRUP

Contract values

Delivery day: 26. 9. 2022

	Contracted power [M...]	Contracted price [LEI...]
09/26/2022 00 - 01	10.000	
09/26/2022 01 - 02	10.000	
09/26/2022 02 - 03	10.000	
09/26/2022 03 - 04	10.000	
09/26/2022 04 - 05	10.000	
09/26/2022 05 - 06	10.000	
09/26/2022 06 - 07	10.000	
09/26/2022 07 - 08	10.000	
09/26/2022 08 - 09	10.000	
09/26/2022 09 - 10	10.000	
09/26/2022 10 - 11	10.000	
09/26/2022 11 - 12	10.000	
09/26/2022 12 - 13	10.000	
09/26/2022 13 - 14	10.000	

Figure 40 - Capacity Trades Details

### 4.8.1.3 Obligation Transfer

BSP is allowed to transfer part of its capacity order to another BSP, up to the set deadline. The identical transfer must be sent by both BSPs via ENTSO-E XML file (transferor and transferee). Alternatively, the transfer can be confirmed by the transferee on user interface.

The subject of the transfer can be any part of the capacity trade, i. e. any part of the quantity in any MTU of the day. The order of both BSPs is recalculated once the transfer is confirmed. The transferee must have sufficient portfolio quantity to confirm the transfer, taking into account its sum of trades.

The bilateral transfer is submitted by the BSP by specifying both transferor and transferee. The public transfer can be submitted by transferor BSP only whereas the transferee BSP is not specified.

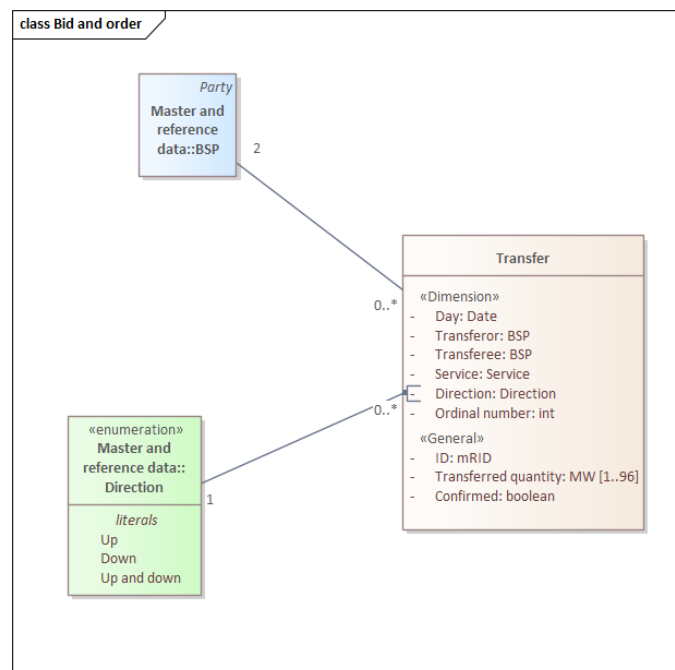
The capacity transfer view in the system displays all transfers for the given day and capacity product. Operator can see (and also modify) all transfers.

BSPs can display only the transfers where they play the role either transferor or transferee, and also all transfers without assigned transferee.

The transferor may submit the transfer only if it has enough quantity of capacity trades for the given MTUs and product. The transferee may confirm the transfer only if it has enough portfolio quantity to take over an additional capacity obligation.

Any manipulation with the transfers is allowed only until the transfers gate closure which is H – 60 minutes. If any unconfirmed transfer or public transfer (which has not yet assigned a transferee) remains in the system, it is automatically marked as rejected.

After the transfer confirmation, the total capacity trade is recalculated both for transferor and transferee and both BSPs are informed about the successful transfer.



AnS contract administration EN 1043337

[+ Create new contract](#)

Filters Time interval 15. 12. 2023 - 13. 1. 2025 Contract type Transfer [Saved Filters](#) [Save](#) [Update](#)

Participant	Tender number	Contract annex number	Contract type	Service	Total contracted power [MW]	
CETARAD	31_2024	30XROCETARAD---5-...	Transfer	mFRR Down	0	🔍 ✎ ✕ +
CETARAD	31_2024	30XROCETARAD---5-...	Transfer	mFRR Down	0	🔍 ✎ ✕ +
ELCEN (30XROELCEN-...	31_2024	30XROELCEN-----D-m...	Transfer	mFRR Down	0	🔍 ✎ ✕ +
CE OLTENIA (30XROC...	53_2024	30XROCENCRATIOVAM...	Transfer	aFRR Up	0	🔍 ✎ ✕ +
HIDROELECTRICA (30...	53_2024	30XROHIDRO-----1-a...	Transfer	aFRR Down	240	🔍 ✎ ✕ +

Figure 41 - Transfer Capacity Contract

**Litgrid** Balance planning - Balancing capacity market - Balancing energy market - BSP balancing settlement - BRP imbalance settlement - Transmission settlement - TSO actual data electricity settlement

**Capacity transfers** [Create](#)

Balancing capacity market / Capacity market /

Day: 19.12.2024 [Update data](#)

Day	Transferor	Transferee	Service	Direction	Transfer #	Transfer ID	Confirmed
19.12.24	Ignitis gamyba	Panevežio energija	aFRR	Down	6	130504	-
19.12.24	Ignitis gamyba	Panevežio energija	mFRR	Down	1	D26E5BD	-
19.12.24	Kauno kogeneracinė jėgainė	Ignitis gamyba	mFRR	Up	1	127516C	✓

Day 19.12.24 Transferor Kauno kogeneracinė jėgainė Transferee Ignitis gamyba

Confirmed  [Edit](#) [Export](#) Change log

Day	Transfer ID	Confirmed
19.12.24	127516C	✓
00:00		5
00:15		8
00:30		3
00:45		66
01:00		23
01:15		54
01:30		67
01:45		44
02:00		5
02:15		8

Figure 42 - Capacity Transfer

**Capacity transfers** [Create](#)

Balancing capacity market / Capacity market /

Day: 19.12.2024 [Update data](#)

Day	Transferor	Transferee	Service	Direction	Transfer #	Transfer ID	Confirmed
19.12.24	Ignitis gamyba	Panevežio energija	aFRR	Down	6	130504	-
19.12.24	Ignitis gamyba	Panevežio energija	mFRR	Down	1	D26E5BD	-
19.12.24	Kauno kogeneracinė jėgainė	Ignitis gamyba	mFRR	Up	1	127516C	✓

**Create**

Day: 19.12.2024 [Update data](#)

Transferor: Achema

Transferee: ORLEN Lietuva

Service: mFRR

Direction: Up

Transfer #: 1

[OK](#) [Cancel](#)

Figure 43 - New Capacity Transfer

#### 4.8.1.4 Configuration

The Balancing Capacity Market can be managed by the general system configuration and market specific configuration. The Balancing Capacity Product can be extended with specific market configuration. Set of configuration will be elicited during analysis phase.

The market configuration is listed below.

Name	Description
Validity	Defines validity of the Balancing Product

Name	Description
Name	Defines name of the Balancing Product.
Direction Up	Defines if bids may be submitted for direction Up.
Direction Down	Defines if bids may be submitted for direction Down.
Direction Up and Down	Defines if bids may be submitted for direction Up and Down.
Price step	Defines number of decimals
Power step	Defines number of decimals
Minimum Power	Minimum possible power for bids
Maximum Power	Maximum possible power for bids
Minimum Price	Minimum possible price for bids
Maximum Price	Maximum possible price for bids
Bidding open offset [Days]	Defines days shifting for the business process step
Bidding open time [HH:MM] UTC	Defines time of the business process step
Bidding close offset [Days]	Defines days shifting for the business process step
Bidding close time [HH:MM] UTC	Defines time of the business process step
Market clear offset [Days]	Defines days shifting for the business process step
Market clear time [HH:MM] UTC	Defines time of the business process step
Auction create offset [Days]	Defines days shifting for the business process step
Auction create time [HH:MM] UTC	Defines time of the business process step

#### 4.8.2 Balancing Energy Market (mFRR)

The Damas MMS provides the following functionality for the mFRR energy market:

- energy bids management,
- communication with BSP using CIM messages, e.g. receiving of incoming bids, sending activated bids,
- standard validation of incoming data (XSD check, sanity check of data),
- bid validations according mFRR product configuration,
- scheduled and direct demand management,
- communication with MARI platform using CIM messages.

The mFRR energy market process is configurable through activities and can be extended for project needs.

The mFRR market can be configured as well through balancing energy product configuration (e.g. it is possible to disable submission of direct bids by BSP).

##### 4.8.2.1 Balancing Energy Bid

This module covers bids submitting by Balancing Service Providers (BSPs) for the mFRR energy market. It is possible to model of the bid structure based on product configuration. It is capable of handling both simple and complex bids.

It also covers the validation of bids based on generic rules and rules defined by TSO. The bids can be received both by data flows via Enelane or by the GUI of the Bids submodule. Such GUI supports not only basic functions like bids entering and validation but also such use cases as copying of bids to make the bidding as easy as possible.

The support for manual bids upload through XLSX can be implemented in scope of project. The format will be same as generated export.

#### 4.8.2.1.1 Structure of Bid

The Balancing Bid includes the following key attributes: Price, Divisibility, Direction, Minimum Offered Volume, Maximum Offered Volume, Activation Type, State, Status, Linking.

Furthermore, bids can be expanded with additional attributes for storing information related to unavailability, activation bid, custom project data, and more. The detailed structure is described in the table below.

Characteristics	Value
BSP	The EIC code of BSP which submitted bid.
Unit	The Production Unit of the offered reserve.
Product	The mFFR product.
Internal ID	Id of the Bid defined by BSP in case of submission through file. Generated by system for bid entered through screen.
Direction	Defines if energy will be produced or consumed. Can be Upward or Downward.
Activation type	The activation type of the bid. Can be scheduled, direct, scheduled and direct. Possible to configure through Balancing Energy Product.
Trading Period	Start of trading period to which bid belongs.
Status	Status of the bid in the trading process, used for communication with external systems or Common Platform.
Minimum offered volume	Limits are configurable for Balancing Energy Product.
Maximum offered volume	Offered volume of bid submitted by BSP. Limits are configurable for Balancing Energy Product.
Activation Origin	Used to identify origin of bid activation. Following origins are possible: congestion, balancing, special regulation, manual activation, support power trade. The list will be analysed more detailed during analysis phase.
Price	Price of bid in default currency from Balancing Energy Product. This currency also used for communication with Common Platforms. Limits are configurable for Balancing Energy Product.
Bid State	State of bid defined by system. Used for defining in which state bid is now depending on life cycle.
Unavailability business type	Stores Business type for bids with changed availability to "Unavailable".
Unavailability reason code	Stores Reason Code for bids with changed availability to "Unavailable".
Unavailability reason text	Stores Text for bids with changed availability to "Unavailable".
Receive Time Stamp	Used as identification of timestamp received from the AOF platform as result of AOF round.
Activation Period Start	Start of the Activation Period from the AOF result.
Activation Period End	End of the Activation Period from the AOF result.
Accepted Volume	Accepted power by AOF.
Accepted Price	Accepted price of bid in default currency from Balancing Energy Product. This currency also used for communication with Common Platforms.

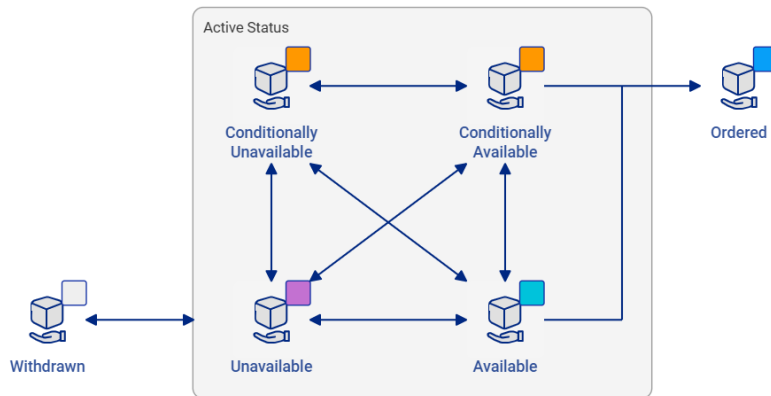


Figure 44 - Bid Status Flow

#### 4.8.2.1.2 Linked Bids

The mFFR bid can be submitted as linked bids. The types of linkage are configurable in the Product master data item. Following types are possible to enable:

- **Multipart Bid:** consists of two or more simple bids within the same Trading Period. Following rules applied:
  - A component of an upward multipart bid cannot be activated unless all other components with a lower price have been activated up to their entire offered volumes.
  - Similarly, a component of a downward multipart bid cannot be activated unless all other components with a higher price have been activated up to their entire offered volumes.
  - If at least one bid is activated in Scheduled Activation (SA), the remaining volume of the multipart bid is no longer available for Direct Activation (DA).
  - Conversely, if at least one bid is activated in an optimization for DA, the remaining bids are no longer available for any subsequent DA optimizations.
- **Exclusive Bid:** is a group of simple bids, where only one of the bids within the group can be activated. Activation of one bid in an exclusive bid group excludes the activation of the others in the same group.
- **Technically linked:** a mechanism used in power generation bidding where the activation of a bid is contingent on meeting the technical requirements of a power unit. Following rules applied:
  - Technical linking can be used with conditional linking.
  - Technical linking is applicable to both simple bids and complex bids (including multipart and exclusive groups).
  - If linked bid is activated in MTU-1 during DA phase, bid in MTU-0 became unavailable.
- **Conditionally linked:** Conditional linking is a mechanism used to control the availability of bids in the current market period (QH0) based on specific conditions related to the activation of bids in previous market periods (QH-1 and QH-2). It allows market participants to adjust bid availability status depending on predefined criteria. Types of Conditions:
  - If bid in earlier MTU period is activated, the linked bid in current MTU is unavailable/available
  - If bid in earlier MTU period is activated in SA, the linked bid in current MTU is unavailable/available
  - If bid in earlier MTU period is activated in SA, the linked bid in current MTU is unavailable/available for DA

- If bid in earlier MTU period is activated in DA, the linked bid in current MTU is unavailable/available
- If bid in earlier MTU period is activated in DA, the linked bid in current MTU is unavailable/available for DA
- If bid in earlier MTU period is not activated, the linked bid in current MTU is unavailable/available.

#### 4.8.2.1.3 BSP Bidding: External Dashboard

The External Dashboard serves as a comprehensive tool for BSP users.

Balancing area	Direction	Min (MW)	Max (MW)	Price (€)	Activation Type	State	Status	Link	Internal ID
UH1	Up	0	12	23.00	Scheduled and direct	Submitted	Available	Link	mFRR_A01_2024129_1600_2029
UH1	Up	1	87	9.00	Scheduled and direct	Submitted	Available	Link	mFRR_A01_2024129_1600_2002
UH1	Up	1	78	8.00	Scheduled and direct	Submitted	Available	Link	mFRR_A01_2024129_1600_2006
UH1	Up	1	69	7.00	Scheduled and direct	Submitted	Available	Link	mFRR_A01_2024129_1600_2007
UH1	Up	1	60	6.00	Scheduled and direct	Submitted	Available	Link	mFRR_A01_2024129_1600_2008
UH1	Up	1	51	5.00	Scheduled and direct	Submitted	Available	Link	mFRR_A01_2024129_1600_2009
UH1	Up	1	42	4.00	Scheduled and direct	Submitted	Available	Link	mFRR_A01_2024129_1600_2010
UH1	Up	1	33	3.00	Scheduled and direct	Submitted	Available	Link	mFRR_A01_2024129_1600_2011
UH1	Up	1	24	2.00	Scheduled and direct	Submitted	Available	Link	mFRR_A01_2024129_1600_2012
UH1	Up	1	15	1.00	Scheduled and direct	Submitted	Available	Link	mFRR_A01_2024129_1600_2013
UH1	Down	0	12	22.00	Scheduled and direct	Submitted	Available	Link	mFRR_A02_2024129_1600_2029
UH1	Down	1	87	9.00	Scheduled and direct	Submitted	Available	Link	mFRR_A02_2024129_1600_2018
UH1	Down	1	78	8.00	Scheduled and direct	Submitted	Available	Link	mFRR_A02_2024129_1600_2017
UH1	Down	1	69	7.00	Scheduled and direct	Submitted	Available	Link	mFRR_A02_2024129_1600_2016
UH1	Down	1	60	6.00	Scheduled and direct	Submitted	Available	Link	mFRR_A02_2024129_1600_2015
UH1	Down	1	51	5.00	Scheduled and direct	Submitted	Available	Link	mFRR_A02_2024129_1600_2014
UH1	Down	1	42	4.00	Scheduled and direct	Submitted	Available	Link	mFRR_A02_2024129_1600_2003
UH1	Down	1	33	3.00	Scheduled and direct	Submitted	Available	Link	mFRR_A02_2024129_1600_2001
UH1	Down	1	24	2.00	Scheduled and direct	Submitted	Available	Link	mFRR_A02_2024129_1600_2000

Figure 45 - External Dashboard

The dashboard provides overview of the submitted bids. It combines various views, forms, and control components to enable the following actions:

- **List Own Bids:** Users can access a list displaying all their submitted bids for the Balancing Energy Product. The list includes comprehensive bid details. Moreover, users have the flexibility to employ filters, sorting mechanisms, and other functionalities to conveniently search and organize their bids.
- **Bid Management:** The dashboard allows users to efficiently manage their bids. The following action possible:
  - **Create One Bid:** The BSP Operator can create bid using simple form. Before creation bid will be validated against the rules described in chapter Bid Validation. System will display at the screen validation error message for non-valid bid.
  - **Create Bids:** The BSP Operator can create multiple bids using table form. Form support copy bids or set of bids directly from an Excel file or other tabular format. Before creation each bid will be validated against the rules described in chapter Bid Validation. System will display at the screen validation error messages for non-valid bid(s).
  - **Edit Selected Bid(s):** The tabular form which allows to operator edit submitted bids. Modified bid(s) will be validated against the rules described in section "Business Validation of the Balancing Energy Bid". System will display at the screen validation error message for non-valid bid(s).
  - **Modify Bid Linkage:** The BSP Operator able to edit linkage between bids using form. The available linkage can be configured per Balancing Energy Product. The supported linkage described in chapter
  - **Delete Selected Bid(s):** the BSP can delete selected bids (status will be set as withdrawn). Before deletion all bids will be validated to check that
  - **Send Own Bids:** This functionality allows to BSP operator receiving of available bids in form of XML file. Generated file will be available in message registry (see chapter Integrations and as well send to BSP through configured channel. BSP can make changes to bids in generated file and insert it into system through data flow (see chapter BSP Bidding: XML file).

- o **Copy Bids:** A useful feature included in the dashboard is the option to copy existing bids (or sets of bids). This streamlines the bidding process by enabling users to replicate and modify existing bids, saving time and effort.
- o **Change Bid Availability:** The BSP user may change the availability of the bids in case of technical constraints. It is possible to configure if availability can be changed after Bidding Gate Closure.

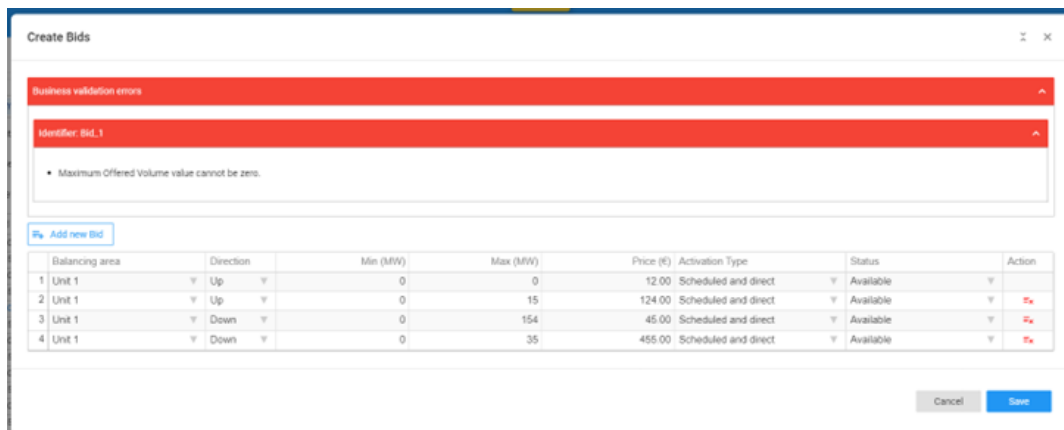


Figure 46 – Create Bids from GUI.

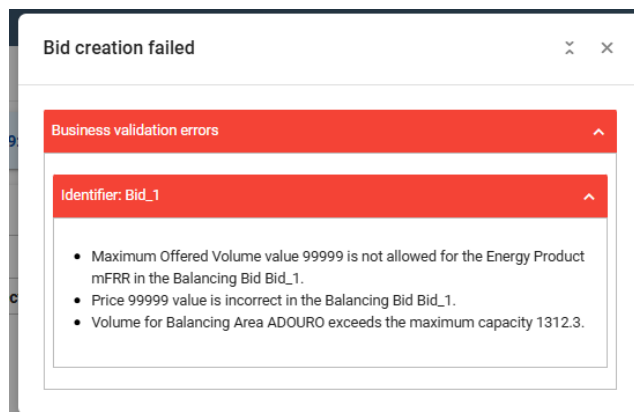


Figure 47 - Bid Validation Result

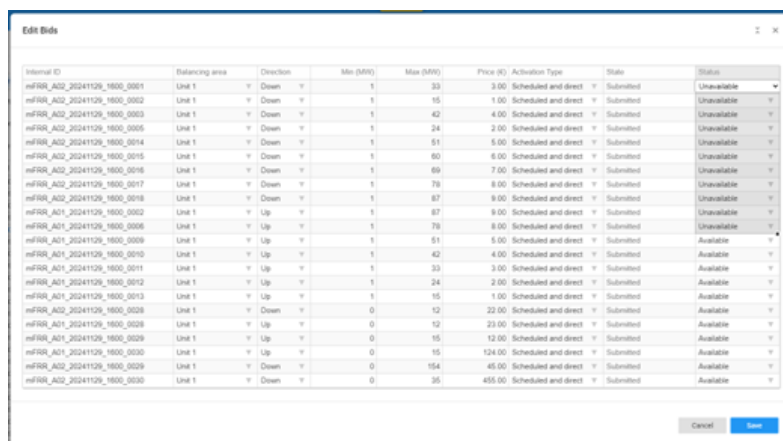


Figure 48 - Edit Bids

Edit Bids Linking										
<b>Current Bid</b>										
Internal ID	Trading Period Start	Direction	Unit	Max (MW)	Min (MW)	Price (€)	Activation Type	Status		
mFRR_A01_20241129_1600_0008	29.11.2024 16:00:00	Up	Unit1	60	1	6.00	Scheduled and direct	Available		
<b>Selection of Linked Bid</b>										
<input type="radio"/> Technical <input type="radio"/> Conditional <input checked="" type="radio"/> Multipart <input type="radio"/> Exclusive										
Internal ID	Trading Period Start	Direction	Unit	Max (MW)	Min (MW)	Price (€)	Activation Type	Status	Linking Bid	
mFRR_A01_20241129_1600_0030	29.11.2024 16:00:00	Up	Unit1	15	0	124.00	Scheduled an...	Available	<input checked="" type="checkbox"/>	
mFRR_A01_20241129_1600_0029	29.11.2024 16:00:00	Up	Unit1	15	0	12.00	Scheduled an...	Available	<input type="checkbox"/>	
mFRR_A01_20241129_1600_0028	29.11.2024 16:00:00	Up	Unit1	12	0	23.00	Scheduled an...	Available	<input checked="" type="checkbox"/>	
mFRR_A01_20241129_1600_0013	29.11.2024 16:00:00	Up	Unit1	15	1	1.00	Scheduled an...	Available	<input type="checkbox"/>	
mFRR_A01_20241129_1600_0012	29.11.2024 16:00:00	Up	Unit1	24	1	2.00	Scheduled an...	Available	<input checked="" type="checkbox"/>	
mFRR_A01_20241129_1600_0011	29.11.2024 16:00:00	Up	Unit1	33	1	3.00	Scheduled an...	Available	<input type="checkbox"/>	
mFRR_A01_20241129_1600_0010	29.11.2024 16:00:00	Up	Unit1	42	1	4.00	Scheduled an...	Available	<input type="checkbox"/>	
mFRR_A01_20241129_1600_0009	29.11.2024 16:00:00	Up	Unit1	51	1	5.00	Scheduled an...	Available	<input type="checkbox"/>	

Figure 49 - Modify Bid Linkage

**Change availability for 2 bids**

Selected reason for changing availability of balancing bids.

Business Type\*

Reason Code\*

Reason Text

Figure 50 - Change Availability Modal

#### 4.8.2.1.4 BSP Bidding: XML File

The Damas MMS provides possibility to receive bids using XML file with reserve bids.

The BSP is able to submit file using configured communication channel or graphical user interface (more details in chapter Integrations).

The supported file format is same as Common Platforms: CIM Reserve Bid Document. The Damas MMS supports same document version as MARI and PICASSO common platforms: version 7.2.

The received message is validated and processed by same pipeline. The several technical validation applied to incoming file:

- XSD validation,
- Sender is BSP and configured in system,
  - Sender role type is Resource Provider (A27),
  - Receiver is equal to the business application (TSO EIC),
  - Receiver role type is System Operator (A04),
  - Process is one of the Balancing Energy Products configured in application, for mFRR product it should be A47.

After successful passing of technical validation system validate each bids according to rules described in chapter Bid Validation. If some technical or business validation failed system provides acknowledgement to BSP. Validation details as well available in Data Flow Message Registry (see example in chapter Integrations).

#### **4.8.2.1.5 Bid Validation**

The each submitted/modified energy bid is passing business validation. Following rules applied:

- correct identifier: space “ “ character is not supported for the bid mRID which is assigned by BSP,
- gate for bidding is opened,
- the minimum offered volume of the bid is set correctly:
  - only if divisibility is allowed,
  - lower than maximum volume,
  - granularity is according to the configuration of the Balancing Energy Product,
  - volume is between the configured minimum and maximum for the Balancing Energy Product,
- the maximum offered volume of the bid is set correctly:
  - granularity is according to the configuration of the Balancing Energy Product,
  - volume is between the configured minimum and maximum for the Balancing Energy Product,
- price is between the configured minimum and maximum for the Balancing Energy Product
- currency is set according to the configuration of Balancing Energy Product
- direction is supported by Balancing Energy Product,
- activation type is supported by the Balancing Energy Product,
- auction the same as configured for the Balancing Energy Product,
- if bid contains links:
  - type of linking is allowed by the Balancing Energy Product,
  - bid linked according to the rules (see chapter Linked Bids),
- project specific validations: will be clarified during analysis phase and implemented as part of scope.

#### **4.8.2.1.6 TSO Overview: Internal Dashboard**

This chapter contains the specification of the Internal Dashboard that used by the TSO Operator to:

- see the status of the trading with detailed info about the business process activities and states for the particular trading period (15 min),
- see the list of all bids with all details, sort and filter bids for the selected trading period.

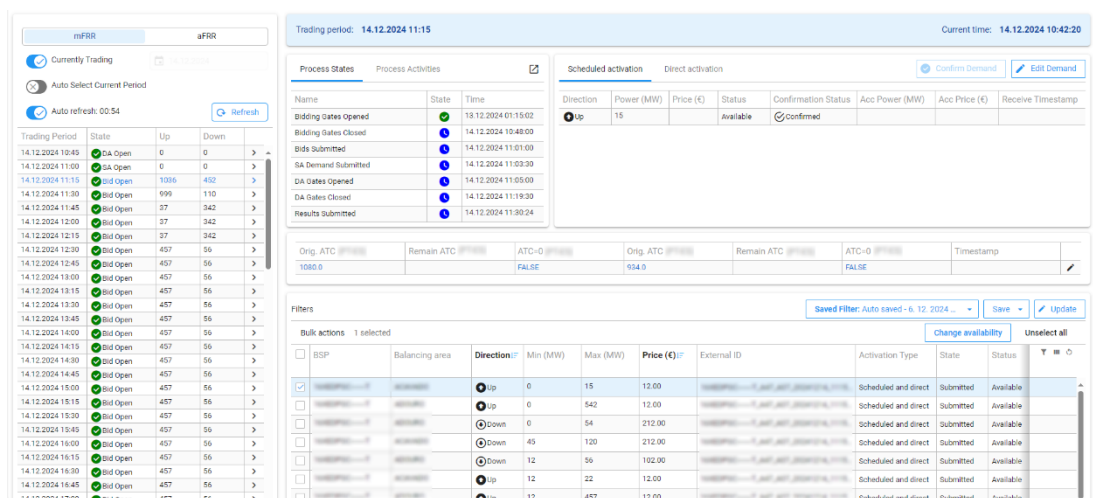


Figure 51 - Internal Dashboard

The view composed from following components:

**Product Selection:** Allows selecting Balancing Energy Product. By default, mFRR product is selected (configurable).

**Trading Periods Section:** Shows the status of each Trading Period with the current state and aggregated values of all bids.

**Info Bar:** Shows the currently selected trading period and current time.

**Trading Period Details Section:** Shows the status (state, timestamps) of the Business Process for a selected quarter-hour. It is possible to as well see state of process activities in separate tab. Shown states and activities are configurable.

**Demands Section (if demand is supported):** Shows the demand information separately for Scheduled or Direct Activation. By default system shows Scheduled or Direct demand based on the current time and gates. If demand is not allowed for selected Balancing Energy Product then the view is not presented.

**ATC Section:** Shows the information about ATC original and remaining ATC per each border. Operator can manually edit values.

**Bids List:** Shows submitted energy bids from all market participants with their statuses. Allows Operator to change availability of selected bids in case of operational limits. View is same as for BSP, see chapter BSP Bidding: External Dashboard.

#### 4.8.2.2 Demand

This submodule is responsible for functions related to the balancing energy demand managed by TSO operators. Based on the configuration of the product it will be possible to handle the demand in Damas MMS.

TSO can enter their demand for the product manually using the dashboard and provide values of the requested power and its price cap. The demand price is optional. Such demand is then sent to the MARI AOF or local solution.

However, the TSO operator does not have to enter demand manually. The open architecture of the solution is ready to integrate automatic receive of demand from other system.

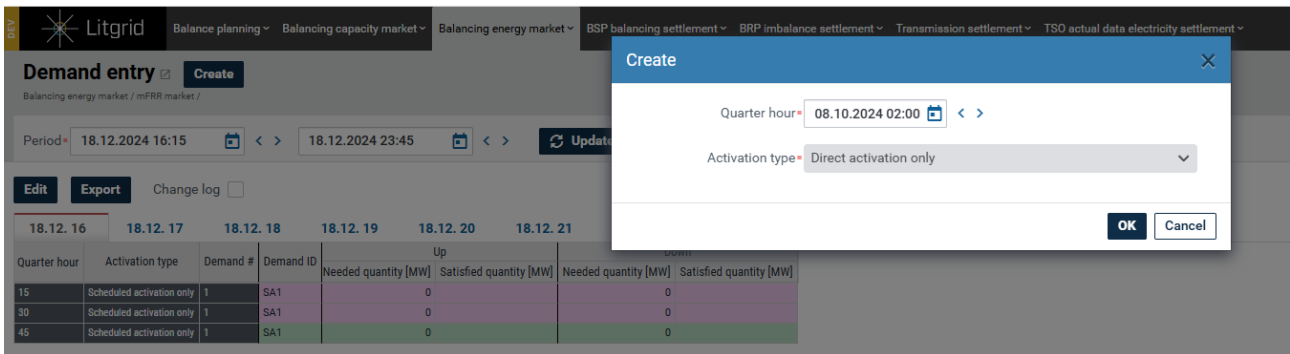


Figure 52 - Demand Entry Example

#### 4.8.2.2.1 Structure of Demand

Characteristics	Value
Balancing Energy Product	Defines the Balancing Product to which this Demand belongs.
Activation Type	Defines the activation type of the Demand: scheduled or direct. More details below.
Trading Period	Defines the start of the Trading Period.
Time Stamp	Filled in for each instance of Demand entity during creation of the new instance of Demand
Send Time stamp	Filled in for each instance of Demand entity during generation of the outgoing Common Message
Direction	Defines the Direction of the Demand and based on the enumeration direction.
Status	Defines the status of the Demand: A06 = Available, A10 = Ordered, A33 = Not Satisfied
Power	Requested power. The number of decimals depends on Balancing Energy Product configuration.
Price	Requested price. The number of decimals depends on Balancing Energy Product configuration.
Confirmation Status	Indicates if demand value is confirmed and can be sent to the Platform. After any update of demand it becomes not confirmed and needs to be confirmed by the operator manually or automatically. Automatic SA or DA Demand Confirmation is possible to enable in Damas MMS configuration.
State	Defines the technical state of the product
Receive Time Stamp	Used as identification of value received as result of AOF round.
Activation Period Start	Start of the Activation Period from the AOF result.
Activation Period End	End of the Activation Period from the AOF result.
Accepted Quantity	Accepted power by AOF.
Accepted Price	Accepted price by AOF.

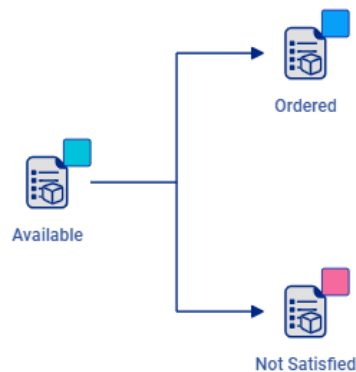


Figure 53 - Demand Status Flow

#### 4.8.2.2.2 Scheduled Activation

Scheduled activations (SA) are used to manage mFRR bids and handle forecasted imbalances according to the TSO's strategy. They include upward and downward bids, positive and negative demands, and can offset opposing demands if there's enough cross-border capacity.

Unlike direct activations, SA timings are known in advance and cover the entire MTU period.

Activation rules are as follows:

- Only confirmed demand is distributed to the Platform.
- To satisfy demand, only bids with Scheduled activations (SA) or Scheduled and Direct (SA&DA) activations can be used.
- To satisfy demand, only bids with status = Available can be used (even though all bids are submitted to the Platform).
- Demand is sent to platform only once through the "Send SA Demand to the Platform"

#### 4.8.2.2.3 Direct Activation

Direct Activations (DA) are used in addition to Scheduled Activations (SA) to address unexpected imbalances. DA demand enables the activation of mFRR bids when imbalances occur at any time until DA Gate Closure. DA occurs after the Scheduled Activation for the same MTU period. It considers TSO demand from one direction per direct activation and only takes into account the remaining bids available for DA in the same direction as the demands.

Activation rules are as follows:

- To satisfy demand, only bids with Direct activations (DA) or Scheduled and Direct (SA&DA) activations can be used.
- Only available bids can be used.
- Only confirmed demand can be distributed.

Confirmation Demand can be postponed in the following cases:

- Time delay for DA confirmation is configured in Damas MMS: useful in case of automatic DA demand calculation and confirmation. In this case system wait preconfigured delay to ensure that Platform results were received.
- The system was decoupled/disconnected from Platform right before confirmation. In this case system wait preconfigured delay to ensure that last Platform results were received.

Demand is sent for optimization right after each confirmation.

#### 4.8.2.2.4 TSO Overview: Demand

The TSO Operator is able to overview demand per each MTU and manually adjust it. The Damas MMS will provides as well overview of calculated demand per each following MTU. Operator will be able to adjust

calculation results and input data. Below presented view used for a Demand Management used for different projects.

Direction	Power (MW)	Status	Confirmation Status	Acc Power (MW)	Receive Timestamp
<input checked="" type="radio"/> Up	55	Available	<input type="radio"/> Not Confirmed		

Figure 54 - The Demand Overview (MTU)

Demand	11:30	11:45	12:00	12:15	12:30	12:45	13:00	13:15	13:30	13:45	14:00	14:15	14:30
BSP													
Consumption forecast	4 217,2	4 242,5	4 264,3	4 295,1	4 303	4 300,1	4 292,4	4 305,6	4 325,9	4 352,1	4 396,6	4 463,2	4 541,6
Delta	-517,2	0	0	0	0	0	0	0	0	0	0	0	0
Adjusted forecast	3 700	4 242,5	4 264,3	4 295,1	4 303	4 300,1	4 292,4	4 305,6	4 325,9	4 352,1	4 396,6	4 463,2	4 541,6
Total demand	-1 133	66	-36	-5	3	0	-88	-75	-55	-29	-154	-87	-9

Figure 55 - Example of Calculated Demand Overview

### 4.8.2.3 Demand Calculation

#### 4.8.2.3.1 Calculate Scheduled Needs

The system will calculate demand based on received forecasts or plans for each production and consumption category. The initial calculation will be triggered automatically by activity, according to the configured parameters. Other calculations will be triggered ad-hoc in case of input data change. The formula of calculation will be clarified during analysis phase of project.

The Operator will have the ability to manually review calculation results and make adjustments if necessary.

#### 4.8.2.3.2 Calculate Direct Needs

The system will calculate direct needs based on user inputs, specifically identifying the component(s) responsible for the outage or failure. For these calculations, the system will prioritize using the latest production values of the components if available; otherwise, it will default to the fixed power production capacity values defined in the configuration.

The Operator will have the ability to manually review the calculation results and make adjustments if necessary. Once confirmed by the Operator, the demand will be sent for optimization.

### 4.8.2.4 Energy Bid Activation

The activation of bids will be handled as a separate sub-module, which can be triggered from multiple sources.

Available Bids selected for activation will be automatically marked in the system with an activation purpose identification (e.g., balancing, congestion, special regulation, etc.). The system will then send an activation message to the BSP.

If bids were unavailable or were changed to unavailable after activation, the system will create new demand to account for the volume of non-activated power.

### 4.8.2.5 Configuration

The Balancing Energy Market can be managed by the general system configuration and market specific configuration. The Balancing Energy Product can be extended with specific market configuration. Set of configuration will be elicited during analysis phase.

The general configuration is present in table below.

Name	Description
Bid Unavailability Reason Code	Configurable parameter defines the Reason Code that will be used in the BidAvailability_MarketDocument when TSO will change bid status to Unavailable
Bid Unavailability Reason Text	Configurable parameter defines the Reason Text that will be used in the BidAvailability_MarketDocument when TSO will change bid status to Unavailable
Bid Unavailability Business Type	Configurable parameter defines the Business Type that will be used in the BidAvailability_MarketDocument when TSO will change bid status to Unavailable
Select Bid unavailability Reason Code	Boolean parameter. Allows to select true - system will show modal window to select reason code for availability change, false - system will use preconfigured reasons
SA Demand Auto Confirm	Configurable parameter defines if the demand will be confirmed automatically after each update or by the Operator.
DA Demand Auto Confirm	Configurable parameter defines if the demand will be confirmed automatically after each update or by the Operator.
Time delay for DA confirmation	Configurable parameter defines how long DA request confirmation should be delayed after creation if DA Demand Auto Confirm is turned on. NULL = 0. Defined at seconds.
Send 0 Demand	Boolean parameter. Defines if 0 demand should be sent to MARI even if demand doesn't exist in the system. After setting it as true it is also possible to confirm 0 demand. Configuration is related to next feature of MARI: in case when SA demand was not submitted to Platform all bids will become unavailable.

The specific market configuration is available below.

Name	Description
Scheduled Activation Allowed	Defines if activation type Scheduled is available for the Balancing Product
Direct Activation Allowed	Defines if activation type Direct is available for the Balancing Product.
Scheduled and Direct Activation Allowed	Defines if activation type scheduled and direct is available for the Balancing Product.
Direction Up Allowed	Defines if bids may be submitted for positive balancing energy.
Direction Down Allowed	Defines if bids may be submitted for negative balancing energy.
Minimum Power Up	Minimum possible power for direction Up
Maximum Power Up	Maximum possible power for direction Up
Minimum Power Down	Minimum possible power for direction Down
Maximum Power Down	Maximum possible power for direction Down
Bid Granularity	MW
Minimum Price Up	Minimum possible price for direction Up
Maximum Price Up	Maximum possible price for direction Up
Minimum Price Down	Minimum possible price for direction Down
Maximum Price Down	Maximum possible price for direction Down
Price Resolution	Default Currency / MWh
Default Currency	Enumeration. Defines the currency, in which Balancing Bid is created.
Reference Currency	Enumeration. Defines the currency, in which is displayed in the selected screens in addition to the Default Currency.

Name	Description
Divisibility Allowed	Defines if divisible bids are allowed.
Technical Linking of Bids Allowed	Defines if technical interconnection between bids is allowed.
Conditional Linking of Bids Allowed	Defines if conditional interconnection between bids is allowed.
Complex Linking of Bids Allowed	Defines if economic interconnection between bids is allowed. Both multipart and exclusive linking.
Use Unit	The Bid can contain additional dimension of registered resource if needed by the Project. It is possible to configure the name of this field for each project
Auction	Defines the value of the field auction that will be validated in the received bids.
Demand Allowed	Specifies if the instance of the balancing demand product has to be created for a particular Energy Product.

### 4.8.3 Balancing Energy Market (aFRR)

The business processes for aFRR will closely follow the mFRR Scheduled Activation process, with the primary difference being the timing of activities. The system will receive data from market participants and forward it to the LFC platform for optimization and activation (LFC platform is not a part of the project scope and typically is a part of SCADA solution). All aFRR processes will be based on a 15-minute Market Time Unit (MTU). It is important to note that there will be no direct aFRR activations in Moldelectrica MMS.

The bid structure for aFRR will largely mirror the mFRR bid structure, with some differences in product configuration. The following configuration rules will apply:

- Divisibility is not allowed.
- Linkage of bids is not supported.
- Demand is not supported.

The submission and overview of bids are same as for mFRR market, see chapter Balancing Energy Bid.

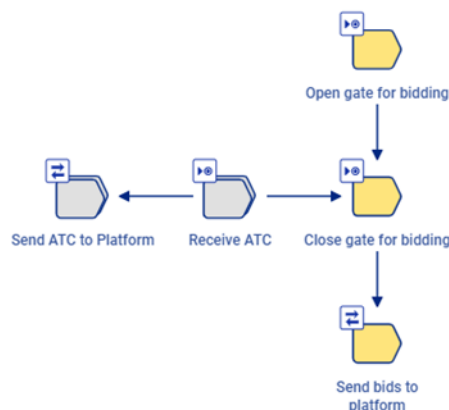


Figure 56 - aFRR Process Flow

## 4.9 Settlement

The Settlement module will cover the following functional groups tailored to Moldelectrica:

1. **Imbalance Settlement:** This includes the calculation and financial settlement of imbalances for each Balance Responsible Party (BRP). It accounts for deviations between scheduled and actual energy positions, applying imbalance prices and generating BRP settlement reports.

2. **Balancing Services Settlement:** The system handles settlement of balancing energy activated in the market. It allocates costs of balancing energy to the respective parties based on their imbalance position.
3. **Grid Losses Settlement:** Specific to Moldelectrica, this will be implemented to handle the settlement of grid losses, ensuring that losses are allocated and settled according to Moldelectrica's rules.
4. **TSO-TSO Settlement (Cross-Border Settlement):** Often referred to as "CBT Settlement" in DUROM, this covers settlement of cross-border exchanges between TSOs. It ensures financial reconciliation of energy flows and transmission costs between system operators.

#### **4.9.1 Imbalance Settlement (BRP Settlement)**

The system performs imbalance settlement for each Balance Responsible Party (BRP) by comparing scheduled positions with actual metered energy. For each settlement period, the system calculates imbalance volumes based on validated schedules (domestic and cross-border) and metering data.

Damas MMS: E settlement engine supports full BRP settlement processing, including evaluation of imbalance volumes, application of imbalance prices, and calculation of financial obligations. The system already includes mechanisms for preliminary and final settlement runs, versioning of results, and publication of settlement outcomes.

## BRP Settlement Detail

### Basic info

BRP settlement evaluation version ID	2023-06-001
Version	1
Year	2023
Month	June
State	Active
Created (EET/EEST)	01.07.2023 12:45

### Evaluation parameters

Balancing market exchange rate date	01.06.2023
Unintended deviations exchange rate date	01.06.2023
Cross-border FCR exchange rate date	01.06.2023
Ramping energy exchange rate date	01.06.2023
Day-ahead market prices exchange rate date	01.06.2023

### Filter

Delivery day	01.06.2023
BRP	HIDROELECTRICA (30XROHIDRO-----1)

### BRP settlement data

Time (EET/EEST)		Metering data - production [MWh]	Metering data - consumption [MWh]	Net metered position [MWh]	Net domestic scheduled energy [MWh]	Net cross-border scheduled energy [MWh]	...
Date	MTU						
01.06.2023	00:00 - 00:15	100,000	100,000	100,000	100,000	100,000	...
01.06.2023	00:15 - 00:30	100,000	100,000	100,000	100,000	100,000	...
01.06.2023	00:30 - 00:45	100,000	100,000	100,000	100,000	100,000	...
01.06.2023	00:45 - 01:00	100,000	100,000	100,000	100,000	100,000	...
01.06.2023	01:00 - 01:15	100,000	100,000	100,000	100,000	100,000	...
01.06.2023	01:15 - 01:30	100,000	100,000	100,000	100,000	100,000	...
01.06.2023	01:30 - 01:45	100,000	100,000	100,000	100,000	100,000	...

### Control area data

Time (EET/EEST)		Minimum System Imbalance to System Consumption Ratio [%]	Maximum Balancing to System Imbalance Coefficient	Minimum BRP Imbalance to System Imbalance Ratio [%]	Metering data - production [MWh]	Metering data - consumption [MWh]	...
Date	MTU						
01.06.2023	00:00 - 00:15	0,10	4,000	0,50	100,000	100,000	...
01.06.2023	00:15 - 00:30	0,10	4,000	0,50	100,000	100,000	...
01.06.2023	00:30 - 00:45	0,10	4,000	0,50	100,000	100,000	...
01.06.2023	00:45 - 01:00	0,10	4,000	0,50	100,000	100,000	...
01.06.2023	01:00 - 01:15	0,10	4,000	0,50	100,000	100,000	...
01.06.2023	01:15 - 01:30	0,10	4,000	0,50	100,000	100,000	...
01.06.2023	01:30 - 01:45	0,10	4,000	0,50	100,000	100,000	...

### Balancing energy product data

Time (EET/EEST)		mFRR up			FCR		...
Date	MTU	Satisfied balancing demand [MWh]	Activated balancing bids volume [MWh]	Balancing bid marginal price [LEI/MWh]	Satisfied balancing demand [MWh]	Activated balancing bids volume [MWh]	
01.06.2023	00:00 - 00:15	100,000	100,000	1,00	100,000	100,000	...
01.06.2023	00:15 - 00:30	100,000	100,000	1,00	100,000	100,000	...
01.06.2023	00:30 - 00:45	100,000	100,000	1,00	100,000	100,000	...
01.06.2023	00:45 - 01:00	100,000	100,000	1,00	100,000	100,000	...
01.06.2023	01:00 - 01:15	100,000	100,000	1,00	100,000	100,000	...
01.06.2023	01:15 - 01:30	100,000	100,000	1,00	100,000	100,000	...
01.06.2023	01:30 - 01:45	100,000	100,000	1,00	100,000	100,000	...

Figure 57 - Example of BRP Settlement Details

Settlement results are generated per BRP with full transparency, including detailed breakdown of volumes, prices, and resulting financial positions. The functionality will be delivered as implemented in Damas MMS: E, with parameterization of pricing rules and settlement periods according to Moldovan market requirements.

## 4.9.2 Balancing Energy Settlement

The system supports settlement of balancing energy activated within the balancing mechanism. It processes activated volumes, prices of balancing energy, and allocates the resulting costs to market participants based on their imbalance position.

Filter	
Year	2022
Month	October
Settlement Notes type	Balancing
Direction	Up
<a href="#">Modify</a>	

### Settlement version and data list

2022-11-03T11:00		2022-11-01T10:03				
BSP	Balancing product	Total contracted	Contracted volume (price >=0)	Contracted volume (price <0)	BSP income	BSP expense
Participant A	aFRR	0,000	0,000	0,000	0,00	0,00
Participant A	mFRR	1 309,257	1 309,257	0,000	2 980 458,66	0,00
Participant A	RR	0,000	0,000	0,000	0,00	0,00
Participant A	<b>Total</b>	1 309,257	1 309,257	0,000	2 980 458,66	0,00
Participant B	aFRR	6 495,126	6 495,126	0,000	22 851 660,00	0,00
Participant B	mFRR	0,000	0,000	0,000	0,00	0,00
Participant B	RR	0,000	0,000	0,000	0,00	0,00
Participant B	<b>Total</b>	6 495,126	6 495,126	0,000	22 851 660,00	0,00

Figure 58 - Example of Balancing Energy Settlement

Damas platform already includes functionality for processing activated balancing energy, balancing prices, and net delivered balancing volumes, which are used as inputs to settlement calculations. The system ensures consistency between balancing activation, system imbalance evaluation, and financial settlement.

Balancing energy costs are incorporated into the overall settlement process, ensuring that all activated volumes are properly valued and allocated. The functionality is fully integrated with the balancing module and will be delivered as-is, with configuration aligned to Moldelectrica balancing rules.

## 4.9.3 Grid Losses Settlement

Grid losses settlement will be implemented specifically for Moldelectrica as an extension of the standard Damas settlement functionality.

The system will support calculation and allocation of grid losses based on defined methodologies (e.g. proportional allocation to BRPs or other regulatory approach). Loss volumes will be derived from the difference between aggregated metered consumption and generation, or provided as input from external systems if required.

The calculated losses will be valued using configurable pricing rules and included in the financial settlement of market participants. Full auditability, versioning, and integration with the settlement process will be ensured. This functionality will be implemented with minimal extension of the existing Damas settlement framework.

## 4.9.4 TSO–TSO Settlement (Cross-Border Settlement / CBT)

The system supports cross-border settlement between TSOs, referred to in Damas as CBT (Cross-Border Transmission) Settlement.

Accounting data overview

Filter

Delivery day: 01.01.2022  
Accounting data type: SOMA  
Tie-line: Arad - Sandorfalva (10T-HU-RO-000016)

Document info

Source	Document identification	Document version
Home TSO	20220101_SOMA_HU_RO	001
Foreign TSO	20220101_SOMA_HU_RO	005

Matching detail

Time (CET)	Export								Import							
	Home data [MWh]	Foreign data [MWh]	Difference (P) [%]	Allowed Difference (P) [%]	Difference (A) [MWh]	Allowed Difference (A) [MWh]	Matching state	Home data [MWh]	Foreign data [MWh]	Difference (P) [%]	Allowed Difference (P) [%]	Difference (A) [MWh]	Allowed Difference (A) [MWh]	Matching state		
Date MTU																
01.01.2022 01:00 - 01:15	3,300	3,310	0,300	2	0,010	5	V	15,300	15,400	0,600	2	0,100	5	V		
01.01.2022 01:15 - 01:30	3,300	3,310	0,300	2	0,010	5	V	15,300	15,400	0,600	2	0,100	5	V		
01.01.2022 01:30 - 01:45	3,300	3,310	0,300	2	0,010	5	V	15,300	15,400	0,600	2	0,100	5	V		
01.01.2022 02:00 - 02:15	3,300	3,310	0,300	2	0,010	5	V	15,300	15,400	0,600	2	0,100	5	V		
01.01.2022 02:15 - 02:30	3,300	3,310	0,300	2	0,010	5	V	15,300	15,400	0,600	2	0,100	5	V		
01.01.2022 02:30 - 02:45	3,300	3,310	0,300	2	0,010	5	V	15,300	15,400	0,600	2	0,100	5	V		
01.01.2022 03:00 - 03:15	3,300	3,310	0,300	2	0,010	5	V	15,300	15,400	0,600	2	0,100	5	V		
...																

Figure 59 - Example of TSO-TSO Settlement Report

This includes processing of cross-border schedules, metering data, and exchange of settlement related documents with neighbouring TSOs. The system performs reconciliation of exchanged energy volumes and supports matching of settlement data between parties.

Damas platform already provides functionality for cross-border accounting, metering reconciliation, and settlement message exchange, including handling of mismatches and confirmation processes. Settlement results are fully traceable and aligned with ENTSO-E standards.

This functionality will be delivered as implemented in Damas, ensuring compliance with cross-border settlement processes and seamless integration with scheduling and capacity allocation modules.

## 4.10 Procurement of Grid Losses

MMS will support the procurement of energy required to cover grid losses as a dedicated process within the market framework of Moldelectrica.

This functionality will be implemented **based on the existing Damas Ancillary Services module**, which already provides a mature framework for tendering, bid evaluation, contracting, and result publication. The Grid Losses procurement process will therefore reuse the standard Damas functionality with **minor adaptations** required to reflect the specific business rules of Moldelectrica.

The system will support:

- Definition and publication of grid losses procurement tenders
- Submission of bids by market participants, including volumes and prices
- Automated evaluation of bids and selection of winning offers
- Generation of contracted volumes and prices
- Full audit trail of the procurement process

To align the standard functionality with Moldelectrica requirements, the following extensions will be implemented:

- **Process management adjustments** to reflect the specific timeline and governance of grid losses procurement (including tender phases and approval steps)
- Support for **preliminary and final results**, allowing publication of initial evaluation outcomes followed by validated final results

- Adaptation of reporting and data outputs to reflect grid losses procurement specifics

The procured volumes will be made available as input to the settlement module, ensuring consistent financial processing of grid losses within the overall market settlement.

This approach ensures rapid implementation, minimizes development effort, and leverages a **proven, production-tested procurement mechanism** already available in Damas.

## 4.11 Reporting

Damas MMS provides a comprehensive and proven set of reporting functionalities covering all key business processes of the Market Management System, including scheduling, cross-border capacity management, balancing, settlement and market monitoring. These reporting capabilities are part of the standard Damas MMS platform and will be delivered as-is.

The reporting scope proposed for Moldelectrica is based on the standard set of reports already implemented and successfully used in existing TSO environments, in particular within the Romanian market operated by Transelectrica. These reports have been designed to comply with European regulations and operational practices, including ENTSO-E transparency requirements and REMIT obligations, as well as national regulatory needs.

The standard reporting package includes, but is not limited to:

- Reports for cross-border capacity allocation and nominations (e.g. allocated capacities, nominations, curtailments, congestion revenues)
- Scheduling reports (e.g. scheduled exchanges, BRP balances, generation schedules)
- Balancing market reports (e.g. offered volumes, activated balancing energy, prices, reserve procurement results)
- Settlement reports (e.g. imbalance settlement, BRP financial positions, invoicing data, reconciliation outputs)
- Operational and monitoring reports supporting market transparency and internal control.

All reports are generated automatically based on data processed within the Damas MMS and are available through the user interface and export mechanisms. The system supports filtering, aggregation and time-based views in accordance with operational needs.

The reporting functionality also supports data provision for external obligations, including publication to ENTSO-E Transparency Platform and reporting under REMIT, using standard interfaces and formats.

It is important to note that the reporting scope will be delivered strictly based on the standard Damas MMS functionality, without development of new custom reports. The proposed approach relies on the assumption that the existing reporting set, already proven in comparable European TSO environments, is sufficient to meet Moldelectrica's operational and regulatory needs.

Any additional reporting requirements beyond the standard Damas MMS functionality may be assessed during the project and can be implemented as optional extensions if required.

The reporting functionality is part of the standard Damas MMS platform and will be delivered as-is, based on proven implementations in European TSO environments.

## 4.12 Integrations

Damas MMS has integrated application called Enelane that provides variety of the possibilities to create and manage data flow with all systems.

Each data flow implemented in the system is managed by the Enelane that gives possibility to see them and manage from the GUI directly. Screenshot below represents the GUI of the data flow message registry (DFMR).

Message ID	Status	Dataflow	Filename	Reception Time	Sending Time	Processing Time	Y	#
6752b86d0f5bdd5948b45614	Processed	IN_SOLAR_FORECAST_FROM_FORECAST_...	20241206.PVPOTn	6.12.2024 08:40:13.868		6.12.2024 08:40:14.07		
6752b8680f5bdd5948b455fb	Processed	IN_WIND_FORECAST_FROM_FORECAST_GS	20241206.POTn	6.12.2024 08:40:08.281		6.12.2024 08:40:08.44		
6752b8600f5bdd5948b455eb	Invalid	IN_VTL_MESSAGE	payload.unknown	6.12.2024 08:40:00.822				
6752b84b0f5bdd5948b455cc	Processed	problemStatementIncomingDataflow	payload.unknown	6.12.2024 08:39:39.849		6.12.2024 08:39:40.15		
6752b8340f5bdd5948b455a3	Delivering	OUT_JSON_ACK	ACK_phfcuSIME_2024120611-28_28.json	6.12.2024 08:39:16.315		6.12.2024 08:39:16.50		
6752b82a0f5bdd5948b45583	Invalid	IN_PFUL_FROM_PIM	phfcuSIME_2024120611-28_28.json	6.12.2024 08:39:06.889		6.12.2024 08:39:07.08		
6752b8240f5bdd5948b45573	Invalid	IN_VTL_MESSAGE	payload.unknown	6.12.2024 08:39:00.418				
6752b8210f5bdd5948b4555a	Delivering	OUT_JSON_ACK	ACK_phfcuSIME_2024120610-27_27.json	6.12.2024 08:38:57.385		6.12.2024 08:38:57.53		
6752b8150f5bdd5948b4553a	Invalid	IN_PFUL_FROM_PIM	phfcuSIME_2024120610-27_27.json	6.12.2024 08:38:45.731		6.12.2024 08:38:45.98		
6752b80f0f5bdd5948b4551c	Delivering	OUT_XML_ACK	ACK_OplanConsumptionForecast_2024120610658_6.12.2024	08:38:39.212		6.12.2024 08:38:39.44		
6752b80e0f5bdd5948b45501	Invalid	IN_CONSUMPTION_FORECAST_FROM_OP	OplanConsumptionForecast_202412061065858.xml	6.12.2024 08:38:38.723		6.12.2024 08:38:38.88		
6752b80c0f5bdd5948b454f3	Processed	problemStatementIncomingDataflow	payload.unknown	6.12.2024 08:38:36.522		6.12.2024 08:38:36.93		
6752b7fa0f5bdd5948b454d2	Delivering	OUT_JSON_ACK	ACK_SaldoREE_Document20241206_29.json	6.12.2024 08:38:18.966		6.12.2024 08:38:19.12		
6752b7f0f5bdd5948b454b7	Processed	IN_NET_POSITION_FROM_SCHEDULES	SaldoREE_Document20241206_29.json	6.12.2024 08:38:18.085		6.12.2024 08:38:18.22		
6752b7e90f5bdd5948b454a5	Invalid	IN_VTL_MESSAGE	payload.unknown	6.12.2024 08:38:01.009				
6752b7e40f5bdd5948b4548c	Processed	problemStatementIncomingDataflow	payload.unknown	6.12.2024 08:37:56.505		6.12.2024 08:37:56.84		
6752b7d30f5bdd5948b4545a	Delivering	OUT_JSON_ACK	ACK_SaldoREE_Document20241206_28.json	6.12.2024 08:37:39.339		6.12.2024 08:37:39.50		
6752b7d00f5bdd5948b45457	Processed	problemStatementIncomingDataflow	payload.unknown	6.12.2024 08:37:39.259		6.12.2024 08:37:39.54		
6752b7d20f5bdd5948b45439	Processed	IN_NET_POSITION_FROM_SCHEDULES	SaldoREE_Document20241206_28.json	6.12.2024 08:37:38.196		6.12.2024 08:37:38.38		
6752b7b00f5bdd5948b45417	Processed	problemStatementIncomingDataflow	payload.unknown	6.12.2024 08:37:04.327		6.12.2024 08:37:06.04		

Figure 60 - Data Flow Message Registry

It is possible to drill down to the details of each data flow and see detailed information about the processing of the flow including general information about the flow, state, timings, results of the validations, linked ACK message, etc.

**Message detail**

Download external | Download internal

**Basic info**

Message ID: 6752b82a0f5bdd5948b45583  
 Sender: PIM  
 Receiver: 10XPT-REN—9  
 Status: Invalid  
 Dataflow: IN\_PFUL\_FROM\_PIM  
 Document ID: phfcuSIME\_2024120611.28  
 Filename: phfcuSIME\_2024120611-28\_28.json  
 Reception time: 6.12.2024 08:39:06.889  
 Processing time: 6.12.2024 08:39:07.088  
 Creation time: 6.12.2024 08:10:49.000  
 Run ID: 283e9e2d587e448fbc10dceac4326bc4

**Business metadata**

receiveActivityCode: MFR-REC-PFUL  
 docRevisionNumber: 28  
 receiveTimeStamp: 2024-12-06T08:39:07.028Z  
 uniqueKey: phfcuSIME\_2024120611-28\_28  
 docMrid: phfcuSIME\_2024120611.28

**Links**

Message ID	Status	Dataflow	Filename	Reception Time	Sending Time	Processing Time
6752b8340f5bdd5948b455a3	Delivering	OUT_JSON_ACK	ACK_phfcuSIME_2024120611-28_28.json	6.12.2024 08:39:16.315		6.12.2024 08:39:16.56

**Business**

CODE	SEVERITY	BLOCKING	TITLE	MESSAGE	TIMESTAMP	VALIDATIONRULEID	PARAMS	SOURCEDATAREF
ERROR_Version	error	true	Message should be unique.	The file with the same mRID and same or higher revision number was already received.	2024-12-06T08:39:11.054Z	null	{}	{}

**Audit log**

Figure 61 - Data Flow Details

Also it is possible to upload each (configured) data flow manually from the dedicated screen, which allows possibility to upload same xml (or other) file manually and it will be processed by the system in the same way as it is received by the communication channel.

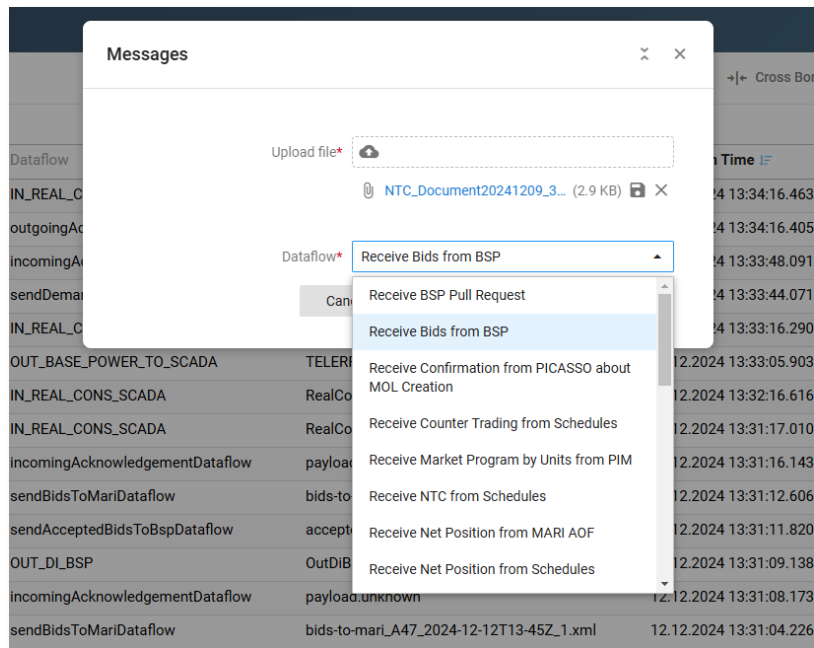


Figure 62 - Upload File Manually

In the data flow message registry each data flow has also detailed information about the processing time and intermediate steps which allows to see statistics of the messages processing and investigate potential issues with generation of the messages.

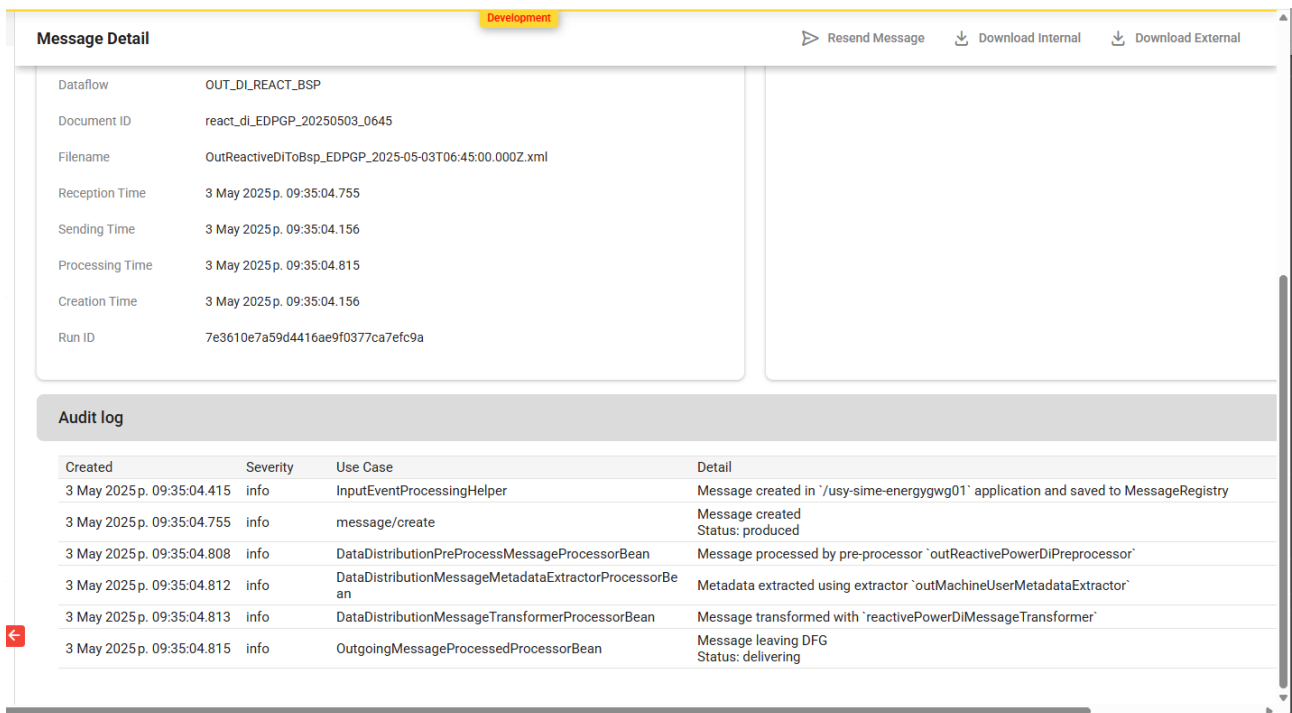


Figure 63 - Message Processing Statistic and Log

E.g. screenshot above shows details of the processing time and detailed information (called “Audit log”) about the processing steps. This data also can be collected and presented on the dedicated screen for general monitoring of the processing time of all incoming and outgoing data flows.

#### 4.12.1 Data Exchanges covered by the Damas MMS

The next list of data flows is already implemented in the Damas MMS and will be reused for the Moldelectrica MMS project.

Data Flow	Direction	Counterparty system	File Format / Protocol
Published market reports	Outgoing	Public website / portal	PDF / HTML
Cross-border flow results (balancing)	Incoming	Picasso / MARI	ENTSO-E XML
aFRR demand & FRCE	Incoming	Picasso / EMS	ENTSO-E XML
Local Merit Order List (LMOL)	Outgoing	Picasso (aFRR platform)	ENTSO-E XML
Common Merit Order List (CMOL)	Incoming	Picasso (aFRR platform)	ENTSO-E XML
TSO-TSO settlement data	Outgoing	Neighbouring TSOs	ENTSO-E XML
Settlement input data	Incoming	MMS internal modules	Internal DB / API
BRP generation schedule	Incoming	Market Participants / BRPs	ENTSO-E ESS XML
BRP consumption schedule	Incoming	Market Participants / BRPs	ENTSO-E ESS XML
Internal trade schedule	Incoming	Market Participants / BRPs	ENTSO-E ESS XML
Schedule acknowledgement	Outgoing	Market Participants / BRPs	ENTSO-E ESS XML
Schedule anomaly report	Outgoing	Market Participants / BRPs	ENTSO-E ESS XML
Final schedule confirmation	Outgoing	Market Participants / BRPs	ENTSO-E ESS XML
mFRR balancing energy bids	Outgoing	MARI platform	ENTSO-E XML
mFRR activation results	Incoming	MARI platform	ENTSO-E XML
Grid losses auction specification	Outgoing	Grid Loss Suppliers	XML / PDF
Grid losses offers	Incoming	Grid Loss Suppliers	XML
Preliminary auction results	Outgoing	Grid Loss Suppliers	XML / PDF
Negotiation phase price updates	Incoming	Grid Loss Suppliers	XML
Final auction results	Outgoing	Grid Loss Suppliers	XML / PDF
Transparency reports	Outgoing	ENTSO-E Transparency Platform	ENTSO-E XML
aFRR activation data	Incoming / Outgoing	EMS / Picasso	XML / real-time data
Balancing capacity offers	Incoming	BSPs	XML / Web Services
Balancing energy offers	Incoming	BSPs	XML / Web Services
Availability declarations	Incoming	BSPs	XML
Activation request	Outgoing	BSPs	XML / Web Services
Activation confirmation	Incoming	BSPs	XML / Web Services
BSP settlement data	Outgoing	BSPs	XML / PDF
REMIT reports	Outgoing	ACER / RRM	REMIT XML

Other data flows to the abovementioned platforms are not the part of the delivery and will be implemented based on the design phase results as additional implementation.

#### 4.12.2 Data exchanges to be implemented

Next data flows will be implemented based on the detailed design phase and included in the proposal scope.

Data Flow	Direction	Counterparty System	File format / Protocol
Compensation schedule (Transnistrian region)	Outgoing	Special BRPs	ENTSO-E ESS XML
External trade schedule (import/export)	Incoming / Outgoing	Neighbouring TSOs	ENTSO-E RG CE XML / EDI
Emergency external schedule	Incoming / Outgoing	Neighbouring TSOs	ENTSO-E RG CE XML
Metered consumption data	Incoming	Metering System	XML / CSV
Metered generation data	Incoming	Metering System	XML / CSV
Adjusted metering values (losses)	Incoming	Metering System	XML / CSV
PX schedule (DAM / IDM)	Incoming	Market Operator (PX)	ENTSO-E ESS XML
PTR nomination	Incoming	Allocation Platforms (Ukrenerg / Transelectrica / JAO)	XML
PTR reduction instruction	Outgoing	Allocation Platforms (Ukrenerg / Transelectrica / JAO)	XML
Offered capacity (NTC / ATC)	Outgoing	Allocation Platforms (Ukrenerg / Transelectrica / JAO)	ENTSO-E Capacity XML
Allocation results	Incoming	Allocation Platforms (Ukrenerg / Transelectrica / JAO)	XML
Already Allocated Capacity (AAC)	Incoming	Allocation Platforms (Ukrenerg / Transelectrica / JAO)	XML
Settlement results	Outgoing	Accounting / Financial System	XML / CSV

### 4.13 Damas Generic Features

This chapter describes in more details some generic features of the Damas MMS that we want to specify in order to provide more detailed answers to the initial requirements.

#### 4.13.1 Process Management

Damas MMS includes also the Process Management product that is responsible for handling of the business processes such as gate open, gate close, send data to platform, run clearing algorithm, send data to external systems, etc.

This part of the Damas MMS also described in the chapter 5. Business Process and Monitoring of the document 4.3.2 Damas MMS Platform.

This module allows to the operator to manage process activities, overview of the current state of the process, run, schedule or postpone separate activities, etc.

Thanks to the FlexiGUI concept (for more information please refer to the chapter 6. FlexiGUI of the document 4.3.2 Damas MMS Platform) the screen with business process and its activities can be composed in different ways to give the user-friendly workspace for the operators.

Picture below shows business process with its activities of the balancing energy market module.

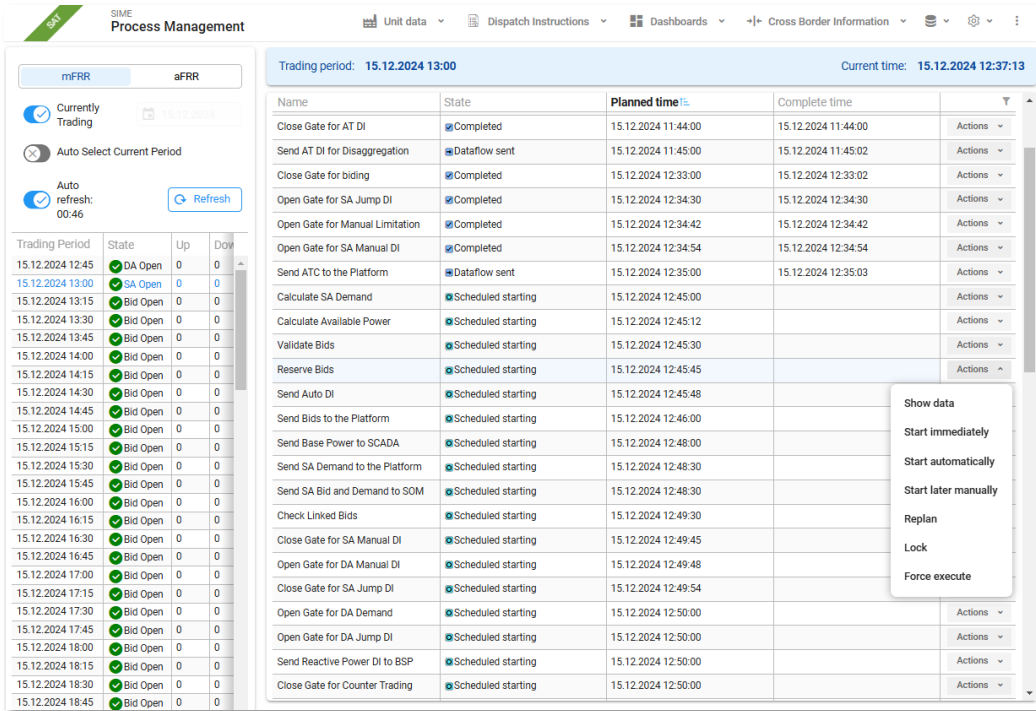


Figure 64 - Process Management Screen

Picture below shows process management screen for the Balancing capacity market built using different approach.



Figure 65 - Process Management Screen

#### 4.13.2 Messages and Monitoring

Damas MMS includes also the Digital Workspace product that stands for the next purpose: it is a main entry point for the users to see all messages and notifications generated by the system. It allows to monitor the business part of the system if there are any errors.

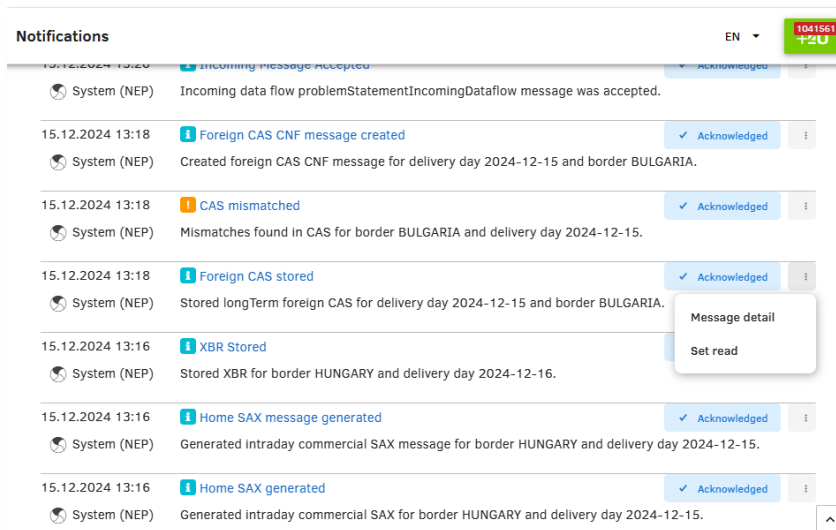


Figure 66 – Messages List

This route allows users to see all messages generated by the system that are assigned to the specific user, manage them (set as read, go to the details of the message, go to the direct screen, etc.).

Thanks to the FlexiGUI architecture it can be composed in a different way based on the requirements of the customer. Picture below shows another example of the monitoring window with extended possibilities for filtering.

Trading Period	Timestamp	Severity	Priority	Business Log Component	Message
17.12.2024 13:00:00	17.12.2024 13:00:06	INFO	MEDIUM	DistributionMessage	Data Flow OUT_ALIVE_ACK_BSP was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 13:00:06	INFO	MEDIUM	DistributionMessage	Data Flow OUT_ALIVE_ACK_BSP was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 13:00:06	INFO	MEDIUM	DistributionMessage	Data Flow OUT_ALIVE_ACK_BSP was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 13:00:06	INFO	MEDIUM	DistributionMessage	Data Flow OUT_ALIVE_ACK_BSP was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 13:00:06	INFO	MEDIUM	DistributionMessage	Data Flow OUT_ALIVE_ACK_BSP was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 13:00:05	INFO	MEDIUM	DistributionMessage	Data Flow ATC_SCADA_OUT was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 13:00:05	INFO	MEDIUM	DistributionMessage	Data Flow OUT_ALIVE_ACK_BSP was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 13:00:04	INFO	MEDIUM	DistributionMessage	Data Flow OUT_ALIVE_ACK_BSP was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 13:00:03	INFO	MEDIUM	DistributionMessage	Data Flow OUT_ALIVE_ACK_BSP was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 13:00:03	INFO	MEDIUM	DistributionMessage	Data Flow OUT_ALIVE_ACK_BSP was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 12:52:01	INFO	MEDIUM	UnreserveBidsAbl	Unreserve mFRR bids completion successful. 0 marked as unavailable.
17.12.2024 13:00:00	17.12.2024 12:50:54	INFO	MEDIUM	CalculateDirectNeeds	Calculate direct needs completion successful
17.12.2024 13:00:00	17.12.2024 12:50:52	INFO	MEDIUM	DistributionMessage	Data Flow OUT_DL_BSP was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 12:50:51	INFO	MEDIUM	DistributionMessage	Data Flow OUT_BASE_POWER_TO_SCADA was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 12:50:50	INFO	MEDIUM	CheckMissingFiles	Check missing files completion successful.
17.12.2024 13:00:00	17.12.2024 12:50:49	INFO	MEDIUM	RecalculateMarketProgram	Updated Market Program/Base Power
17.12.2024 13:00:00	17.12.2024 12:50:48	INFO	MEDIUM	StoreDisaggregatedResults	New dispatch instruction DIALIMA_20241217T1300_001 was created for Balancing Area ALIMA for Trading Period 2024-12-17T13:00:00.000Z.
17.12.2024 13:00:00	17.12.2024 12:50:48	INFO	MEDIUM	StoreDisaggregatedResults	New dispatch instruction DIAGUADIA_20241217T1300_001 was created for Balancing Area AGUADIA for Trading Period 2024-12-17T13:00:00.000Z.
17.12.2024 13:00:00	17.12.2024 12:50:48	INFO	MEDIUM	StoreDisaggregatedResults	New dispatch instruction DIACAVADO_20241217T1300_001 was created for Balancing Area ACAVADO for Trading Period 2024-12-17T13:00:00.000Z.
17.12.2024 13:00:00	17.12.2024 12:50:41	INFO	MEDIUM	DistributionMessage	Data Flow OUT_SOM_DISAGGR_BID_SA was sent for Trading Period 2024-12-17T13:00:00.000Z
17.12.2024 13:00:00	17.12.2024 12:50:39	INFO	MEDIUM	CalculateDirectNeeds	Calculate direct needs completion successful
17.12.2024 13:00:00	17.12.2024 12:50:35	INFO	MEDIUM	CheckMissingFiles	Check missing files completion successful.

Figure 67 - Business Logs

In general this route represents shortened functionality of the Digital Workspace product as its main purpose is much wider and includes also managing of the tasks. Picture below shows more comprehensive functionality of the Digital Workspace product. It includes not only simple notifications but also tasks with the time when the task must be done, possibility to set different states of each task or notification, etc.

The screenshot displays the 'Task List' interface. It features a navigation bar with 'Task List', 'Calendar', 'Action History', and 'Component Overview'. The main area shows a list of tasks, each with a title, a description, and a list of participants. A 'SET STATE' dropdown menu is open, showing options: Active, Solved, Warning, Problem, Not solved, Canceled, Add comment, Show detail, Synchronize, Copy detail, Copy component, and Set as read.

Figure 68 - Digital Workspace Product

Using Digital Workspace product in the system will be implemented notifications and tasks for the operators and other specific functionalities according to the detailed design that will be done during design phase.

### 4.13.3 User Management

The User management process ensures central registration of new users to a system, and eventually their update or suspension.

The target solution will clearly distinguish between the human users and machine users. The former represents the users, which access system GUI, the latter – the external systems, which exchange data with the system.

As comes from the description, two configurations have different sets of attributes. Typically, human user contains the basic information about the users, such as name, organization and assigned roles, while machine users contain information about the connection to external systems (endpoint, credentials, certificates etc.).

Administration of certificates is supported.

Please, see the example of the human user screen below.

The screenshot displays a 'User Detail' page for a user named 'Admin'. The page is divided into several sections:

- Basic Information:** A table with fields for Firstname, Surname, State, and Note. The values are 'Admin', 'Admin', 'Active', and empty respectively. There are edit and refresh icons.
- Emails:** A table with columns for Connection, Is primary, and Note. One email is listed: 'gejop67602@cybtric.com' with 'Is primary' checked. There are 'Add', 'Refresh', and 'Delete' icons.
- Phone numbers:** A table with columns for Connection, Is primary, and Note. One phone number is listed: '+791111111' with 'Is primary' checked. There are 'Add', 'Refresh', and 'Delete' icons.
- Participant list:** A table with columns for Name, EIC, and Role groups. One participant is listed: 'Fingrid' with EIC '11XUSENE-----4' and Role groups 'Internal backoffice specialist'. There are 'Refresh' and 'Delete' icons.

Figure 69 - User Management Screen

The user management that is available for the system administrators via the dedicated route allows to see and update users directly from the system's GUI.

User List

Welcome ⋮

+ Add user
🔍
📄
📌
📏
🔔

Surname	Firstname	Participant	Phone	E-Mail	State
Admin	Admin	Fingrid (11XUSENE-----4)	+791111111	gejop67602@cybtric.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
2	1	TEST111 (87XUSENE-----4)		xerebim130@erapk.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
2	1	TEST111 (87XUSENE-----4)		xerebim130@erapk.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
2	1	TEST111 (87XUSENE-----4)		xerebim130@erapk.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
User2	User2	Participant1 (87XUSENE-----6)		lifiwox195@dmener.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
Maks	Test	Fingrid (11XUSENE-----4)		sarob40866@deenur.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
baxisa1971	baxisa1971	F Test 2 (10X1001A1001A095)		baxisa1971@dzigg.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
ddd	paxari2385	()		paxari2385@dzigg.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
F Test 3 User 1	F Test 3 User 1	F Test 3 (1234567890QWERTY)		bovamo2389@deenur.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
sivahed847	sivahed847	AAAAAAAAAAAA (18XUSENE-----7)		sivahed847@flektel.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
vapejay596	vapejay59	LALALA (41XUSENE-----8)		vapejay596@nokdot.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
vapejay596	vapejay59	LALALA (41XUSENE-----8)		vapejay596@nokdot.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
fiwar11249	fiwar11249	LALALA (41XUSENE-----8)		fiwar11249@nokdot.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
mibiyad667	mibiyad667	UKRNET (95XEDPGC---T-)		mibiyad667@dzigg.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
giseda7191	giseda7191	F Test 3 (1234567890QWERTY)		giseda7191@flektel.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
F Test 4 User 1	F Test 4 User 1	F Test 4 (012345678901234A)		hafov90846@informa.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
F Test 5	F Test 6 User	F Test 6 (01234567891234B)		kesepp15377@flektel.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
NDV	NDV	F Test 6 (01234567891234B)		bingerua+test1@gmail.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
F Test 7 User 1	F Test 7 User 1	F Test 7 (0123456789012345)		dmytro.nikolaenko85+test1@gmail.com	<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>
Bespeshkiv	Taras	EDPGP (16XEDPGC-----T)			<span style="color: green;">🟢 Active</span> <a href="#">Detail</a>

Figure 70 - User List

## 5. Solution Architecture

This Chapter provides an overview of high-level solution architecture and elaboration of technical concept as a response to non-functional requirements defined in technical specification document. As already mentioned in Solution concept, the proposed solution is planned to be delivered on top of Unicorn Damas MMS product.

Following picture illustrates proposed solution from high-level view. The business modules are backed up by vast variety of technical products and components from Damas MMS.

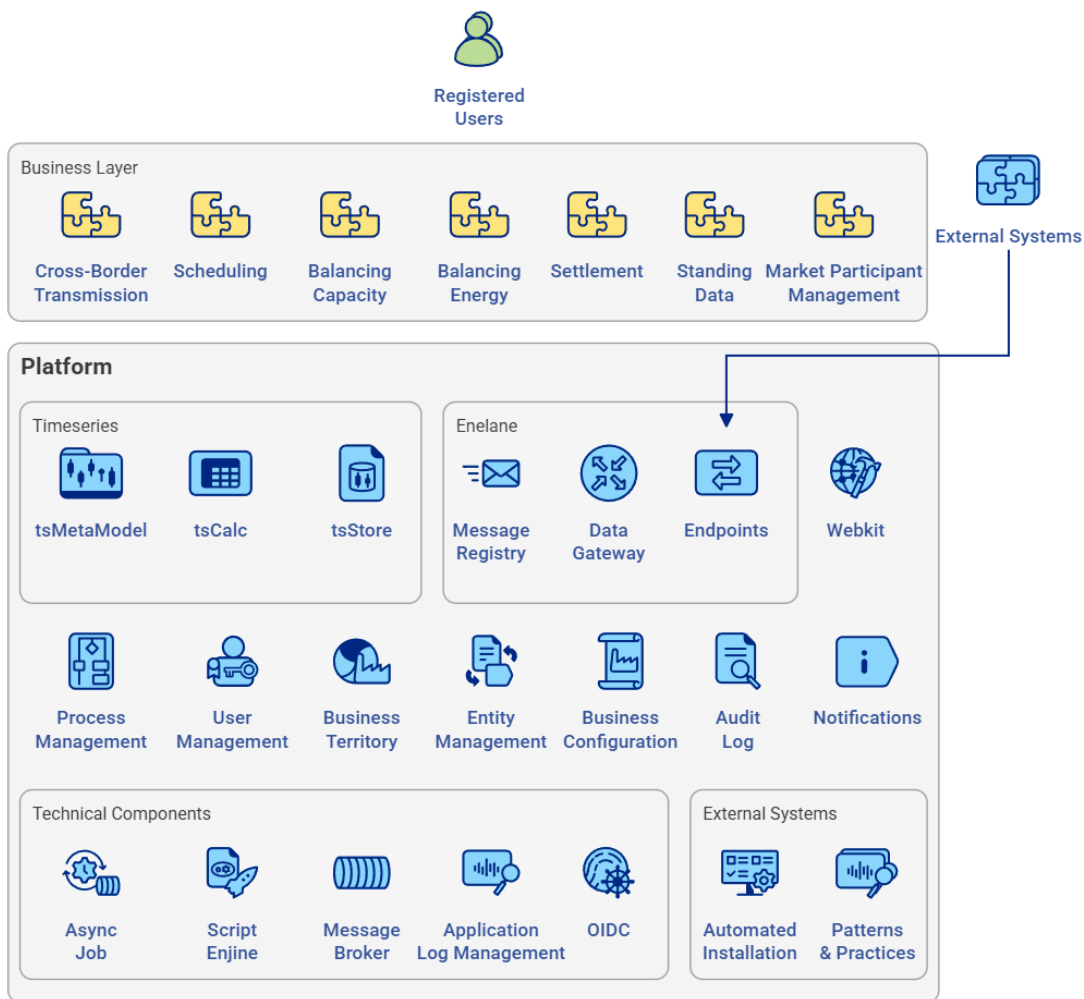


Figure 71 - Solution architecture big picture

Upcoming chapter elaborates on the Moldelectrica's non-functional requirements for Moldelectrica MMS solution.

### 5.1 Architecture and Infrastructure

Damas MMS product is built upon Unicorn Digital construction kit. This world-class application platform was developed by Unicorn over the long term and serves as the foundation of all our recent solutions and products, both in the energy domain and elsewhere. It is focused on the design, development, deployment, and operation of progressive web applications deployed to public, private, or hybrid clouds that scale optimally with the needs of their customers and users.

Whole Damas MMS is built upon set of key architectural principles which ensure that solutions implemented and operated on top of the platform are naturally modular, robust, resilient and scalable. Every part of the platform uses harmonized open-source technology stack without space for any technologies overlapping or confuse which eases development and maintenance of final solutions greatly.

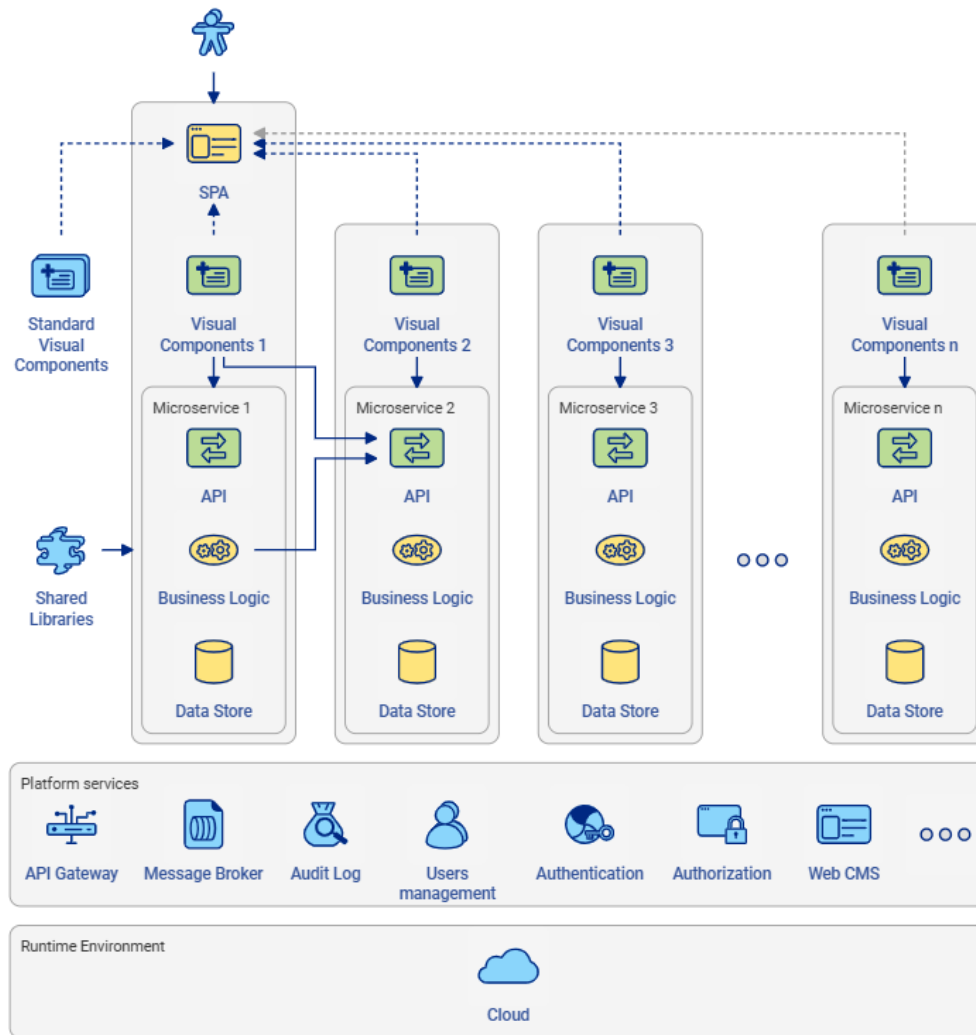


Figure 72 - Architecture Overview

Front-end part of the platform is based on **Microfrontend** approach which breaks UIs into smaller, self-contained and reusable components. These components, ranging from general-purpose to service-specific, form a library of over a thousand elements. By leveraging microservice APIs, a unified system design ensures seamless integration with backend functionalities. This architecture enables responsive UIs adaptable to various screen sizes, maintaining a consistent user experience. With dynamic composition capabilities, UIs can be assembled on-the-fly, enhancing development agility and scalability. Microfrontend offers a modern, adaptive solution for building feature-rich web applications.

One of the most important architectural principles is **Microservice-based business logic** – structuring business logic to microservices with consistent and well-defined API and providing various types of multitenant data stores with a common abstraction level independent from specific storage technologies. There are 50+ common business or technical microservices available to solve standard tasks.

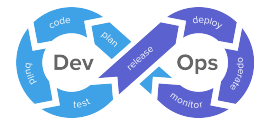
Microservices revolutionize how software is built by breaking down applications into smaller, independent pieces. This approach offers several benefits: teams can update parts of the system without affecting others, scale components individually as needed, and minimize downtime by containing issues. With simpler, easier-to-understand code, maintenance becomes smoother. Plus, microservices adapt well to different technologies,

fostering innovation. Overall, they provide a more agile and efficient way to develop and manage software, crucial for staying competitive in today's fast-paced business environment.

The runtime environment and deployment models provided by the **Cloud Management Platform** offer a robust foundation for managing and scaling microservices applications effectively. This platform automates and dynamically manages public cloud, on-premise, or hybrid infrastructures, ensuring seamless deployment, operation, and elastic scaling of thousands of containers with zero downtime. With a focus on standardization, the Cloud Management Platform provides abstraction over specific cloud platforms or physical on-premise infrastructure, facilitating a uniform environment for deployment. Standardized installation procedures and infrastructure services such as zero-downtime deployment, logging, and monitoring streamline operations across different environments. Leveraging technologies like Kubernetes, Docker, Helm, and Harbor, the platform supports various operational models, including Microsoft Azure (AKS, VMs), Amazon AWS, and on-premise deployments using Kubernetes clusters (preferably Suse Rancher) or virtual machines (VMs). Additionally, organizations have the flexibility to choose deployment models tailored to their needs, whether it's utilizing cloud resources with the Cloud Management Platform's abstraction layer or managing infrastructure on-premise, including hybrid solutions that combine both cloud and on-premise environments. This approach allows organizations to retain control over hardware and maintenance while leveraging the scalability and automation benefits of cloud-native technologies.



kubernetes



With all these principles the solutions built on top of the Damas MMS platform possess following characteristics out-of-the-box:

- High availability between two and more physically different locations on all layers of the solution
- Several possibilities of isolation of different environments which can even be combined to achieve best fit for needs for particular types of environments – full physical isolation (network, HW resources, Kubernetes clusters, database instances etc), logical isolation (logically isolated instances of environments running on the same resources), multitenancy (logically isolated spaces in the same instances of microservices)
- Backup and recovery both as a whole or partial if needed
- Both vertical and horizontal scalability on a level of particular microservices ensuring performance tuning addressed optimally to demanding parts of the system
- Zero-downtime deployments possible on the level of microservices and front-end libraries independently
- Environments can be created and decommissioned swiftly using fully automated pipelines

### Deployment, availability and resilience

One of the key non-functional requirements of the system is to achieve 99.5% availability. We plan to fulfil this requirement by deploying the system in (at least) 2 datacentres in active-active cluster. The datacentres must have minimal network latencies between each other to achieve reasonable performance according to non-functional requirements. This standard setup ensures that the system run without any outage even when one datacentre fails. In active-active cluster the system is deployed into 3 availability zones (2 standard availability zones plus one additional for arbiter). Each component will preferably be deployed in active-active cluster on at least 2 nodes.

- This allows to the system to operate even when 2 servers or one whole availability zone is down.
- The system also benefits from this redundancy to deliver better performance. The load is distributed to all nodes of cluster.

- The system is build using standard open-source lightweight but reliable solutions: Java, Tomcat, NodeJs, MongoDB, GridFS, RabbitMQ, OpenSearch, etc.
  - All these components have possibility to deploy updates or new version without outage.

The redundancy on all levels means that there are also no single points of failure. In case of failure of application/database server, there shall be no impact on the business function of the system.

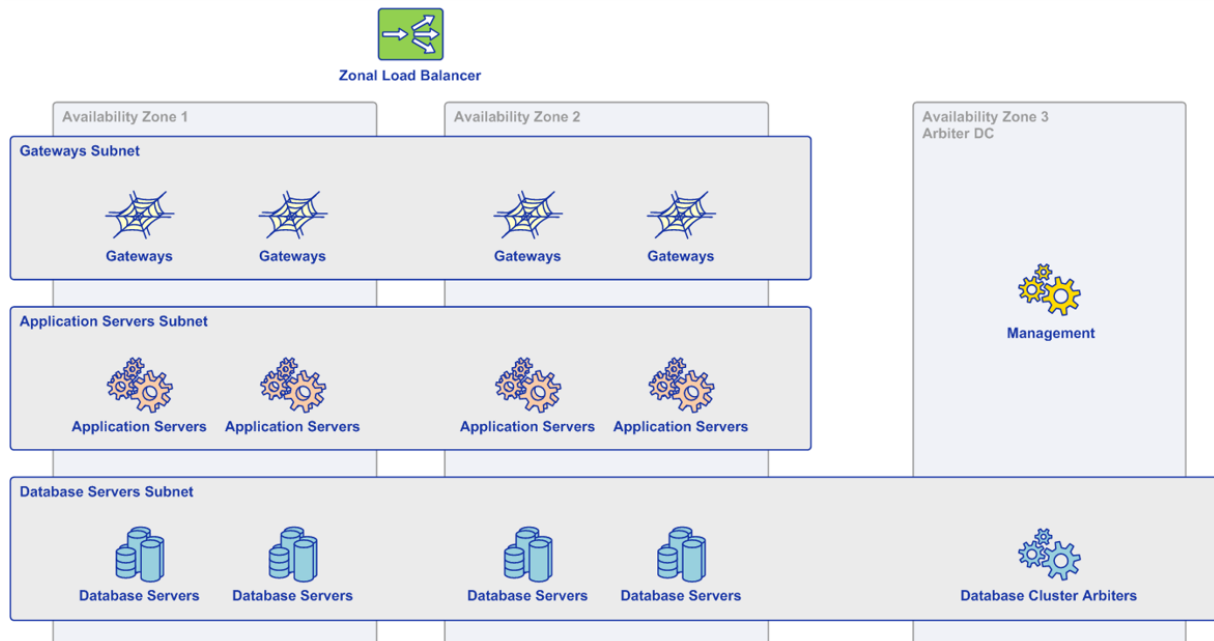


Figure 73 - Logical Deployment Scheme

It's important to notice that for establishing standard Active-Active cluster 3 datacentres are required. To solve this situation in case that there are only 2 datacentres:

- **One datacentre will be primary**  
 In this option primary datacentre hosts 2 (of 3) availability zones. This ensures that system runs without any outage in case that any availability zone is down or when secondary datacentre is down. In case of failure of primary datacentre there is required manual intervention with short outage (less than 10 minutes).

System is considered to be available if the critical functionalities are available (input and output data exchanges, balancing process).

## 5.2 Logical infrastructure configuration

The proposed solution is based on a high-availability, geo-redundant architecture designed to ensure service continuity, fault tolerance, and resilience in the event of infrastructure or site-level failures.

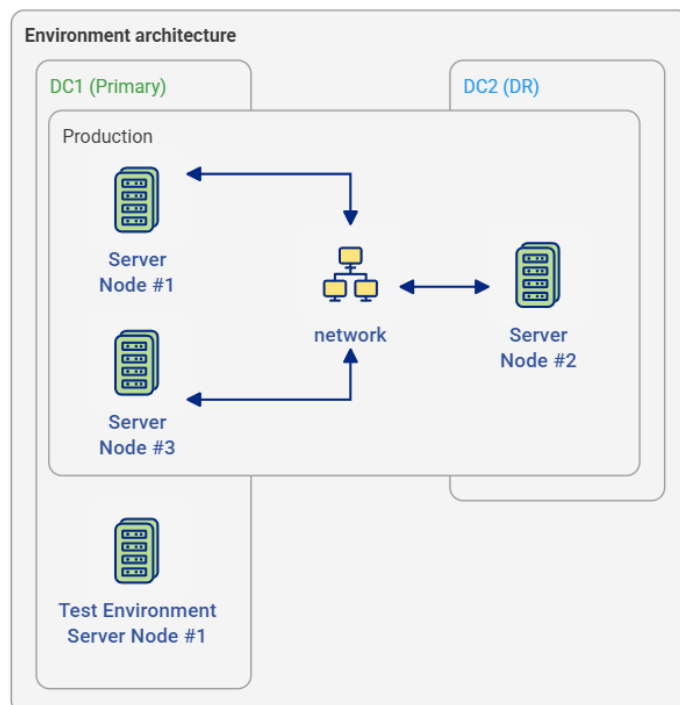


Figure 74 - Logical Environment Scheme

## Production Environment

The Production environment is implemented as an active-active cluster consisting of three nodes: two primary (worker) nodes and one master (arbiter) node. This configuration enables continuous operation and supports failover scenarios without service interruption.

The cluster is distributed across two geographically separated Data Centers (DCs) to provide resilience against site-level failures:

- **Primary Data Center (DC1):**
  - Hosts **Worker Node 1** (active processing node)
  - Hosts **Master (Arbiter) Node**, responsible for cluster coordination, quorum management, and split-brain prevention
- **Disaster Recovery Data Center (DC2):**
  - Hosts **Worker Node 2** (active processing node)

Both worker nodes operate in an active-active mode, simultaneously handling application workloads and ensuring load distribution across sites. The arbiter node, located in the Primary Data Center, participates in cluster decision-making processes but does not handle application traffic.

This architecture ensures:

- **High Availability (HA):** In the event of failure of any single node, the remaining nodes continue to provide uninterrupted service.
- **Quorum-based Decision Making:** The arbiter node enables reliable quorum formation, preventing split-brain scenarios in case of network partitioning.
- **Geo-redundancy:** Distribution across two Data Centers ensures protection against full site outages.

- **Failover Capability:** Automatic failover mechanisms allow the system to maintain operational continuity in case of node or site failure.

### Test Environment

The Test environment is designed as a non-high-availability (non-HA) setup and is deployed exclusively within the Primary Data Center (DC1). This environment is intended for development, testing, and validation activities and does not require the same level of redundancy or fault tolerance as the Production environment.

Key characteristics include:

- Single-node or non-clustered deployment
- No geo-redundancy
- Reduced infrastructure complexity
- Isolation from Production workloads

This approach ensures cost efficiency while still providing a controlled environment for testing and quality assurance processes.

### 5.3 Application architecture layer design

The proposed Application Architecture is based on a layered, containerized design that ensures scalability, isolation, high availability, and operational flexibility. The architecture follows a structured approach, where each layer has clearly defined responsibilities and interacts with adjacent layers through controlled interfaces.

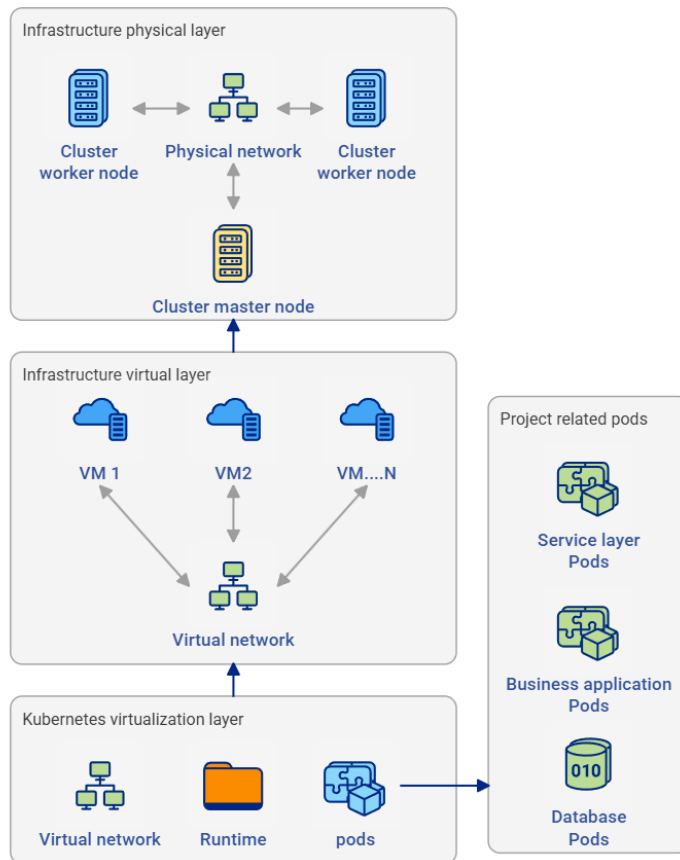


Figure 75 - Logical Environment Scheme

## Cluster and High Availability Layer

At the top level, the solution is deployed on an **active-active cluster architecture** consisting of two primary (worker) nodes and one master (arbiter) node. This layer provides the foundational high-availability capabilities required for mission-critical operations.

Both primary nodes operate concurrently and process application workloads, ensuring load distribution and redundancy. The master (arbiter) node is responsible for cluster coordination, quorum management, and prevention of split-brain scenarios. This design guarantees continuous service availability in the event of node or site failure.

## Virtualization Layer

Beneath the cluster layer, the solution utilizes a **virtualization layer** responsible for provisioning and managing virtual machines (VMs). This layer introduces logical separation of infrastructure resources and enables flexible resource allocation.

Virtual machines are deployed across **segregated network zones**, allowing isolation of different functional components (e.g., application services, databases, integration endpoints). This segmentation enhances security, simplifies access control, and reduces the risk of lateral movement in case of security incidents.

The virtualization layer ensures:

- Logical isolation between environments and services
- Independent scalability of infrastructure components
- Efficient utilization of physical resources
- Simplified infrastructure management and provisioning

## Container Orchestration Layer (Kubernetes)

On top of the virtualization layer, the architecture leverages a **Kubernetes-based container orchestration platform**. This layer is responsible for managing containerized workloads, service discovery, networking, and runtime execution.

Key components of this layer include:

- **Kubernetes cluster networking**, enabling communication between services and pods
- **Container runtime environment**, responsible for executing containerized workloads
- **Pod orchestration mechanisms**, ensuring automated deployment, scaling, and recovery of application components

This layer abstracts the underlying infrastructure and provides a consistent and portable platform for application deployment and lifecycle management.

## Application and Service Layer (Pods)

At the lowest logical level, the system hosts **application-specific workloads deployed as Kubernetes pods**. These pods encapsulate all core system components and are logically grouped based on their functional responsibilities:

- **Database Pods:** Responsible for data persistence and storage management
- **Business Application Pods:** Implement core business logic and domain-specific functionality
- **Service Layer Pods:** Provide supporting services, APIs, integration mechanisms, and auxiliary processing capabilities

This modular and containerized approach ensures:

- Independent deployment and scaling of system components
- Fault isolation between services

- Simplified updates and continuous delivery processes
- Technology flexibility across different application components

### **Network and Isolation Principles**

Across all layers, the architecture enforces strict **network segmentation and isolation principles**. Communication between components is controlled via defined network policies and virtual networking constructs, ensuring secure and predictable data flows.

Each layer operates within its own logical boundary while maintaining controlled interoperability with adjacent layers. This layered isolation enhances overall system security, stability, and maintainability.

## **5.4 Configurability**

We're very aware of a fact that today's enterprise-grade systems such as Market management system for balancing must be configurable on many levels. These systems must be able to incorporate many types of changes which come from many sources such as the market, legislative, organization's strategy, security needs or technology progress.

Damas MMS offers configurability on various levels from low-level technical configurations to high-level workflows models. We see following configuration possibilities as the key ones for the delivery of Market management system for balancing:

- Business processes and workflows – the Damas MMS contains BPM engine microservice ensuring that modelling of the processes and it's changes can be done easily using standard tools heavily used at the market.

### **5.4.1 Master data management – as described in Market Participants Management**

Management of Market Participants consists of two main components: Master Data Management, described in the following chapter, which enables the configuration of organizations, units, and related entities; and User Management, described in this section, which governs user access and permissions within the system.

The User Management module ensures secure, structured, and auditable administration of all internal and external users of the Moldelectrica MMS.

The module supports the full lifecycle management of users, including registration, modification, activation, suspension, and deactivation. Each user is assigned one or more roles that define access rights, functional permissions, and visibility of data within the system.

The system enables:

- Creation and maintenance of user accounts for TSO operators, market participants, and other authorized stakeholders
- Role-based access control (RBAC) with configurable permissions per module and functionality
- Assignment of users to specific organizations
- Management of authentication parameters and security policies
- Complete audit trail of user activities and configuration changes

User Management is tightly integrated with Master Data Management and all business modules, ensuring that access rights are consistently enforced across capacity markets, balancing energy markets, scheduling, settlement, and reporting.

## **5.5 Secure Software Development Life Cycle**

Software security is about building software to be secure even when it is exposed to a threat or attack. As we have learned from years of practice, protecting software is much easier if the software is built with security in mind. Furthermore, security is a property and not a thing, so software security - being resistant to threat or attack - involves much more than simply adding security features like encryption or passwords to the software.

The SSDLC (Secure Software Development Life Cycle) Process used in Unicorn Systems defines how to integrate security into the software development process. A secure SDLC process ensures that security assurance activities such as design review, architecture analysis, code review, and penetration testing are an integral part of the development lifecycle:

- > More secure software as security is a continuous concern.
- > Awareness of security considerations by stakeholders.
- > Early detection of flaws in the system.
- > Cost reduction because of early detection and resolution of issues.
- > Overall reduction of intrinsic business risks for the organization.
- > Facilitation of informed executive decision-making through the application of a comprehensive risk management process promptly.
- > Documentation of important security decisions made during the development process to inform the management about security considerations during all phases of development.
- > Improved organization and customer confidence to facilitate adoption and use of systems, and improved confidence in the continued investment in government systems.

Damas MMS is resilient against cyber threats, which is ensured through regular security audits and security exercises such as vulnerability scanning and/or penetration testing. Further to the security, development and maintenance procedures are compliant with the latest security standards and industrial standards – user certificates and other access control methods including the least privilege principle, encryption of the data, validation, logging, anti-virus scans and so on.

## 5.6 OIDC and Identity Management

The user authentication processes are based on the **OAuth 2.0/OpenID Connect 1.0** (OIDC) protocols. There is an OAuth/OIDC-compliant identity provider (OIDC service) available in Damas MMS, with support of various OIDC flows and several authentication scenarios (e.g., single-factor authentication, multi-factor authentication, "remember me" cookie, single-sign-on and single-sign-out).

The OIDC service supports **internal identities**, but it can also be linked to identities from any **external identity** provider supporting OIDC or SAML federation, e.g.:

- > **social identity providers** such as Google Sign-In, Facebook Login, Microsoft Login and Apple ID are already integrated and ready to be used,
- > for corporate deployments it can be integrated with existing **corporate identity providers** (like the MS Active Directory, and KeyCloak),
- > public sector deployments can utilize integrations with **national identities or bank IDs**, etc.

The **Identity Management** service is responsible for managing identities and their user settings (like preferred time zone, language etc.). Various types of identities are supported – e.g. person (real users), system (technical user) and "things" (IoT devices).

The following images show the basic screens for user management.

**Standard Users**  
List of all users

Global Actions Log [+ Create a User](#)

State active suspended X Clear filters X

State	Name	Email	uulD	Creation time	
ACTIVE	...	...	...	23. 5. 2024 14:14	: >
ACTIVE	...	...	...	23. 5. 2024 14:19	: >
ACTIVE	...	...	...	23. 5. 2024 14:20	: >
ACTIVE	...	...	...	23. 5. 2024 13:35	: >
ACTIVE	...	...	...	23. 5. 2024 14:20	: >
ACTIVE	...	...	...	23. 5. 2024 13:34	: >
ACTIVE	...	...	...	21. 5. 2024 11:26	: >
ACTIVE	...	...	...	27. 6. 2024 10:00	: >
ACTIVE	...	...	...	18. 7. 2024 08:55	: >
ACTIVE	...	...	...	23. 5. 2024 13:38	: >
ACTIVE	...	...	...	23. 5. 2024 13:39	: >
ACTIVE	...	...	...	23. 5. 2024 14:27	: >
ACTIVE	...	...	...	25. 4. 2024 15:48	: >
ACTIVE	...	...	...	23. 5. 2024 13:41	: >

Figure 9 - List of Users

...

Name	Email	State	uulD	Type	Creation time	
...	...	ACTIVE	...	uuPerson	23. 5. 2024 14:14	: <ul style="list-style-type: none"> <li>Modify Basic Properties</li> <li>Modify Roles</li> <li>Suspend</li> <li>Terminate</li> </ul>

Details ^

More Information Operations Operations Log

BusinessTerritory

Access Role

Figure 10 - User Details

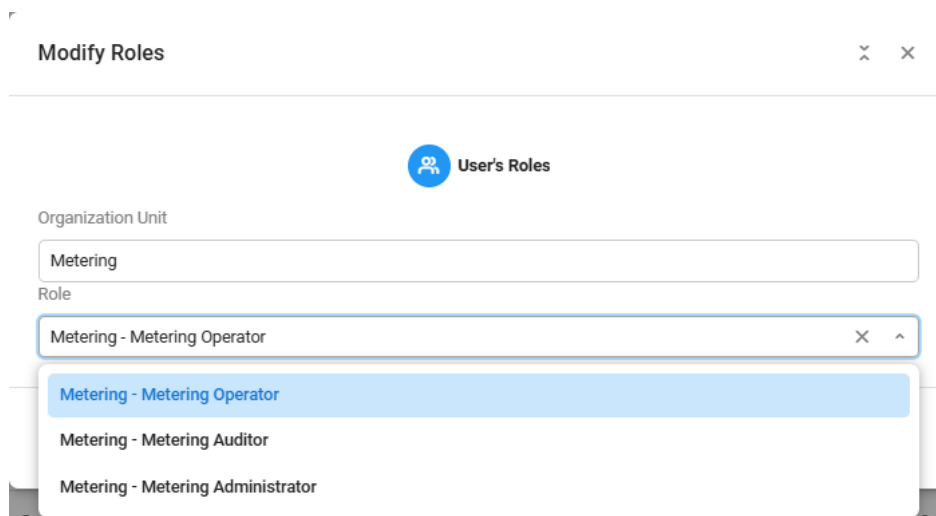


Figure 11 - Assigning Roles to Users

- Master Data chapter, the Damas MMS contains Master data management microservice which brings rich and easy configuration of market data, enumerations and other business configurations.
- Alerts and notifications – all the alerts and notifications generated by the system can be configured on the level of receiving roles, channels and content.
- Access control and data access – configuration of access control is key and integral part of the whole MMS platform. The access control solution follows many security-grade principles (incl. for example least privilege principle). The access rights are configurable for both functionality and data and administrator can configure access to particular users, roles or groups.
- Other lower-level configurations such as configuration of integrations, front-end components and screens, screen menus, scheduled tasks, parallelism of asynchronous tasks etc.

## 5.7 Data Management

Data architecture and data management is important part of the solution architecture.

Following schema summarizes some important aspects of data architecture and data management of proposed solution. All the important aspects are realized by standard components and services of Damas MMS platform.

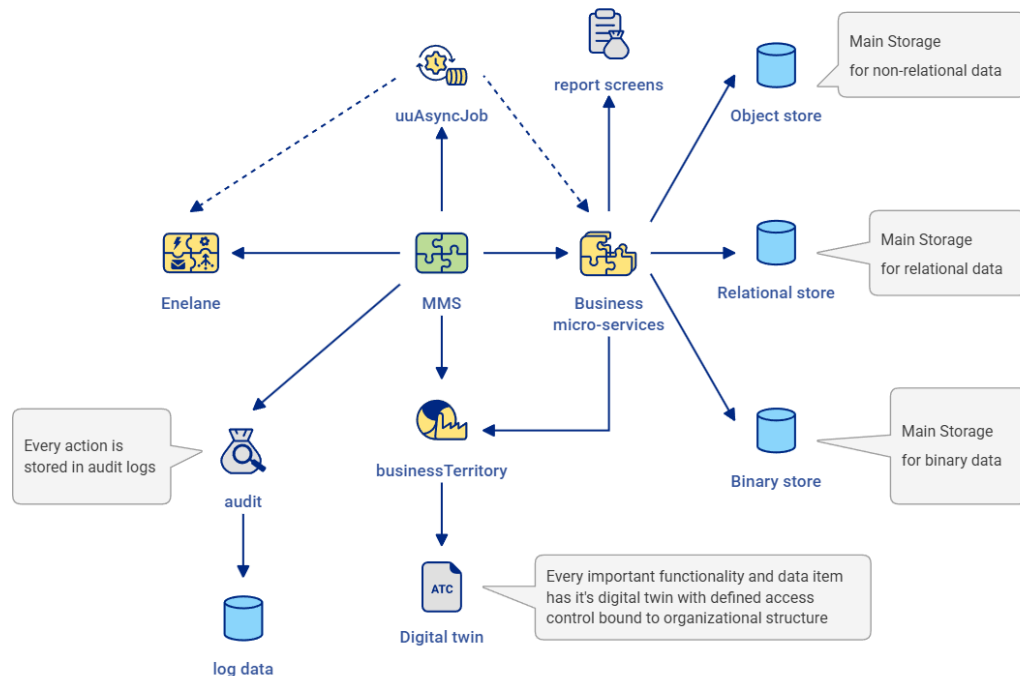


Figure 76 - Data Architecture and Management

One of the basic rules of the microservice architecture states that each microservice is exclusively responsible for its data and so each microservice has its own database (logically or physically) isolated from the others. The Damas MMS Platform leverages three types of storages:

- **object store** (MongoDB) for storing of object data and some type of binary data
- **relational database** for storing relational data (used mainly for time-series data) – for Moldelectrica MMS system we plan to use PostgreSQL database.
- **binary store** MongoDB for storing purely binary data such as integration payloads and MinIO for storing of backups

Very important role in data privacy, protection and classification is played by Business territory service. It implements Digital Twin Model pattern – for every important piece of functionality and data item it creates and maintains a digital twin which is then used for definition and evaluation of access control and authorization. The Business territory's authorization model can be split to three main levels:

1. **application workspace** authorization – every microservice in Unicorn Digital construction kit which is an architectural basis of Damas MMS platform supports multitenancy – each tenant has its own logical space called application workspace. And even every such application workspace has its own digital twin in the Business territory which is used in first level of authorization.
2. **use case** authorization – use cases are authorized on a application workspace level
3. **data** authorization – every important piece of data has its own digital twin inside Business territory structure and is used for authorization as well

All levels of authorization are of course role based – the roles, as well as various types of groups, are defined in the Business territory and can be synchronized with external systems such as Active directory for example.

Every user's (all human, system, IoT or AI) action is automatically authorized following Zero trust policy with applying of basic security principles and at the same time, every action in the system is audited. Every audit

record contains basic data necessary for identification of the user who performed the action, the use case which was invoked, the microservice instance which processed the request etc.

Very important part of data management is data flows and integrations. All data exchanges are handled by state-of-the-art integration Unicorn product Enelane, which is seamlessly encapsulated in Damas MMS. Enelane integration platform has already been successfully used in many projects, for example European Balancing platforms (TERRE, MARI), and is cornerstone of every energy market related integration in software delivered by Unicorn.

Every incoming and outgoing message is stored in the data message register. From a special screen, users may monitor details of all incoming and outgoing data flows. The message register provides filters to specify reception time, sender, data, processing state, etc. For monitoring purposes, incoming messages are bound to their corresponding outgoing messages.

## 5.8 Documentation

One of key standard deliverables in Unicorn software development lifecycle is set of standard documentation. As the proposed solution is to be composed from Damas MMS modules, big part of the documentation is already existing. The standard development production line counts with following documents:

- Business model – analytical documentation of the system. The purpose is to provide information about the **business area**, its **processes**, **actors**, **entities** and desired **use cases**. It is important mainly for the development team, which analyses and verifies requirements, whether they were understood well, if they can be realized - what the system should do. It also contains a dictionary to have a single place where every important term is defined. This document is expected to be reviewed by Moldelectrica representatives.
- Application model – technical design of the system. Contains detailed design of each micro service, micro frontend and other connected areas. The purpose is to provide the **technical design of the system**. The architecture is described there - its division into microservices and its inner structure. It covers the main decomposition, data storage description, and the technical design of use cases with stress on their algorithms. This is the output of the implementation phase, which serves as the technical documentation for the development and operation teams.
- User guide - The purpose is to provide a description of the system to its users. There should be information about **how to reach defined goals** (defined as initial requirements) and how to operate in the given system. It is important mainly **for the users of the system**. There may be multiple user guides based on the groups of users - e.g. for end users and system administrators. This is the output of the development phase, which serves as help for the users of the system.

## 5.9 Identity and Access Management

Damas MMS contains several core-level services which solve agenda of identity management and access management. Standard functionality can be configured, customized or extended to cover specific features potentially requested by Moldelectrica.

Damas MMS OIDC based authentication is ready to be integrated with Moldelectrica's Active Directory using standard means of OpenID Connect protocol (if it is supported in Moldelectrica's Active Directory installation). All microservices of the solution based on Damas MMS platform uses the same central services for identity and token management as well as authorization management which means whole solution uses single-sign-on. If needed, the Platform supports multi factor authentication of users.

Whole platform uses centrally managed user groups and roles for the matter of authorization – the central management is kept in dedicated microservice Business territory.

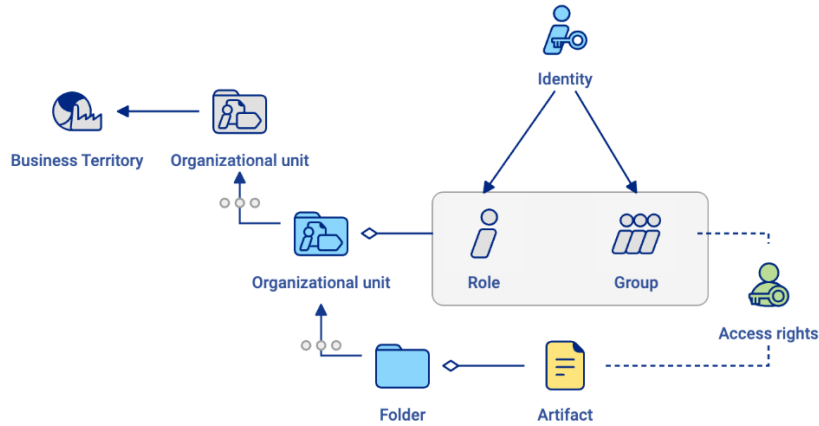


Figure 77 - Authorization Model of Business Territory

All levels of authorization (see authorization levels description in Data Management chapter) are bond to defined organization structure which keeps the authorization model clean and naturally bond with organization's structure.

## 5.10 Integration Capabilities

All solutions built on top of Damas MMS follow API-first principle for REST based integration. Each business and technical microservice communicates by default using its REST API fully documented in its Application model (for more information about Application model please see Documentation chapter).

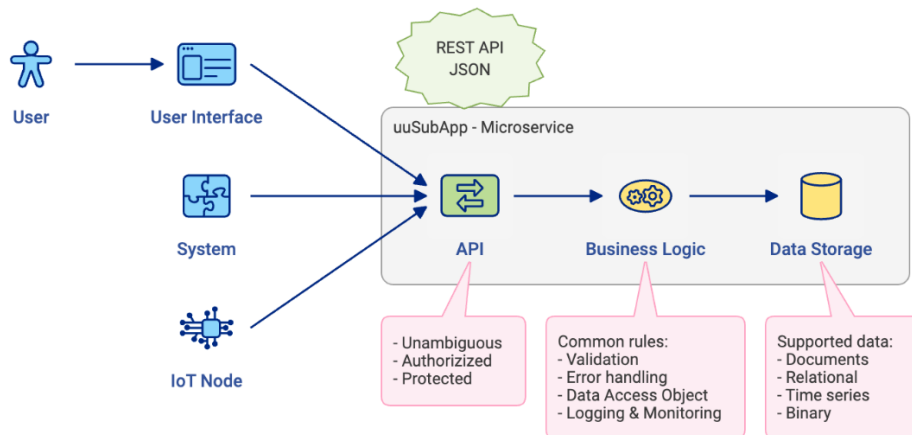


Figure 78 - REST as Default API

The REST API of the microservices is used in internal integration between the microservices of the solution and by the solution's front-end. However more internal (and external) integration possibilities exist.

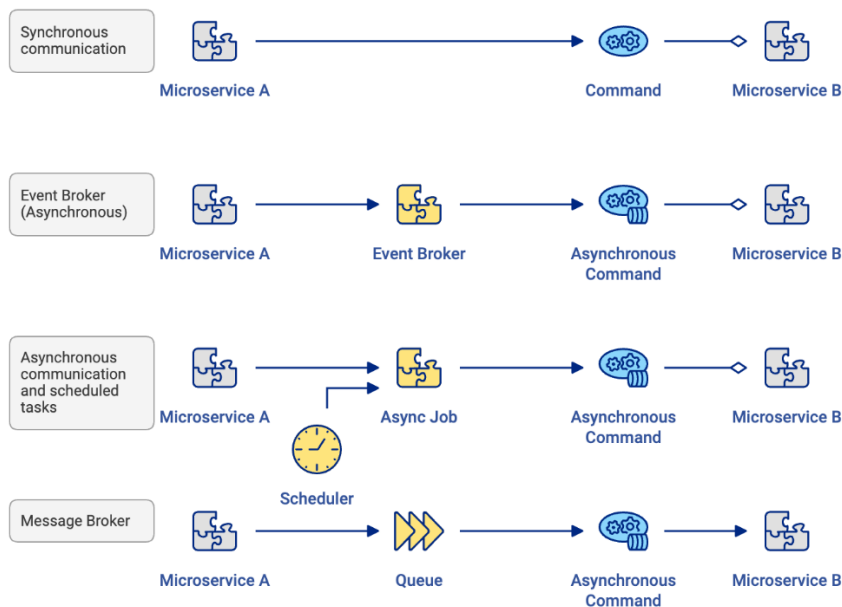


Figure 79 - Microservices Integration Possibilities

Depending on situations, which may differ for example in logic complexity, user experience, operational stability, the microservices can be integrated using synchronous REST API (synchronous command) or asynchronous command. The asynchronous command can be invoked

- by an event via Event broker (event-based integration) or
- asynchronously via Async Job service or
- based on a schedule via Async Job service or
- using message via AMQP Message broker (implemented on top of RabbitMQ messaging technology)

The second important part of integration capabilities of proposed solution is Enterprise integration of the solution to external systems and markets. Such enterprise-grade integration is implemented by Unicorn enterprise integration platform called **Enelane** which is seamlessly encapsulated as an integral part of Damas MMS Platform. It is typically used as a data communication gateway between an organization and the external environment but can also be used for the integration of heterogeneous IT systems within an organization.

Enelane provides a large set of functions related to secured communication and data flow handling, allows its user to monitor the communication and actively manage individual data flows. Enelane can communicate via any channel type used in the energy industry and transmit any data flow type and any data type, including compressed.

Key features of Enelane are:

- Integration of external systems via independent endpoints.
- Sending/Receiving messages.
- Message registry with history.
- Configurable validations, transformations, metadata extraction and routing to target applications.
- All standard domain data channels/protocols, message types and formats supported.
- Message filtering and monitoring.

Enelane is designed for any actor in the energy market, allowing them to communicate with any other actors within the industry domain. This means that Enelane is designed for the market integration of TSOs and DSOs, HVDC interconnectors, power exchanges and allocation offices, market operators, metering operators, traders and other market participants, regulatory authorities, transparency platforms and so on.

Enelane by default contains variety of endpoint types including all commonly used endpoints on energy market:

- > Kafka Endpoint
- > ECP/EDX Endpoint
- > E-mail Endpoint
- > AS2/AS4 Endpoint
- > IEC-62325 Endpoint
- > IEC-60870 Endpoint
- > FTP Endpoint
- > ... and more

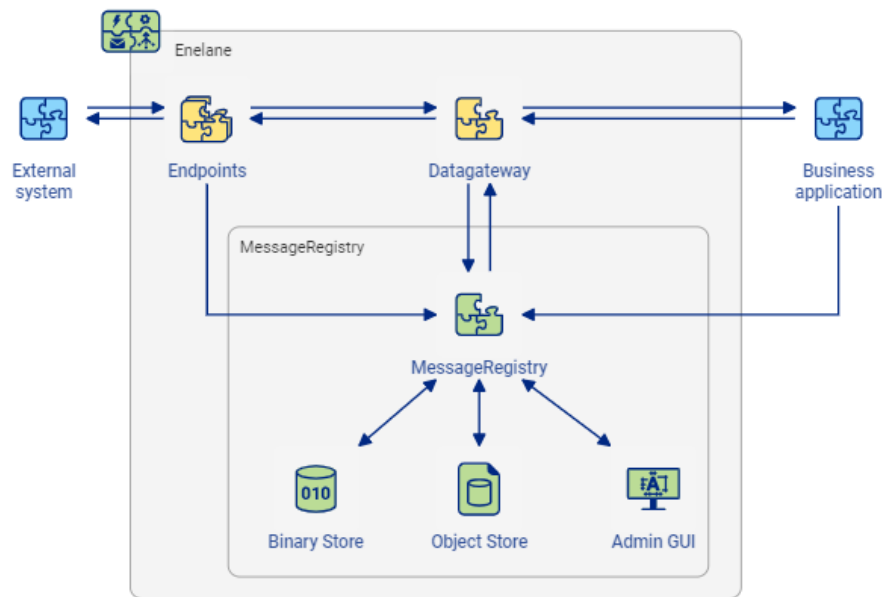


Figure 80 - Enelane Structure

For message storing and monitoring Enelane contains Message registry microservice. Message Registry is responsible mainly for the storing of messages in various stages of their lifecycle. Message Registry furthermore provides the functionality related to archiving and administration, including the possibility of manual upload. Message Registry GUI allows user to monitor the status of the traffic using the message list, browse the messages and display their content in message detail.

uuEnelane  
Messages

Views Saved Views: Default Save Update

Message ID	Status	Dataflow	Filename	Receipt
637f6319a3fa4d3328db8b85	Received	ftp_incoming_paused_message_dtf	IOKZTA_message_file.xml	24.11.20
637f6318a3fa4d3328db8b7c	Received	ftp_incoming_paused_message_dtf	3SHXFY_message_file.xml	24.11.20
637f6317a3fa4d3328db8b73	Received	ftp_incoming_paused_message_dtf	TBAMDJ_message_file.xml	24.11.20
637f6316a3fa4d3328db8b6a	Received	ftp_incoming_paused_message_dtf	NLTIPT_message_file.xml	24.11.20
637f6315a3fa4d3328db8b5f	Received	ftp_incoming_paused_message_dtf	UGWIIT_message_file.xml	24.11.20
637f6264a3fa4d3328db8b4c	Received	ftp_incoming_paused_message_dtf	IOKZTA_message_file.xml	24.11.20
637f6264a3fa4d3328db8b43	Received	ftp_incoming_paused_message_dtf	3SHXFY_message_file.xml	24.11.20
637f6263a3fa4d3328db8b3a	Received	ftp_incoming_paused_message_dtf	TBAMDJ_message_file.xml	24.11.20
637f6262a3fa4d3328db8b31	Received	ftp_incoming_paused_message_dtf	NLTIPT_message_file.xml	24.11.20
637f6261a3fa4d3328db8b28	Received	ftp_incoming_paused_message_dtf	UGWIIT_message_file.xml	24.11.20
637f61b0a3fa4d3328db8b13	Received	ftp_incoming_paused_message_dtf	IOKZTA_message_file.xml	24.11.20
637f61afa3fa4d3328db8b0a	Received	ftp_incoming_paused_message_dtf	3SHXFY_message_file.xml	24.11.20
637f61aea3fa4d3328db8b01	Received	ftp_incoming_paused_message_dtf	TBAMDJ_message_file.xml	24.11.20
637f61aea3fa4d3328db8af8	Received	ftp_incoming_paused_message_dtf	NLTIPT_message_file.xml	24.11.20
637f61ada3fa4d3328db8aef	Received	ftp_incoming_paused_message_dtf	UGWIIT_message_file.xml	24.11.20
637f60fca3fa4d3328db8ada	Received	ftp_incoming_paused_message_dtf	IOKZTA_message_file.xml	24.11.20
637f60fba3fa4d3328db8ad1	Received	ftp_incoming_paused_message_dtf	3SHXFY_message_file.xml	24.11.20
637f60faa3fa4d3328db8ac8	Received	ftp_incoming_paused_message_dtf	TBAMDJ_message_file.xml	24.11.20
637f60faa3fa4d3328db8abf	Received	ftp_incoming_paused_message_dtf	NLTIPT_message_file.xml	24.11.20
637f60f9a3fa4d3328db8ab6	Received	ftp_incoming_paused_message_dtf	UGWIIT_message_file.xml	24.11.20
637f6048a3fa4d3328db8aa1	Received	ftp_incoming_paused_message_dtf	IOKZTA_message_file.xml	24.11.20
637f6047a3fa4d3328db8a98	Received	ftp_incoming_paused_message_dtf	3SHXFY_message_file.xml	24.11.20

Figure 81 - Enelane Message Registry Screen Example

## Performance

One of the key aspects of enterprise-grade systems generally is uncompromised expectation of huge performance under all circumstances. This is one of the main reasons why enterprise organizations prefer delivery of information systems based on already existing products and platforms. Both Damas MMS Platform and Unicorn production pipeline process understand the performance as one of the basic quality identifiers. We can build on our best experience from referenced projects like Libra for TERRE, MARI and many other project

Top performance of the systems is a goal which cannot be fulfilled by a single aspect, but it must be took care of complex set of activities and approaches. Of course, quality architecture must be a firm base for performing system. As described also in other chapters, Damas MMS Platform is built on various architecture principles which lead to ensuring system performance and scalability – microservice architecture, operational isolation, modular scalability etc. To provide best service, the architecture of the platform must be implemented on top of modern, performing, stable and secure software technologies. Details about technology stack can be found further below in this document but we can declare, that the technology stack of Damas MMS platform is chosen in a way to give best performance outcomes on all levels all the way from operating systems and operation platform to front-end part of the system. The operation platform is built on top of Kubernetes which out of the box brings possibility to scale the solution both up and out separately for each microservice.

We are fully aware that declaring the system performance is not enough. We can responsibly declare the system performance only after passing properly designed performance tests. In our projects, there are usually two parallel performance testing activities. As the proposed solution will be implemented on top of Damas MMS platform, we already know, that we’re building on performing base components – all key parts of the platform, both technical and business, are periodically tested on performance. Besides these periodical performance tests of the platform, there are the performance tests performed as part of the implementation project which declares that the specific customizations and implementations meet necessary requirements. We use Apache JMeter as a main tool for performance testing.

We can responsibly declare that the proposed solution based on Damas MMS platform is more than ready to fulfil required performance goals. In current and previous installations of solutions based on the same platform we’re processing higher tens of thousands and event hundreds of thousands of data flow messages per day. The platform’s architecture is built to be used by thousands of simultaneously working users. The responses

of the system from the user's point of view (screens and components loading) are standard for web-based applications (no more than a few seconds).

After studying Moldelectrica requirements for the Moldelectrica MMS solution and from our experience we count with following high-level HW resources sizing needed for operation of whole solution. The sizing counts with all business, technical, operational and supporting parts of the system. However, during further clarification of requirements (such as complexity of processes, computation and data etc) during next phases of the tender or project, the necessary HW resources sizing may change.

## 5.11 Preliminary HW Resources Sizing (IT Architecture)

Following tables contain preliminary sizing estimates for proposed solution. The sizing has been estimated from information known from the requirements and information specified by Moldelectrica in Technical Specification documentation. If Moldelectrica will utilize only two data centres (as was also clarified during question phase of tender), one of the data centres will have to act as the DC3 and therefore will contain the VMs specified for DC3 in following tables.

### Production DC 1

Virtual machine	# VMs	# Cores / VM	Mem GB / VM	Disk space GB / VM	Additional storage GB / VM
App cluster load balancer	1	2	2	32	
App cluster master node	1	4	8	100	
App cluster worker node	4	32	80	100	
Database	1	32	100	2000	2000

### Production DC 2

Virtual machine	# VMs	# Cores / VM	Mem GB / VM	Disk space GB / VM	Additional storage GB / VM
App cluster load balancer	1	2	2	32	
App cluster master node	1	4	8	100	
App cluster worker node	4	32	80	100	2048
Database	1	32	100	2000	2000

### Production DC 3

Virtual machine	# VMs	# Cores / VM	Mem GB / VM	Disk space GB / VM	Additional storage GB / VM
Cloud management master / worker (quorum)	1	4	32	100	512

Virtual machine	# VMs	# Cores / VM	Mem GB / VM	Disk space GB / VM	Additional storage GB / VM
App cluster worker node (quorum)	1	32	80	100	
App cluster DB node (quorum)	1	32	100	100	2000

### Non-production DC 1 (Test environment)

Virtual machine	# VMs	# Cores / VM	Mem GB / VM	Disk space GB / VM	Additional storage GB / VM
Cloud management cluster load balancer	1	2	2	100	
App cluster worker node	1	12	48	100	
App cluster worker node (data bound)	2	16	40	100	
Database	1	24	60	2000	2048

## 5.12 Software Platform / Core

As it was already mentioned in the previous chapters, the Damas MMS Platform is implemented using modern, stable, proven and secure technology stack with great accent on open-source software on all layers of the architecture. The important software technologies supported and used by the platform are shown at following picture.



Figure 82 - Technology Stack

Unicorn Digital construction kit architecture leverages the top of contemporary technology but at the same time it's open to changes in underlying technologies. From time to time it's necessary to swap some of the software technology to a new one from many reasons:

- security issues,
- licencing policy,
- lack of performance for needed usage,
- position on market
- or simply when new suitable technology emerges on the market

On top of these lower-level technologies, built-in **Business Process Management (BPM)** service is responsible for managing and controlling business processes implemented in Damas MMS solutions.

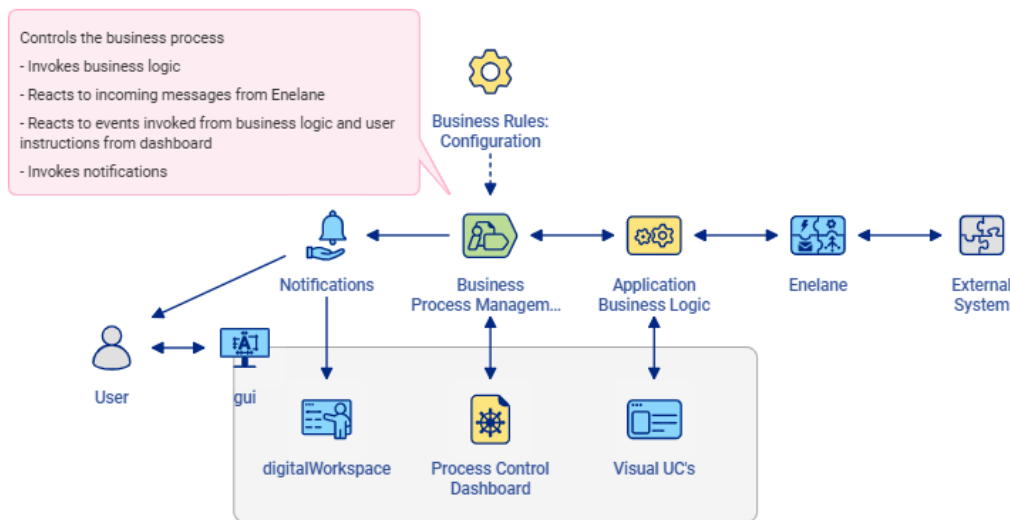


Figure 83 - Business Process Management

Business Process Management controls the orchestration of business processes and flows through the whole system. It glues together inputs from enterprise integration flows, orchestrates all tasks needed to be performed during the processing of important business functionalities, applies business rules in cooperation with other parts of the system, delegates manual tasks for user roles and controls publication of necessary data via various channels.

Processing of business processes is thoroughly monitored, and all monitoring data are kept for further analysis of all kinds – technical, operational, business intelligence etc. The business activity monitoring data are of course exposed via API which makes it usable in other parts of the platform.

### 5.13 Usability

The cornerstone for great usability of the system is based on world class user experience. Design of all visual and non-visual use cases of the Damas MMS Platform and solutions based on it are prepared with the user experience in mind. Very important part of the user experience is graphical user interface of the solution. Damas MMS approach to user interface design and development is based on three keystones:

- **Excellent user interface design language** that defines consistent graphical presentation and ergonomic handling of components. It can be composed together in various responsive layouts to form a final user interface with the user customization and application of corporate designs in mind. Unlike other design languages, Damas MMS FlexiGUI focuses on direct applicability and provides structured metadata that can be used by libraries and architectures that implement it.
- **Efficient architecture and libraries of components** that implement the design language and allow effective construction and deployment of user interfaces that can run the same code on any device and screen factor - from mobile phones to smart TVs - with the same look and feel as a native app for the platform would do. Damas MMS FlexiGUI provides GUI features for dynamic screen composition and customization. The feature of dynamic screen composition can also be used for user-defined screens (custom reports, individual dashboards, etc.).
- **Dynamic Component Content** offers an innovative solution for dynamic embedding of components, making it a perfect fit for micro-frontends. With Damas MMS FlexiGUI, a single component can be used across multiple applications, ensuring consistency and reusability. The dynamic assembly feature allows components to be loaded only when they are first displayed, optimizing performance and resource utilization. This flexibility empowers users to customize various aspects of the application, such as dashboards, reports, web pages, and documentation. Additionally, "smart" components connected to server-side business logic enable sophisticated functionalities like chat, task lists, and live charts, enhancing the overall user experience with real-time, interactive features.

Damas MMS provides set of business-specific components for working with time series data, business process, notifications, dataflows and master data management.

Graphical user interface of the Damas MMS platform uses set of key features which are very important for whole system usability for users:

- **Progressive Web Applications (PWA)** - HTML/CSS/JavaScript-based user interfaces that run the same code in all major browsers on all devices and screen factors with the native look and feel and ergonomics.
- **Dynamic component loading and composing** - components are discovered and loaded on the fly. Dynamic screen composition and customization are built-in features.
- **Internalization, localization** - full support of multilingualism, local formatting, time zones etc.
- **Routing** - even though the application is SPA, it fully supports browser history and server-side routing, and links can be natively shared and bookmarked.
- **500+ generic components** – basic elements, layouts, inputs, data visualization and manipulation, charts, media, vector graphics, animations, sensor connectors, and more.

To facilitate development and standardize the user interface, the Damas MMS platform defines a standard page structure. This was created based on our extensive experience in MMS development.

All visual components of the Damas MMS platform share a uniform appearance, so it is easy to adapt the appearance of the final solution to the customer's graphic manual.

If the nature of the implemented solution or customer requirements require it, the page structure can be customized.

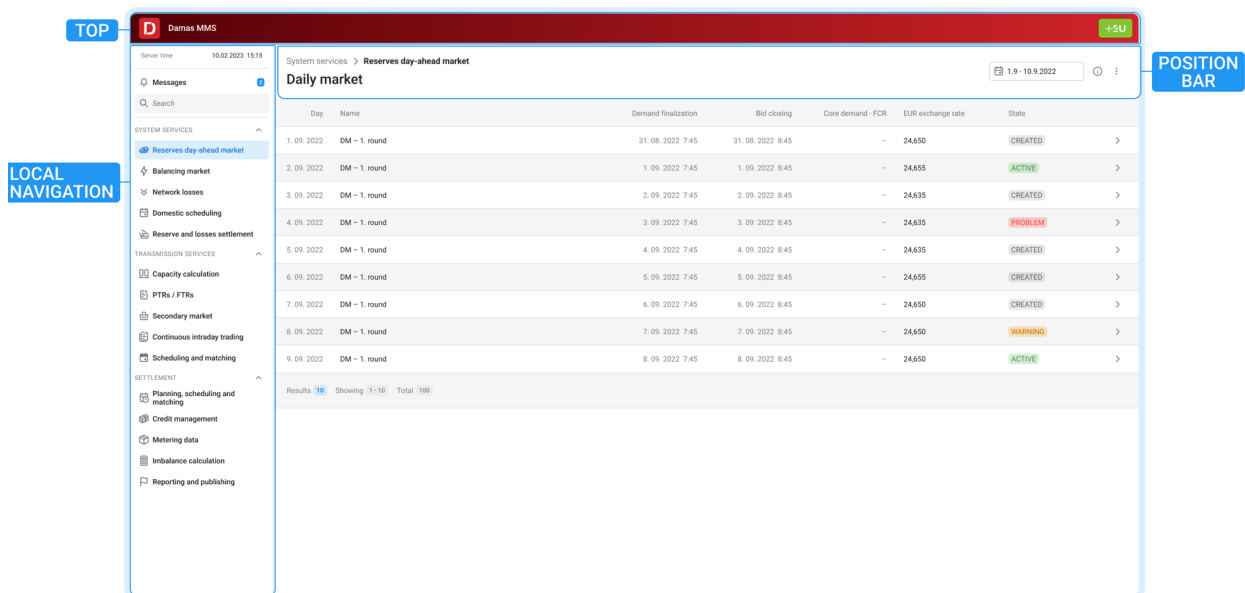


Figure 84 - Basic Page Structure

### Top navigation bar

Bar used on the top of the page, presenting visual identification of the energy application, and providing basic navigation components. When users scroll down, it smoothly retracts out of sight, allowing users to focus on the content without distraction. Even though the navigation bar is hidden from view, its functionality remains accessible. Users can easily access navigation options by scrolling back up or using other relevant UI cues.

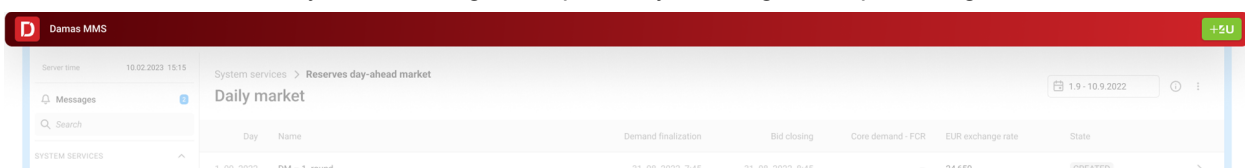


Figure 85 - Top Navigation Bar

## Local navigation menu

The local navigation menu is located on the left side. It provides access to the system functions. For ease of orientation, items can be arranged in categories and marked with illustrative icons.

Menu items can be searched for ease of access.

The local navigation menu can be collapsed to enlarge the work area.

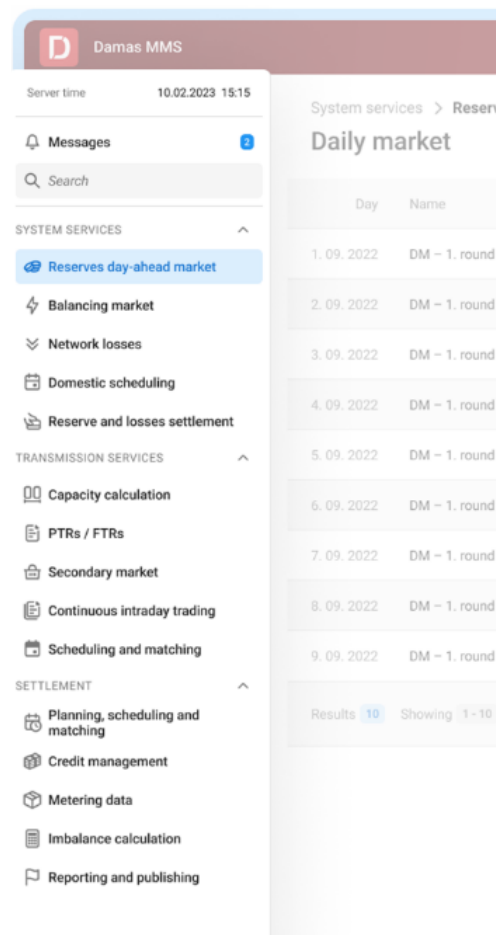


Figure 86 - Local Navigation Menu

## Position bar

The position bar contains the name of the page and its location in the system hierarchy - breadcrumb navigation.

In addition, it can contain functionality-specific elements such as basic data filtering (e.g. by business day) or information about the status of a business process.



Figure 87 - Position Bar

The Damask MMS platform's Flexi GUI provides templates for efficient and consistent development of standard pages, such as: – e.g.

- **Time series view** provides access to time series data using the tsView component
- **Process monitoring** serves as a control centre and provides a detailed overview of running and upcoming processes. It offers an instant overview of the current process status, highlights any anomalies, and provides links to related process details.

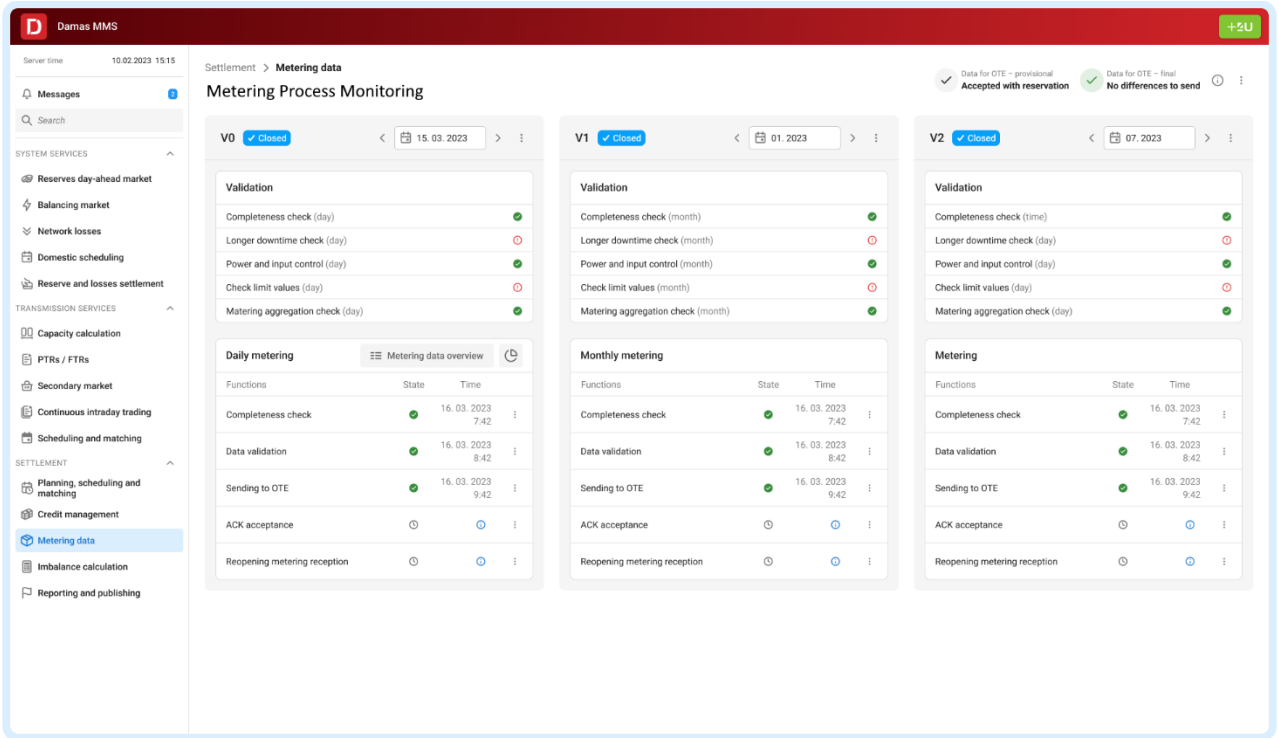


Figure 88 - Process Monitoring Page Example

- **Master/detail** for Master data management and other structured data such as bids.

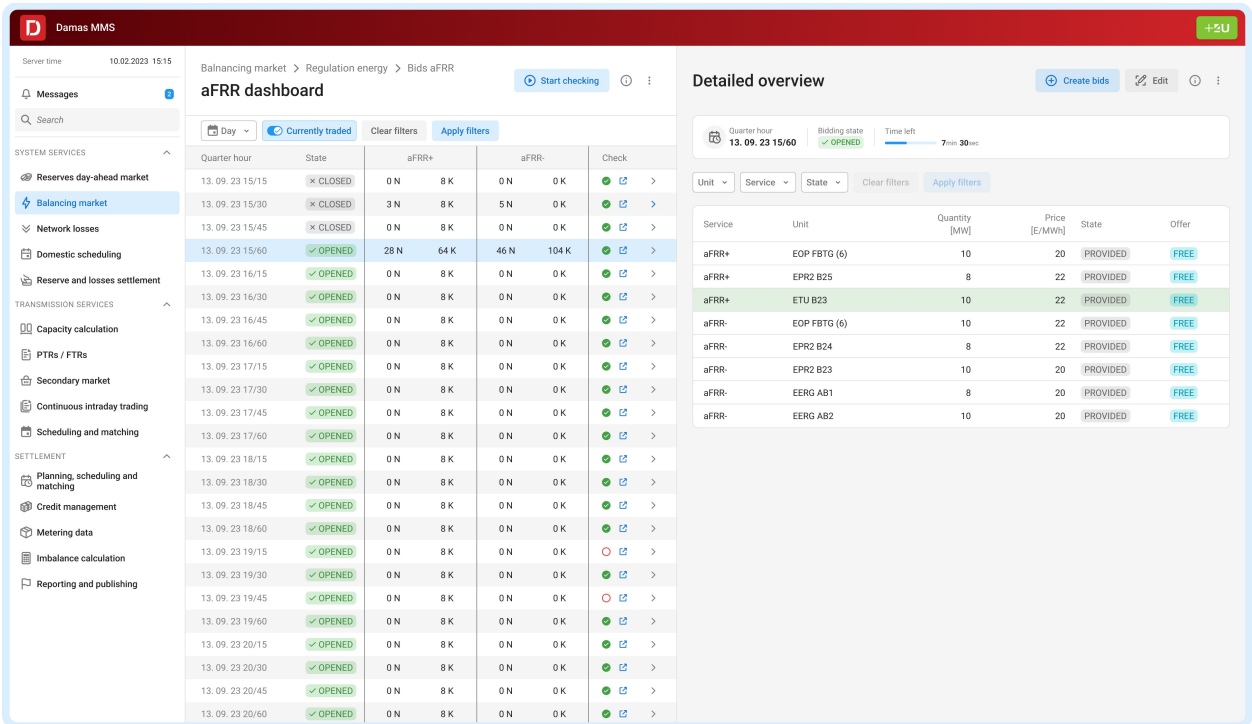


Figure 89 - Master/detail View

- **Dashboards** – The purpose of dashboards is to provide a wide range of information and controls, enabling the presentation of complex data and their context on a single page, including the capability to manage related business processes. Consequently, dashboards in Damask MMS are typically used

as entry screens for operators, where the current status of the process, key data, and controls are clearly displayed. A business process can appear on multiple dashboards tailored for different user roles.

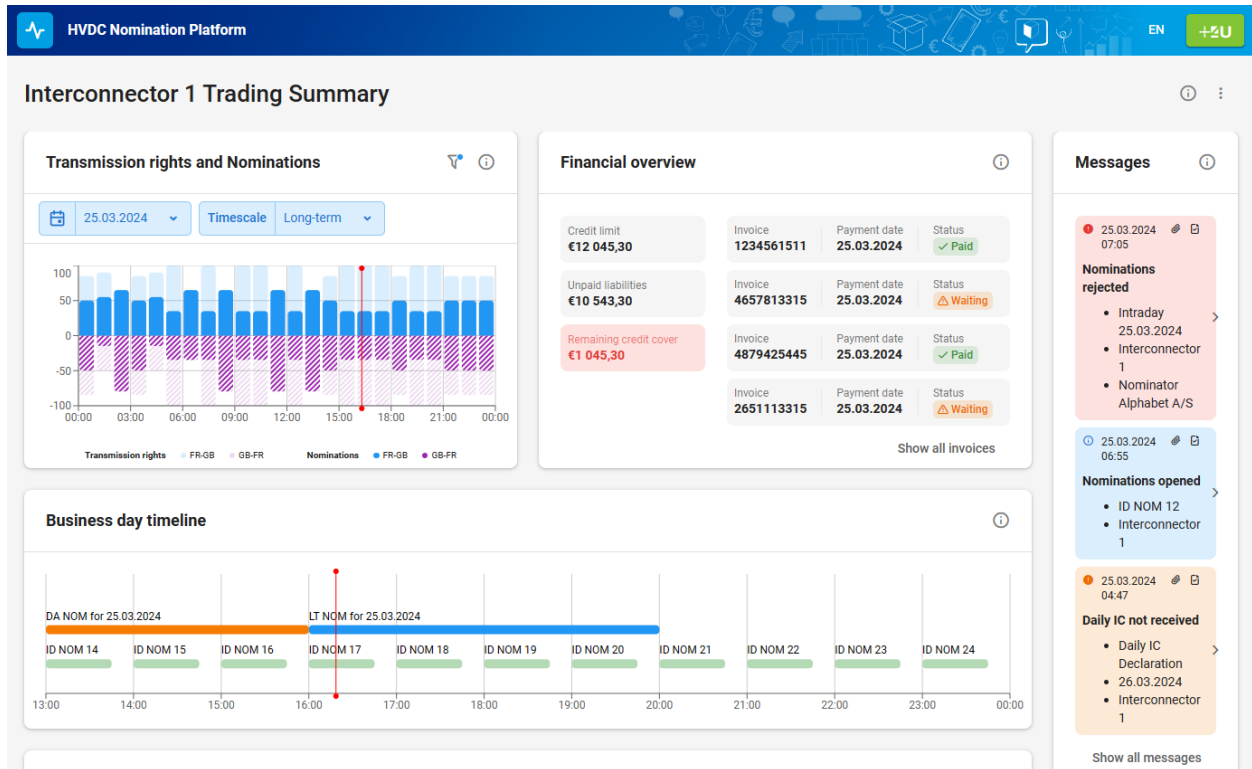


Figure 90 - Dashboard Page Example

- **Reporting views** – reporting is an important part of enterprise grade systems and reporting pages usually combine many components and features from all previously mentioned screen types. Damas MMS FlexuGUI's dynamic component content nature is perfect for seamless integration of components from all business and technical components with rich filtering capabilities. Reporting output tables are capable of adding and hiding columns, sorting according to multiple columns and other common features.

Of course, in addition to these basic patterns, it is possible to create any custom pages according to the needs of a particular business module. The Damas MMS platform supports this with a rich set of components with a unified way of use that can be composed into screens without any programming.

## **6. Hardware**

List of HW components to be used to fulfil requirements is listed in Infrastructure.pdf file.

Customs to be paid when importing HW components from EU (Czech Republic) are to be paid by Moldelectrica, as the receiving party and are not included in the price.

Installation costs of the HW componens provided are included in the price.

## 7. Delivery Project Plan

The delivery of the Moldelectrica MMS will follow a phased approach based on deployment of the standard Damas MMS solution delivered as-is, already implemented in comparable European TSO environments. The objective of this approach is to make the system available to Moldelectrica users at an early stage of the project, allowing validation of standard functionality, early feedback collection and reduction of implementation risk.

The project is structured into the following main phases:

- Deployment of standard Damas MMS (as-is)
- Configuration and adaptation to Moldelectrica requirements
- Parallel development of missing functionalities
- Testing phases (FAT, SAT, UAT)
- Go-live preparation and support.

### 7.1 Our Approach

Unicorn Systems provides modern and complex information systems designed to meet its clients' requirements using well-proven information technologies. Based on requirements and understanding of the way the solution should work from user perspective, we will design and build an information system (IS) integrated into its specific ICT environment. While designing an IS, we bear in mind the principles of best practice for each business area.

Unicorn project approach is systematic, managed, documented and certified according to ISO9001, ISO14001, ISO20000 and ISO27001. Our standard development methodology is IBM Rational Unified Process (RUP), our project methodology is compliant with Prince2 and our maintenance and support services complies with ITIL. Our project approach itself is built on industry best practices, methodologies, and standards – mainly Scrum at the development team level and PRINCE2/PMI PMBOK 6th Ed. We comply with ISO certifications.



Project approach covers the following areas:

- Project methodology
- Development and integration methodology
- Project team structure
- Project plan
- Quality plan & assurance
- Risk management plan

Thanks to our extensive experience with large project for TSOs in Europe, we guarantee that the staff used on this project shall have:

- Experience from large international projects in European energy sector
- Experience with TSOs environment and business processes

- Experience with cross-border trading systems

Such skills shall play key role in the successful project execution and shall be critical for the timely identification and mitigation of the foreseen project risks.

## 7.2 Project Timeline

Project Stage									
	1	2	3	4	5	6	7	8	9
Project kick-off	█								
Delivery of default Damas MMS for Moldelectrica	█								
Introduction to Moldelectrica users	█	█							
Analysis of the missing functionality	█	█	█						
Development of the missing functionality			█	█	█				
Factory Acceptance Test			█	█	█				
Delivery and installation of hardware at Moldelectrica				█	█				
Delivery of the system for Moldelectrica					█				
Site Acceptance Test						█			
User Acceptance Test							█		
Testing with Market Participants								█	█
Go-live									█

Figure 91 - Moldelectrica MMS Project Plan

The project delivery follows a phased approach based on early deployment of the standard Damas MMS solution delivered as-is, combined with parallel development of missing functionalities and progressive validation with Moldelectrica.

The project starts with the project kick-off, during which governance, communication structure and detailed planning are established.

Immediately after kick-off, the standard Damas MMS solution is delivered and deployed for Moldelectrica. This includes the full baseline functionality of the system as implemented in existing European TSO environments. The system is made available to Moldelectrica users at an early stage of the project.

Following the deployment, Moldelectrica users are introduced to the system through dedicated training sessions and hands-on access. This enables early familiarization with the solution and allows users to validate standard processes in real conditions.

In parallel, a structured analysis of missing functionality is performed. This activity focuses only on identifying gaps between the standard Damas MMS (delivered as-is) and specific Moldelectrica requirements.

Based on this analysis, development of missing functionality is carried out. This development runs in parallel with ongoing user interaction with the system, ensuring continuous feedback and alignment.

Once the system reaches sufficient functional completeness, Factory Acceptance Testing (FAT) is performed to validate both standard and newly developed functionalities in a controlled environment.

In parallel with FAT, delivery and installation of hardware at Moldelectrica is completed, followed by deployment of the system in the target environment.

Subsequently, Site Acceptance Testing (SAT) is conducted to verify system behavior in the production-like environment, including integration with external systems.

User Acceptance Testing (UAT) follows, involving Moldelectrica users and covering end-to-end business processes.

Testing is further extended to include market participants, ensuring validation of external interactions such as schedule submission, matching, balancing processes and reporting.

The project concludes with go-live, after successful completion of all testing phases and confirmation of operational readiness.

This approach ensures early system availability, continuous user involvement and reduced implementation risk, while limiting custom development to clearly identified gaps.

Exit criteria are

Stage	Description	Exit Criteria
<b>Design (DSG)</b>	Analysis of requirements, business and technical workshops, specification from high-level concept to detail use case specification. This stage requires intensive cooperation with business and technical owners from Moldelectrica.	<ul style="list-style-type: none"> <li>• All deliverables are accepted</li> </ul>
<b>Development (DEV)</b>	Technical description; coding; basic tests on level of individual modules, preparation of test scenarios, data and configuration. The stage will be divided into sprints. There will be up to 3 visibility sessions (live demonstrations) during the Development stage This stage requires small to medium amount of consultation with Moldelectrica.	<ul style="list-style-type: none"> <li>• Complete scope is developed</li> <li>• Test scenarios covers complete scope</li> <li>• Solution is deployed to FAT env.</li> <li>• All deliverables are accepted</li> </ul>
<b>Factory Acceptance Testing (FAT)</b>	Functional testing of whole solution according to pre-agreed test scenarios. This stage requires small amount of consultation with Moldelectrica.	<ul style="list-style-type: none"> <li>• Know issues <ul style="list-style-type: none"> <li>• 0 A1</li> <li>• 5 A2</li> <li>• 20 B+C</li> </ul> </li> <li>• Solution fulfils functional requirements</li> <li>• Solution is deployed to SAT env.</li> <li>• All deliverables are accepted</li> </ul>
<b>Site Acceptance Testing (SAT)</b>	Computation and non-functional testing of whole solution according to pre-agreed test scenarios. This stage requires intensive cooperation with hosting experts from Moldelectrica.	<ul style="list-style-type: none"> <li>• Know issues <ul style="list-style-type: none"> <li>• 0 A1</li> <li>• 0 A2</li> <li>• 20 B+C</li> </ul> </li> <li>• Solution fulfils non-functional requirements</li> <li>• Solution is deployed to IOP env.</li> <li>• All deliverables are accepted</li> </ul>

<b>User Acceptance Testing</b>	Testing by Moldelectrica users and Market Participants	<ul style="list-style-type: none"> <li>• Know issues <ul style="list-style-type: none"> <li>• 0 A1</li> <li>• 0 A2</li> <li>• 10 B+C</li> </ul> </li> <li>• Solution is successfully integrated with Moldelectrica's and external solutions</li> <li>• Solution is deployed to PROD env.</li> <li>• All deliverables are accepted</li> </ul>
<b>Trainings</b>	Provide necessary set of knowledge to our customer so the users on customer side are able to correctly use new information system.	<ul style="list-style-type: none"> <li>• All trainings are completed</li> <li>• BSPs, operators, Application Administrators are well trained for the solution</li> <li>• Supportive materials are shared with the project</li> </ul>
<b>Go-live (GL)</b>	Deployment to PROD env., setting up initial configuration, creation of users and access rights, preparation and start of Maintenance and Support service.	<ul style="list-style-type: none"> <li>• Solution is able to perform main processes and communicate with Stakeholders.</li> </ul>

### 7.3 List of Deliverables

The project will deliver a complete and operational Market Management System for Moldelectrica based on the standard Damas MMS platform. The solution will be delivered as-is, using proven functionality already implemented in European TSO environments, with configuration adapted to Moldelectrica requirements and limited development of missing functionalities where required.

The key project deliverables include:

- Standard Damas MMS solution deployed for Moldelectrica, including core modules (scheduling, cross-border capacity management, balancing, settlement and reporting), delivered as-is
- Configured system aligned with Moldelectrica market rules and operational processes
- Additional functionalities developed limited to agreed gaps identified during the project
- Integration with external systems based on agreed interfaces and specifications provided by the Customer
- Project documentation, including High-Level Design and Technical Design, configuration documentation and user manuals
- Testing deliverables, including FAT, SAT and UAT test scenarios, protocols and results
- Training limited to up to 10 days delivered by up to 2 experts
- Installed and operational system environments (Production and Test)
- Support for testing with market participants and validation of external processes
- Go-live support and transition to operation
- Warranty and maintenance services for the agreed period
- Solution is delivered in English and Romanian. Russian translation of the solution and Romanian translation of the missing parts is provided by Customer

- Source code provided under escrow agreement
- Any deliverables, functionalities or services not explicitly defined in this section are considered out of scope of the project and may be subject to a change request procedure
- Configuration is limited to parameterization of existing functionality and does not include redesign of standard processes.
- Testing with the Market Participants will be organised by Moldelectrica

All deliverables are based on the standard Damas MMS platform and are provided in line with proven implementations in comparable European market environments.

## 7.4 RACI Matrix

The following table describes responsibilities of individual parties.

- R - Responsible
- A - Accountable (Approver)
- C – Consulted
- I – Informed

Task	PCG (Moldelectrica)	Supplier (Unicorn)	Stakeholders
Weekly project status calls	R	C	
Effort estimates approval	A	R	
Change management process	R, A	C	I
Consolidation and prioritization of requirements	R, A	I	I
Coordination and communication with Stakeholders	R, A	I	I
Overall Project Plan (incl. all Service Providers)	R, A	C	C
Coordination of SAT	C	R	I
Coordination of UAT	R	C	C
Monthly steering meetings	R	C	I
Central risk list	R	C	C
Central action point list	R	C	C
Weekly Report	I	R	I
Definition of project standards (DMS, templates, way of working)	R	C	I
Project deliverables	A, C	R	I
Review and acceptance of project deliverables	R, A	I	I
Specification of functional and non-functional requirements	R, A	I	C
Requirement analysis and traceability	A, C	R	I
Functional Specification / System Architecture / Use case specification	A, C	R	I

Weekly calls with Business Owner	C	R, A	
Build process	I	R, A	
Deployment process	I	R, A	
DEV env.	I	R, A	
FAT test scenarios	A, C	R	
FAT test data and configuration	A, C	R	
FAT test planning and coordination	A	R	
FAT test execution	I	R, A	
FAT test automation	I	R, A	
SAT performance tests	I	R, A	
SAT penetration tests	I	R, A	
SAT test planning and coordination	A, C	R	
SAT test scenarios	A, C	R	
SAT test data and configuration	A, C	R	
SAT test execution	A, C	R	
UAT test planning and coordination	A, C	R	C
UAT test scenarios	A, C	R	C
UAT test data and configuration	A, C	R	C
UAT test execution	A, C	R	R
Training of stakeholders	A, C	R	I
Training of operators	R	A, C	I
Go Live plan	R, A	C	C
Production configuration	R, A	C	C
User, access rights	R, A	C	C
Use of Damas Platform	R, A	C	
Incident resolution	A	R	C
Infrastructure requirements (HW, SW)	A	R	
HW procurement and delivery	C	R, A	
Server room	R, A	I	
HW installation	C	R, A	
TEST, PROD env. setup	R, A	C	
Network throughputs setup	R, A	C	C
Connectivity to external systems	R, A	C	C
TEST, PROD deployment	R, A	C	
Operation of TEST, PROD env.	R, A	I	
Disaster recovery test	R, A	C	

## 7.5 Expected Cooperation

Successful delivery of the Moldelectrica Market Management System is based on the following cooperation assumptions between Unicorn and Moldelectrica (hereafter the Customer).

- The Customer acts as the project lead and is responsible for overall coordination of the project on its side, including cooperation with third parties such as market participants, neighbouring TSOs and other involved suppliers.
- The Customer is responsible for ensuring timely provision of all required inputs, including business requirements, technical specifications, message formats and test data. All provided information shall be complete, consistent, accurate and up to date. Where required, working assumptions may be agreed to ensure continuity of project activities.
- The Customer will facilitate and mediate communication with external stakeholders, including neighbouring TSOs, service providers and market participants, where such communication is necessary for solution design, integration and testing.
- The Customer will establish a Project Coordination Group with sufficient capacity and authority to support the project. This group will be responsible for day-to-day cooperation, coordination of inputs and consolidation of feedback.
- The Customer will ensure availability of decision-making authority within the project, either directly or via escalation to a Steering Committee. Decisions required for project progress are expected to be provided without unnecessary delay.
- The Customer will appoint Single Points of Contact (SPOC) for key roles, including:
  - Business Owner
  - Technical Owner
  - Test Owner
- These SPOCs will ensure coordination on the Customer side, provide required inputs and resources, and support timely review and acceptance of project deliverables.
- The SPOCs will actively participate in solution design activities, clarification of open issues and coordination with external stakeholders.
- The review process for deliverables assumes up to two review cycles per deliverable increment, each with a duration of five working days. For initial deliverables not previously discussed, a longer review period may be agreed. The Customer will provide consolidated feedback within the agreed timelines.
- Unicorn will provide a detailed project plan, including deliverables and review timelines. The plan will be regularly updated and tracked through weekly project status reporting.
- The Customer will ensure availability of required resources for participation in testing activities, including FAT, SAT and UAT, as well as testing involving market participants.
- The Customer is responsible for preparation and availability of integration environments, including cooperation of third parties and their participation in integration and testing activities.
- Regular project governance will include:
  - Weekly project status meetings at working level
  - Monthly steering committee meetings
- Communication within the project will be conducted in English. All functional and technical documentation will be delivered in English.
- The Customer will provide appropriate tools for document sharing and collaboration (e.g. SharePoint or equivalent).
- Unicorn project team members will be primarily located in Unicorn offices, with remote collaboration as the default mode of operation.
- These cooperation assumptions are aligned with the proposed delivery approach, where the standard Damas MMS solution is delivered as-is and made available to the Customer early in the project, requiring active and continuous involvement of the Customer throughout the implementation lifecycle.

## 7.6 Risk Management

Our project approach is focused on proper management of risks and we consider the management of risks to be one of the key pre-requisites for the success of the project. The risk management of the project shall be under the responsibility of project manager who shall be maintain two key documents:

**Risk management plan** - defines process of risk management in terms of roles, responsibilities and workflows for risk identification, analysis and contingency planning. This plan is being setup during the project start-up phase.

**Risk list** – the list of all project risks and for each risk there is described a set of attributes like: ID, Name, Impact, Probability, Description and for each risk there are defined set of mitigation and contingency strategies.

As a part of project initiation, the draft of risk list is created, it is continuously assessed and remedial actions are taken accordingly. Unicorn generally divides risks into following categories:

- Project management risks
- Business-related risks
- Technological risks

The following principles and procedures will take place to lower the project risks to a manageable level:

- Phase approach with clear priorities for each phase minimise the key project risks.
- Project governance principles ensuring good risk visibility and efficient mitigation environment.
- Information sharing and cooperation among all parties involved into the project ensure early risk identification.
- Technological risks are proactively mitigated by prototyping key solution components.
- Scope revisions included in each project phase keep the expectations clear and stable.
- Risk register in JIRA including risk classification, responsibility, mitigation measures and subsequent tasks.
- Risk mitigation measures shall be decided and approved without unnecessary delays.
- Risk management reporting included in Weekly Project Reports and Steering Committee Reports.

## 8. Trainings

Training activities will be provided to ensure that Moldelectrica users are able to effectively operate and utilize the Market Management System from early stages of the project.

Training will be organized shortly after the deployment of the standard Damas MMS solution (delivered as-is), when the system becomes available to the Customer. This allows users to gain hands-on experience with the solution and actively participate in testing and validation activities.

The training scope includes:

- Functional training for business users covering key processes (scheduling, balancing, capacity management, settlement and reporting)
- Technical training for administrators and IT personnel covering system operation, configuration and monitoring
- Support for users during testing phases (FAT, SAT, UAT), including clarification of system behavior and functionalities.

Training sessions will be based on the standard Damas MMS functionality and supported by user documentation and practical demonstrations in the system environment.

This approach ensures early familiarization with the solution, efficient participation in testing activities and smooth transition to operational use.

## 9. Project Organization

This section describes proposed project governance model and organization and communication schema.

Based on our experience we proposed the project organization described below. This structure is derived from the standard Unicorn organization and updated to fully support the agile way of the development. As the project has specific business background, which expects higher knowledge we amend the basic roles defined by the Scrum methodology (Scrum Master and Product Owner) especially by the business architect and software architect. Unicorn is ready to support all the business tasks by the experienced capacities.

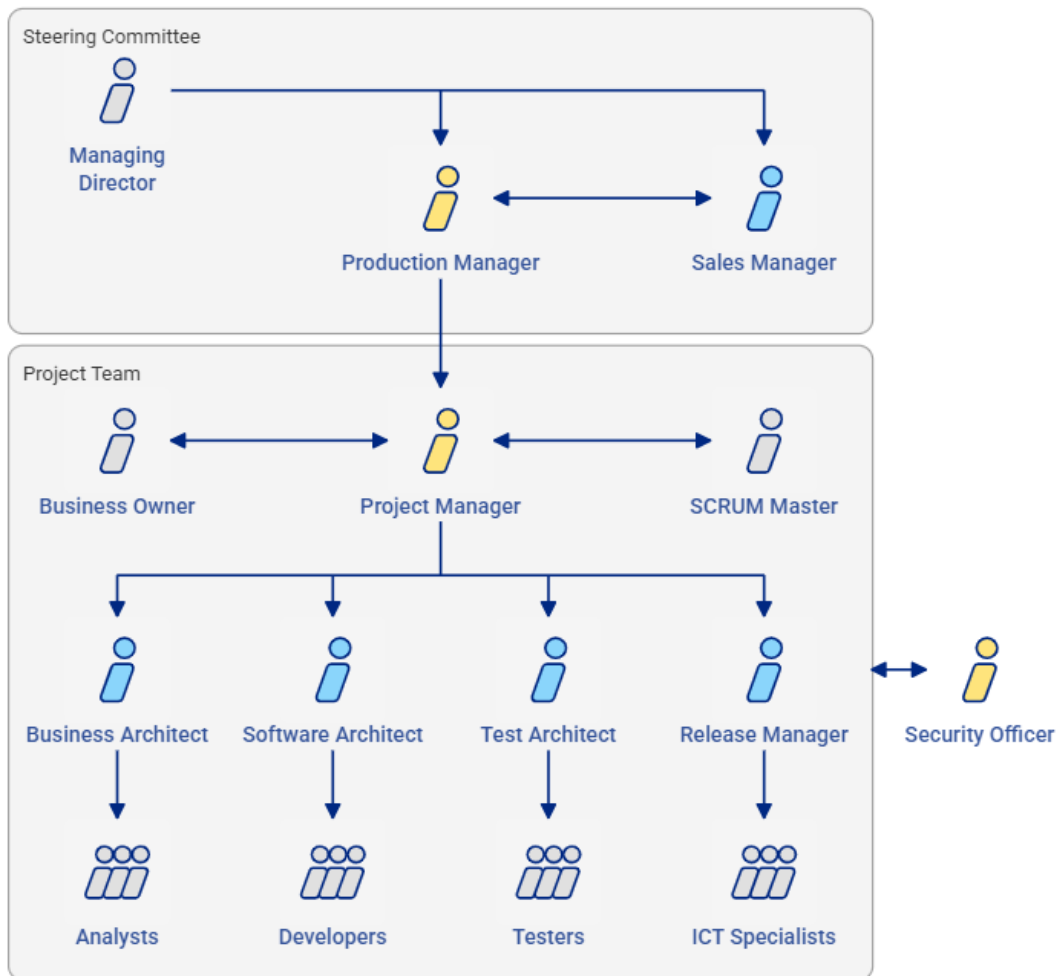


Figure 92 - Organisation Scheme

We expect to involve experts that are specified above. However, we reserve the possibility to change them before the start of the project with similarly qualified resources.

### 9.1 Organization and Communication Schema

The following schema further elaborates interaction between the Customer and Vendor's teams:

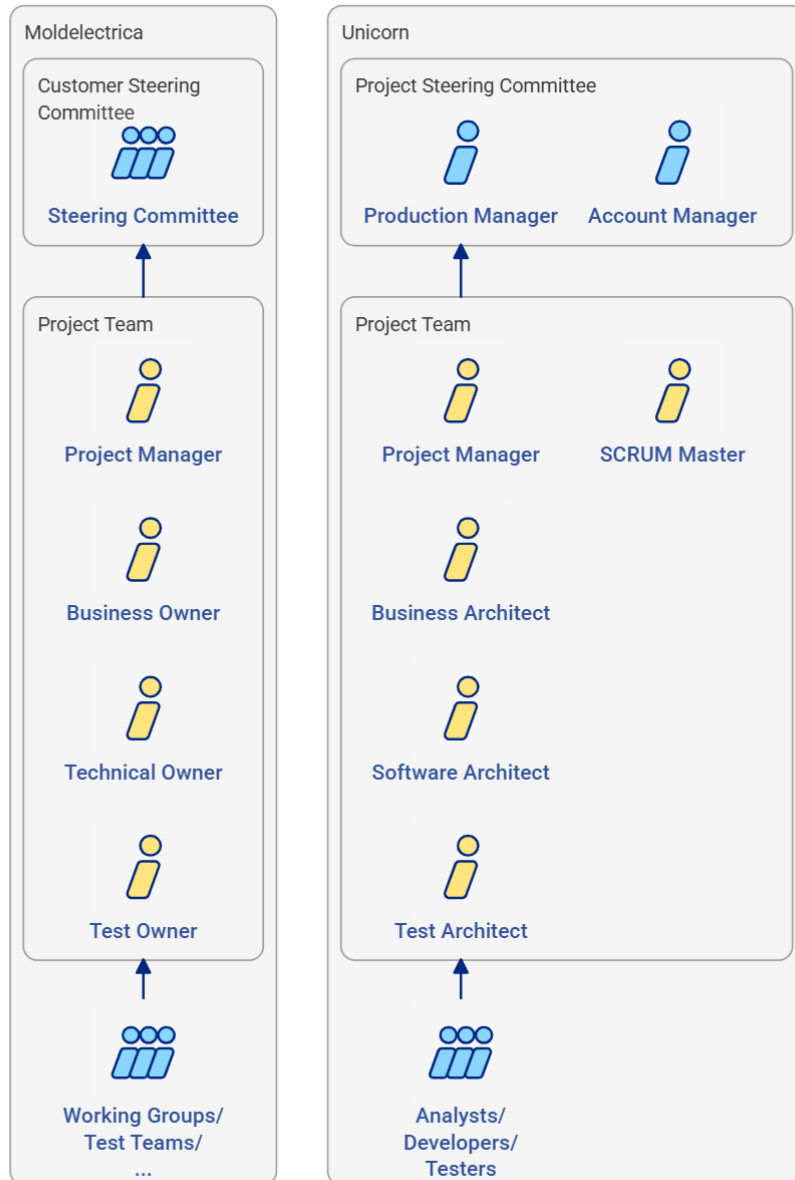


Figure 93 - Communication Scheme

### 9.1.1 Customer's Project Team

We assume that Moldelectrica will provide Project Team responsible for:

- work with the information provided by 3<sup>rd</sup> parties (regulators, legislation, IT suppliers, market agents)
- tracks the project progress and risk mitigations,
- makes operative decisions,
- prepares reports and decision proposals for the Steering Committee,
- approves minor change requests in the project.

The Customer's Project Teams meets with Vendor's Integration Team physically or via video conference on weekly basis and in appropriate extent.

The following table describes proposed roles and their responsibilities.

Role	Responsibility
Project Manager	<p>Coordinates all the project activities. The Project Manager role plans, manages and allocates resources, shapes priorities, coordinates interactions with customers and users, and keeps the project team focused. The Project Manager also establishes a set of practices that ensure the integrity and quality of project documents.</p> <p>The Project Manager role is responsible for managing activities and team leading on the project, acting as a single point of contact for the Customer.</p>
Business Owner	<p>Responsible for functional requirements/change requests and for review of business deliverables.</p> <p>The Business Owner role is nominated by the Customer and leads the Customer's functional team and is responsible for the product backlog. The product owner also has the responsibility for the functional architecture. The product owner will be spending most time and effort during the requirements analysis and solution description until the user stories are being handed over to the construction phase.</p>
Technical Owner	Responsible for technical requirements/change requests and for review of technical deliverables.
Test Owner	Responsible for testing requirements and for review of testing deliverables.

### 9.1.2 Vendor's Integration Team

IT Delivery of all project deliverables in agreed scope, quality, time-schedule and budget,

- requirement analysis and solution design,
- development,
- execution of FAT,
- support during SAT.

The following table describes proposed roles and their responsibilities.

Role	Responsibility
Project Manager	Project Manager is coordinating all the project activities and interactions between the teams. Must oversee all standard project aspects within time, quality and quantity, especially planning, managing and allocating resources, shaping priorities, coordinating interactions with customers and users, and keeping the project team focused. Project Manager is responsible for reporting and continuously evaluates the progress.
SCRUM Master	A scrum master is the facilitator for an agile development team. He is responsible for helping the team to reach consensus for what can be achieved during a specific period of time, helping the team to reach consensus during the daily scrum, helping the team to stay focused and follow the agreed-upon rules for daily scrums, removing obstacles that are impeding the team's progress and protecting the team from outside distractions.
Business Architect	Business Architect role is responsible for functional solution design and verifying the design with the customer on regular basis. Business architect cooperates closely with the Software Architect to verify that all solution architecture will fulfil functional requirements.
Software Architect	Software Architect role responsible for design of solution architecture. Apart from that, he will initiate setup of development process on the platform and leads and evaluates technical prototyping.

Test Architect	Test Architect is responsible for testing strategy. The role helps to prepare, run and evaluate performance tests and stress tests. The aim is to have all tools and procedures prepared before the start of development.
Security Officer	The Security Officer role is responsible for independent project governance from security perspective (project compliance with security process and standards). The security officer is not a member of team and reports to Unicorn Chief Security Officer.

### 9.1.3 Vendor’s Delivery Team(s)

Integration Team assigns development and testing activities to individual Delivery Team(s). It is responsible for finding relevant people with appropriate capacity and knowledge.

The following table describes proposed roles and their responsibilities.

Role	Responsibility
Delivery Team(s)	Team(s) of developer or testers fulfilling tasks assigned from the Integration Team.

### 9.1.4 Maintenance and Support Organization Team

There will be a dedicated team established for SIME maintenance and support. In order to maximize synergies, support will be supervised by the same organization structure that is responsible for maintenance of Transelectrica MMS DUROM.

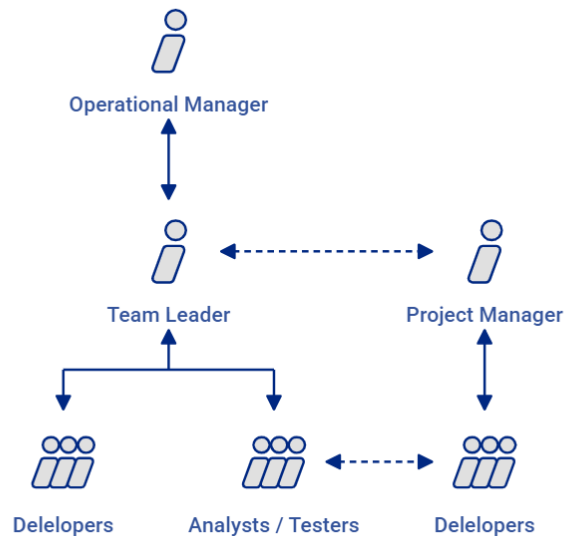


Figure 94 - Maintenance and Support Organization Structure

## 9.2 Unicorn’s Experts

Qualified personnel is listed in Qualified Personnel.pdf file.

## **10.Damas terms and conditions**

Damas terms and conditions are listed in Terms and Conditions Damas.pdf

## 11. Working Assumptions

ID	Area	Working Assumption
WA1	Delivery	Regular remote weekly meetings for requirements clarification, design validation and project coordination are assumed.
WA2	Delivery	Unicorn experts will primarily work remotely from Unicorn offices. On-site activities will be limited and agreed in advance.
WA3	Delivery	Communication will be organized primarily between Unicorn and the Customer. The Customer is responsible for coordination with external stakeholders.
WA4	Delivery	The solution will be delivered based on the standard Damas MMS platform as-is. No redesign of standard system processes is assumed.
WA5	Delivery	Configuration activities are limited to parameterization of standard Damas MMS functionality based on Moldelectrica market rules.
WA6	Delivery	Development activities are limited to agreed gaps identified during the project and confirmed by both parties.
WA7	Planning	The project assumes early deployment of the standard Damas MMS solution, made available to the Customer for testing and familiarization within an agreed period.
WA8	Planning	Parallel execution of system usage, testing and development of missing functionalities is assumed.
WA9	Planning	Availability of external platforms and third-party systems is assumed for integration and testing activities.
WA10	Testing	Planning, coordination and participation of stakeholders (including market participants) during FAT, SAT and UAT are the responsibility of the Customer.
WA11	Testing	Integration testing depends on availability and readiness of external systems and third-party stakeholders.
WA12	Maintenance&Support	Regular maintenance and support status meetings will be organized remotely. Periodic reporting (e.g. monthly) will be provided.
WA13	Maintenance&Support	SLA parameters apply primarily to the production environment. Testing environments are supported on a best-effort basis.
WA14	Maintenance&Support	Maintenance and support services are provided remotely unless otherwise agreed.
WA15	Hosting	The Customer is responsible for providing and maintaining the hosting environment, including data centre facilities, server rooms, power supply, cooling, physical security, network connectivity and access to communication networks.
WA16	Hosting	The Customer is responsible for ensuring connectivity to external systems, including TSOs and market platforms.
WA17	Hosting	Planned outages or failures of infrastructure not caused by Unicorn are excluded from system availability evaluation.
WA18	Hosting	Availability requirements apply only to the production environment unless otherwise agreed.
WA19	Operation	The Customer is responsible for infrastructure operation, while Unicorn is responsible for application-level operation and support.
WA20	Operation	Monitoring of business-critical processes will be performed using agreed monitoring tools and indicators.

WA21	Solution	<p>The system supports standard communication.</p> <p>For all communication channels and message formats existing at the time of project initiation, the solution will reuse such interfaces and formats where feasible.</p> <p>For new communication channels and message formats developed during the project, the Contractor will define the interface specifications, formats and implementation approach, in alignment with applicable standards and in coordination with the Customer.</p>
WA22	Solution	All data exchanges are based on predefined formats and specifications provided by the Customer or third parties.
WA23	Solution	System language will be English and Romanian. Russian localization will be provided by the Customer.
WA24	Solution	Functional and technical documentation will be delivered in English.
WA25	Solution	Data will be stored in UTC with a configured time zone for display.
WA26	Go-live	Data migration from legacy systems is not included.
WA27	Delivery	Limited on-site presence is assumed, with most activities performed remotely.
WA28	General	Any deliverables, functionalities or services not explicitly defined in the proposal are considered out of scope and subject to change request procedure.

## 12. Continuous Services

Continuous services (Application operation and Maintenance and Support) are provided by Unicorn for whole delivery of Damas MMS.

We provide Continuous service according to ITIL standard, and we also have experience with securing more critical systems and stricter SLAs at a high level of quality, what we can prove with our references from LIBRA, MARI RCCs projects.

### 12.1 Maintenance and Support

Unicorn System provides Maintenance and Support services for critical systems where high availability requirements need to be met. The Maintenance and support services are provided 24 x 7 and 365 days in a year.

Unicorn's Maintenance and Support Team manages cases where there is no immediate solution and implementation effort is required. The team analyses, designs, tests, and implements solutions so that they can become standardized. The goal is to completely resolve incidents and issues as quickly as possible and to fulfil the Service Level Agreement (SLA).

The guaranteed availability of the system, infrastructure and interfaces shall be at the highest level 99.95%. All the planned outages of MMS platform will be in advance discussed and confirmed with project representatives.

As part of our maintenance & support Unicorn provides the following portfolio of services as part of regular maintenance fee:

- 24/7 Helpdesk for reporting incidents
- 5x8 Base service times
- Project Management
- Incident Management
- Bug-fixing and release Management
- User support
- Quarterly Releases

Apart from that, the following services can be provided if required (under agreed conditions):

- Change Management
- Configuration Management
- Consultations

Our incident and problem management process is compatible with the ITIL requirements.

All the reported tickets will be available centrally in JIRA. There will be predefined dashboards enabling fast overview of status of reported tickets over defined period and there will be possibility to export data easily. Maintenance and support report will be prepared in predefined structure on monthly basis.

The estimation of the Maintenance and support is prepared with the assumption that effort is decreasing over the years as system is getting more stable with each year in production.

### 12.1.1 SLA parameters

The Customer shall report Errors without undue delay. Errors shall be reported according to a procedure defined by the Supplier.

Errors shall be reported according to the following categories:

Level	Category	Description
A	A-Errors	A-Errors are errors that results in the stoppage of the Software in an important functional area or for a critical group of users, and that not can be worked around in a reasonable way.
B	B-Errors	B-Errors are errors that will delay the use of the Software but can be worked around in a reasonable way in a short period. All stops in the use of the Software is categorized as B-errors, if this is not categorized as an A-error.
C	C-Errors	C-Errors are errors not qualified as A- or B-errors.

Activity/Parameter	Maintenance
Monthly availability	99%
Heldesk (phone, e-mail, on-line)	For incident reporting 24/7
Base service hours	5x8 (08:00 – 16:00 UTC+2)
Corrective warranty maintenance	Yes, one year
Status meeting	Weekly, remote meeting
Regular report	Monthly
Issue tracking software	JIRA

Incident Priority	Response Time	Resolution Time
Critical (A-Error)	2 working hours	8 working hours
Serious (B-Error)	4 working hours	20 working hours for solution without program code change, 1 week otherwise

Less Serious (C-Error)	8 working hours	30 days
------------------------	-----------------	---------

Violation of SLAs caused by part of the solution, which is not under Unicorns' responsibility, is excluded from the SLA calculation (e.g. HW failure, etc.).

## 12.2 Helpdesk

One of the elementary requirements of users is to have qualified advice and help available when solving problems which can arise while using MMS platform.

The method of reporting problems to Unicorn and submitting requirements is always standardized. Regardless of a used communication channel (ticketing system, email, phone), we register every request, and we maintain a log concerning the course of the solution. Users are indeed able to submit requests via ticketing tool as well. It gives them guaranteed various and continuous access to the service support in agreed response and service times.

The available communication channels for helping users are:

1. Phone - dedicated phone number for First line support (Helpdesk service - 24 x 7, 365 days in a year), 2)
2. E-mail - dedicated mail address to Unicorn Systems First line support,
3. JIRA, issue tracking tools - will be used as fault logging system (available 24 x 7 and 365 days in a year)

Unicorn team is based on a team of specialists with the knowledge and background necessary for the identification, analysis, and solution of any problems. Besides non-standard tasks, it also deals with small changes and adjustments which do not have an impact on the basic solution architecture. It also creates relevant statistics based on the Customer's requirements.

## 12.3 Project Management

Unicorn will allocate a dedicated Maintenance and Support manager on the project who will be the nominated contact person for the customer and escalation point. The Maintenance and Support Manager will also be responsible for presenting on weekly status assessment and preparation and provision of the monthly report.

Included cooperation:

- Maintenance and Support Weekly status assessment call (1-hour weekly call)
- Monthly Maintenance Report (defined in Non-functional requirements)
- Availability for ad-hoc calls

## 12.4 Incident Management

Incident Management means the coordinated activities to restore normal operations of the Moldelectrica MMS as quickly as possible with the least possible impact on the users. In scope of maintenance and support services, Unicorn will handle incidents and resolve errors according to agreed service levels.

In connection with the notification of Incident, the users shall provide

- summary of the Incident,
- description of the expected behaviour and obtained results,
- the data of the instance that produces the issue,
- log files,
- export files generated by the software.

Unicorn will confirm the receipt of a notification of Incident within the Service time as per agreed service levels. Unicorn will do initial triage and set the priority (if not already done by user) however, user has the possibility to reclassify it accordingly. An error classification may change during the time of correction depending on circumstances attributable to Customer business.

When applicable, a workaround will be sent to the user as a temporary solution to fix the issue following the bug-fixing procedure.

In case that incident will not be caused by the application and will be closed as not valid all the analytical effort will be charged as extra hours (time and material basis).

## **12.5 Bug-fixing and Release Management**

Error correction means the correction of Errors in the Moldelectrica MMS that arise during its use or cause an Incident. Reported Error shall contain at a minimum: the summary of error, a description of the expected behaviour and obtained results, any information that assists reproducing the error, for example, identification of input data, time, user accounts or other circumstantial factors.

Error correction activities related to incidents/errors attributable to hosting or operation is out of warranty support scope and will be charged as Time and Material Services (TMS).

## **12.6 User Support**

User Support request is a formal request submitted by a user for some type of standard service (predefined procedure) or additional information. Support request means a request from a user for common and known support, information, consultancy or additional documentation. All user support activities are provided and applicable only during standard business hours. Only designated employees of the Customer (users) are able to request the User Support.

Listed user support request related to Moldelectrica MMS are part of warranty support services:

- an assistance with user problems related to the function of the Moldelectrica MMS of technical nature,
- user management in the ticketing system – small tens of users at a maximum,
- functions that cannot be performed in the Moldelectrica MMS without assistance

Any other user support requests shall be paid on Time and Material basis. This can be for example

- consultancy for development/integration
- request to perform functions which are not in the Moldelectrica MMS,
- analysis of specific datasets (e.g., production data) or outputs of the optimization module unless a defect is identified,
- HW operation consultancy, etc.

## 13. List of Delivered Functional Use Cases

This chapter defines the scope of functionality delivered within the proposed Market Management System (MMS) based on the standard Damas MMS platform. The solution is provided primarily as-is, leveraging proven functionality already implemented in European TSO environments. The table below presents the list of delivered functional use cases covered by the standard system, together with identification of any limited additional developments required to address specific Moldelectrica requirements. This approach ensures clarity of scope, transparency of delivered capabilities and controlled implementation of any deviations from the standard solution.

### 13.1 List of Standard Functional use Cases

Recalculate Balancing Data
Create Auction List XML Message
Recalculate Imbalance Settlement Inputs
Input File Reception via Enelane
Incoming ACK Reception
CBT File Reception
Pre-process Foreign Allocation Results File
Pre-process Auction Specification File
Pre-process Auction Bid file in Enelane
Pre-process incoming ATC
Pre-process FB Implicit Allocation Results File
Pre-process NTC file in Enelane
Pre-process Foreign OC from TSO
Pre-process Global Final Confirmation File (from Amprion)
Pre-process Global Final Confirmation (from OPCOM)
Pre-process Verification Result
Pre-process Transmission Rights file in EGW
Pre-process Foreign Capacity Transfer File
Pre-process Foreign Capacity Resales File
Pre-process Compensations for Curtailment File
CBT Settlement File Reception
Pre-process Domestic SOMA / Metering Data File
Pre-process SOMA File
Pre-process SOAM File
Cross-border Scheduling File Reception
Pre-processs Cross-border Schedule File
Pre-process CAS File in EGW
Pre-process CAS CNF File in EGW
Pre-processs SAX CNF File
Pre-process XBR File
Pre-process SXS File
Pre-process SHC File
Pre-process Foreign UIOSI Compensation File
Domestic Scheduling File Reception

Pre-process Availability Declaration File
Pre-process Domestic Schedule File
Pre-process Generation Schedule File
Ancillary Services File Reception
Pre-Process AnS Demand File
Pre-Process AnS Bid File
Pre-process AnS Contract File
Balancing Settlement File Reception
Pre-process DAMP from Amprion File
Pre-process DAMP from OPCOM File
Pre-process DSR File
Pre-process DSPR File
Pre-process MSR File
Pre-process Metering Data File
Pre-process Imbalance Settlement Inputs from LFC Monitor File
Pre-process Realized aFRR File
Pre-process Consumption Forecast File
BRP Settlement File Reception
Pre-process aFRR CB Flows File
Pre-process IGCC Prices File
Pre-process BRP Metering Data File
Other
Output File Submission via Enelane
CBT File Submission
Send NTC Reduction Notification Message
Send Trade Report to JAO
Send Capacity Transfer Message
Produce XBID Result report
Produce DAM Result report
Produce IDA Result Report
Send Auction Specification Message
Send Allocation Results File
Send Allocation Results to Traders
Send Auction Results to ETP [art. 12.1(a)]
Send Offered Capacity to ETP [art. 11.1(a)]
Send ATC to Common Platform [art. 11.1(a)]
Send Auction Configuration to ETP
Send Transmission Rights to TSO
Produce Transmission Rights for BRP Report
Send OC to TSO
Send Auction Revenue (Congestion Income) Message to ETP [art. 12.1(a)]
Send Forecasted Transfer Capacity (NTC) Message to ETP [art. 11.1(a)]
Send Implicit Allocation (Net Position) Message to ETP [art. 12.1(e)]

Send Implicit Allocation (Congestion Income) Message to ETP [art. 12.1(e)]
Send Total Capacity Already Allocated Message to ETP [art. 12.1(c)]
Produce DAM Congestion Revenue Report
Send DAM Congestion Revenue Report
Produce DAM Shipper to JAO Report
Send DAM Shipper to JAO Report
Produce DAM Shipper to Shipper Report
Send DAM Shipper to Shipper Report
Produce IDA Shipper to Shipper Report
Send IDA Shipper to Shipper Report
Produce IDA Shipper to JAO Report
Send IDA Shipper to JAO Report
CBT Settlement File Submission
Send Home SOMA to TSO
Send Home SOAM to TSO
Send SOVA to CC
Send Metering Data to OMEPA
Send SOAM ACK
Produce Cross-border Metering Data XML Download Data File
Produce Cross-border SOMA XML Download Data File
Cross-border Scheduling File Submission
Send DAMFT to SCADA
Send Nomination Report Message for REMIT to OPCOM
Send Total Allocation Message for REMIT to OPCOM
Send Total Nominated Capacity Message to ETP [art. 12.1(b)]
Send Total Scheduled Commercial Exchanges Message to ETP [art. 12.1(f)]
Send CAS to TSO
Send CAS to JAO
Send CAS CNF to TSO
Send SAX to VP
Send Cross-border Balance to SCADA
Send UIOSI Compensation to TSO
Domestic Scheduling File Submission
Send Total Generation Schedules Message to ETP [art. 14(c)]
Send Generation Forecasts to ETP [art. 14(d)]
Ancillary Services File Submission
Send ANS Tender Results [art. 17(b)&(c)]
Send Tender Bids Message to ETP [GL EB art. 12.3.f]
Balancing Market File Submission
Send Prices of Activated Balancing Energy to ETP [art. 17(f)]
Send Aggregated Energy Balancing Bids to ETP [GL EB art. 12.3.e]
Send Balancing Energy Bids Message to ETP [GL EB art. 12.3.b,c,d]
Balancing Settlement File Submission

Send Day-ahead total load forecast to ETP [art. 6(b)]
Send DAMP to ETP [art. 12.1(d)]
Send LMOL Common Message to SCADA
Send DAMP to Amprion
Send Settlement Report CNF Message to Amprion
Produce Auction Settlement Report
Produce Frequency Bias Factors Report
Produce Unintended Deviations Report
Produce Ramping Energies Report
Produce Internal Exchanges of BRP Report
Produce External Exchanges of BRP Report
Produce External Exchanges of TSO Report
Produce BM Offers Report
Produce Contracted Volumes Report
Produce Realized Volumes Report
Produce Imbalance Netting Report
Produce Monthly Regulatory Notes
Send Estimated System Imbalance Volume to ETP [art. 17(h)]
Send Estimated System Imbalance Price to ETP [art. 17(g)]
BRP Settlement File Submission
Send Final Imbalance Prices to ETP
Send Final Imbalance Volumes to ETP
Send Financial Expenses and Income for Balancing to ETP
Internal Reports
Produce MSN - BRP Final Imbalance XLS/PDF
Produce MSN - BRP Final Imbalance XML
Produce MRN - BRP Final Imbalance XLS/PDF
Produce MRN - BRP Final Imbalance XML
Produce MSN - BRP Distribution XLS/PDF
Produce MSN - BRP Distribution XML
Produce MRN - BRP Distribution XLS/PDF
Produce MRN - BRP Distribution XML
Produce MSN - Temporary BRP Cost XLS/PDF
Produce MSN - Temporary BRP Cost XML
Produce MRN - Temporary BRP Cost XLS/PDF
Produce MRN - Temporary BRP Cost XML
Produce MSN - Activated Balancing Energy Total XLS/PDF
Produce MSN - Activated Balancing Energy Total XML
Produce MSN - Activated Balancing Energy Down XLS/PDF
Produce MSN - Activated Balancing Energy Down XML
Produce MSN - Activated Balancing Energy Up XLS/PDF
Produce MSN - Activated Balancing Energy Up XML
Produce ANRE - MSN BRP Final Imbalance XLS

Produce ANRE - MSN BRP Final Imbalance XML
Produce ANRE - MRN BRP Final Imbalance XLS
Produce ANRE - MRN BRP Final Imbalance XML
Produce ANRE - MRN BRP Distribution XLS
Produce ANRE - MRN BRP Distribution XML
Produce ANRE - MSN BSP Monthly Settlement XLS
Produce ANRE - MSN BSP Monthly Settlement XML
Public Reports
Produce Final Imbalance Volumes XML Public Report
Produce Final Imbalance Prices XML Public Report
Other
Send Home ACK CIM File
Send Home ACK ECAN File
Produce Accepted Balancing Energy Per Resource XML for Download File
Produce Market Participant Master Data Report
Produce AnS Results XML Download Data File
Produce Availability Declarations XML Download Data File
Produce Balancing Bids per Resource XML Download
Produce Capacity Transfer XML Data File
Produce Capacity Resale XML Download Data File
Produce Domestic Schedules XML Download Data File
Produce Generation Schedules XML Download Data File
Produce Cross-Border Schedules XML Download Data File
Produce LMOL XML Download
Produce Balancing Energy Demand XML Download Data File
Produce BM Energy Selected XML Download Data File
Produce Total Allocation Results XML for Download
Produce Marginal Prices XML Download Data File
Produce TSO-TSO Energy Exchange XML Download Data File
Produce Dispatch Orders XML Download Data File
Produce Imbalance Netting XML Download Data File
Produce Net Positions XML Download Data File
CBT
Public screens
Capacity Limits - public
Auction Statistics - public
Manage Capacity Limits
Visual Use Cases
Capacity Limits
Update Capacity Limits
Non-visual Use Cases
Create NTC Reduction Notification Message
Calculate ATC

Transform NTC Intermediate to Common Message
Store NTC
Store NTC for timescale
Manage Auction Configuration
Visual Use Cases
Auction Product List
Create Auction Product
Auction Product Detail
Update Auction Product
Non-visual Use Cases
Create Auction Product (NVUC)
Update Auction Product (NVUC)
Manage Allocation Configuration
Visual Use Cases
Allocation Configuration
Non-Visual Use Cases
Store Allocation Configuration
Decide Allocation Type
Fallback Day-ahead Explicit Auction
Manage Auctions
Visual Use Cases
Auction List
Create Auction
Auction Detail
Update Auction
Auction Statistics
Non-Visual Use Cases
Store Auction
Store Foreign Auction
Update Long-term Auction
Cancel Auction
Set Auction State
Evaluate Auction
Calculate Auction Statistics
Auction Data Distribution
Create Allocation Results Message
Create Auction Specification Message
Create Auction Configuration Message for ETP to EGW
Create Offered Capacity Common Message for ETP to EGW
Create Auction Results Message for ETP to EGW
Create Allocation Results Message for Traders to EGW
Create Auction Revenue (Congestion Income) Message for ETP
Create Forecasted Transfer Capacity (NTC) Message for ETP

Create Implicit Allocation (Net Position) Message for ETP
Create Implicit Allocation (Congestion Income) Message for ETP
Create Total Capacity Already Allocated Message for ETP
Manage Auction Bids
Visual Use Cases
Create Auction Bid
Update Auction Bid
Non-visual Use Cases
Transform Auction Bid Intermediate Message to Common Auction Bid Message
Store Auction Bids
Manage Allocation Results
Visual Use Cases
Allocated Capacity Overview
Non-visual Use Cases
Store Allocation Results
Convert Auction Results to Allocations
Store Capacity Resales
Capacity Transfers Module
Visual Use Cases
Capacity Transfer List
Create Capacity Transfer
Capacity Transfer Detail
Update Capacity Transfer
Non-visual Use Cases
Store Capacity Transfer
Create Outgoing Capacity Transfer Message
Set Capacity Transfer State
Store Foreign Capacity Transfer
Automatically Cancel Unconfirmed Capacity Transfers
Create UIOSI Compensation Message
Store Foreign UIOSI Compensation
Transmission Rights Module
Visual Use Cases
Transmission Rights List
Transmission Rights Detail
Non-Visual Use Cases
Convert Allocations to Transmission Rights
Transform Transmission Rights Intermediate Message to Common Message
Store Transmission Rights
Create TSO Transmission Rights Message for EGW
Create Transmission Rights for BRP Message
Capacity Curtailment Module

Visual Use Cases
Capacity Curtailment
Non-Visual Use Cases
Cancel Curtailment
Evaluate Curtailment
Perform Curtailment
Store Compensations for Curtailment
Manage Implicit Auctions
Visual Use Cases
OC Update
Implicit Allocation List
Implicit Allocation Detail
Cross-border Implicit Exchanges
Non-Visual Use Cases
Create DAM Result Message
Create IDA Result Message
Create Trade Report Message
Store Incoming ATC
Create ATC to Common Platform Message
Create Home OC to TSO Message
Transform OC Intermediate Message to Common Message
Store OC
Match OC
Store Implicit Auction Results
Process Verification Result
Process Global Final Confirmation
Tariff Management
Visual Use-cases
Tariff List
Tariff Detail
Tariff Create
Tariff Update
Non-visual use-cases
Store Tariff Settings
Cross-border Scheduling
Public screens
Scheduled Exchanges
Scheduled Exchanges Aggregated
Outgoing dataflows
Create Total Allocation Message for REMIT
Create Nomination Report Message for REMIT
Create Total Nominated Capacity Message for ETP
Create Total Scheduled Commercial Exchanges Message for ETP

Cross-border Scheduling
Visual Use Cases
Cross-border Schedule Overview
Cross-border Schedule Create
Cross-border Schedule Update
Cross-border Balance
Non-Visual Use Cases
Create DAMFT Message
Plan Cross-Border Scheduling Process
Transform Cross-border Schedule Intermediate to Common Message
Store Cross-border Schedule
Generate Implicit Schedules
Perform Cross-border Schedules Curtailment
Create Cross-border Balance Message for SCADA
Nominations Curtailment
CAS Matching
Visual Use Cases
CAS Matching Detail
CAS Control Panel
Non-Visual Use Cases
Generate Home CAS
Store Foreign CAS
Store Foreign CAS CNF
Create CAS Message for JAO
Create CAS Message for TSO to EGW
Create CAS CNF Message for TSO to EGW
Match CAS
Apply Nomination Reduction
Apply Lower Values
Single Side Matching
SAX Matching
Visual Use Cases
SAX Matching Overview
SAX Matching Detail
Non-Visual Use Cases
Generate SAX
Create SAX Message to VP for EGW
Store SAX CNF
Match SAX
XBID
Visual Use Cases
Non-Visual Use Cases
Store XBR

Store SXS Results
Store SHC Results
Create XBID Result Message
Domestic Scheduling
Public screens
NonDU Energy Delivery & Total Generation Notified
Availability Declaration Scheduling
Visual Use Cases
Availability Declarations Overview
Create Availability Declaration Schedule
Update Availability Declaration Schedule
Non-Visual Use Cases
Transform Availability Declaration Intermediate to Common Message
Store Availability Declaration Schedule
Generate AD Schedule at Gate Closure
Generation Scheduling
Visual Use Cases
Generation Schedule Overview
Create Generation Schedule
Update Generation Schedule
Non-Visual Use Cases
Transform Generation Schedule Intermediate Message to Common Message
Store Generation Schedule
Create Total Generation Schedules Message for ETP
Create Generation Forecasts Message for ETP to EGW
Domestic Scheduling
Visual Use Cases
Domestic Intraday Interval Overview
Domestic Schedules Overview
Create Domestic Schedule
Domestic Schedule Matching Detail
Update Domestic Schedule
Schedules Overview in EET
Non-Visual Use Cases
Transform Domestic Schedule Intermediate to Common Message
Store Domestic Schedule
Match Domestic Schedules
Apply Minimum Value
Apply Last Matched Values
Ancillary Services
Public screens
ANS Tender Statistics - public
Tender

Visual Use Cases
Tender List
Tender Create
Update Tender Parameters
Update Tender Demands
Tender Detail
Tender Statistics
Non-Visual Use Cases
Store Tender
Transform Demand Intermediate to Common Message
Store Tender Demand
Set Tender State
Create ANS Tender Results Message
Tender Bid
Visual Use Cases
Tender Bid Overview
Tender Bid Create
Tender Bid Update
Non-Visual Use Cases
Transform Tender Bid Intermediate to Common Message
Store Tender Bid
Create Tender Bids Message for ETP
Tender Evaluation
Visual Use Cases
Tender Evaluation Version Create
Tender Evaluation Version Detail
Non-Visual Use Cases
Evaluate Tender
Set Final (Tender Evaluation Version)
ANS Contract
Visual Use Cases
AnS Contract Administration
ANS Contract Create
ANS Contract Update
ANS Contract Detail
Non-Visual Use Cases
Transform ANS Contract Intermediate to Common Message
Store ANS Contract
Generate ANS Contracts
Cancel ANS Contract
Confirm/Reject ANS Transfer
Automatically Cancel Unconfirmed ANS Transfers after Deadline
CBT Settlement

CB Accounting
Visual Use Cases
Accounting Data Overview
Non-Visual Use Cases
Store Domestic SOMA / Metering Data
Generate Home SOMA
Create Home SOMA Message
Store Foreign SOMA
Match SOMA
Generate Home SOAM
Create Home SOAM Message
Create Home SOAM ACK Message
Store Foreign SOAM
Match SOAM
Create SOVA Message
Generate Metering Data for OMEPA
Balancing Market
Public screens
Common Platform Data Exchange
Incoming data
Store Accepted Bids and Needs
Store Balancing ATC
Store Clearing Prices
Store Net Positions
Store XB flows
Store Problem Statement
Outcoming data
Create Balancing ATC Message
Create Balancing Bids message
Create Balancing Demand Message
CZCL
Visual Use Cases
Show ATC Detail
Update ATC
Non-Visual Use Cases
Calculate ATC for Balancing
Store Balancing ATC
Bids
Visual Use Cases
Trading Period Detail
Copy Balancing Bid
Balancing Bid List
Trading Period List

Internal Dashboard
External Dashboard
Create / Update Balancing Bid
Balancing Bid Detail
Balancing Bid Linking Detail
Non-Visual Use Cases
Activate Balancing Bids for Congestion Management
Evaluate Bids Linking
Store Balancing Bid(s)
Create Prices of Activated Balancing Energy Message for ETP
Create Aggregated Balancing Energy Bids for ETP
Create Balancing Energy Bids Message for ETP
Demand
Visual Use Cases
Balancing Demand Detail
Demand Overview
Insert/Edit Demand (via Internal Dashboard)
Merit Orders
Visual Use Cases
Merit Order List
Merit Order Detail
Create Merit Order
Compensation Price Overview
Create Compensation Price
Update Compensation Price
Non-Visual Use Cases
Cancel Merit Order after Deadline
Create LMOL Common Message to SCADA
Generate LMOL
Generate VLMOL
Generate EHMOL
Generate Financial MO
Store Financial MO
Decide Merit Order Variant
Reject Merit Order
Set Balancing Lock
Store Compensation Price
Dispatch Orders
Visual Use Cases
Create Dispatch Order (DEPRECATED)
Update Dispatch Order (DEPRECATED)
Dispatch Order / Transaction Confirmation
Dispatch Order Detail

Non-Visual Use Cases
Generate Dispatch Orders from the Platform results
Update Dispatch Orders by Cross-border Marginal Prices
Store Dispatch Order (DEPRECATED)
Generate Dispatch Orders
Cancel Dispatch Order
Balancing Product Configuration
Visual Use Cases
Balancing Energy Product Configuration
Update Balancing Energy Product Configuration
Non-Visual Use Cases
Store Balancing Energy Product Configuration
Balancing Settlement
Public screens
Daily Consumption Overview
Estimated Power System Imbalance
Estimated Imbalance Prices
Marginal Prices Overview
Activated Balancing Energy Overview
Final Unintentional Deviations
Visual Use Cases
Settlement Reports Overview
FCR Coefficient Overview
FCR Coefficient Update
Monthly Settlement Notes
Consumption Forecast Overview
Consumption Forecast Update
Non-Visual Use Cases
Create Day-ahead total load forecast Message
Create DAMP Message for ETP
Transform Consumption Forecast Intermediate to Common Message
Store Consumption Forecast
Store Imbalance Settlement Inputs from LFC Monitor
Evaluate Estimated System Imbalance Volume
Evaluate Estimated System Imbalance Price
Evaluate Delivered FCR
Evaluate Net Delivered Balancing Energy
Store DAMP/IDAMP
Pull Exchange Rates from Romanian National Bank
Create DAMP Message for Amprion
Create Estimated System Imbalance Message for ETP
Store DU Metering Data
Store Settlement Report

Store Realized aFRR
Store FCR Coefficient
Evaluate Monthly Settlement Notes
Initiate Generation of Settlement Reports
Create Auction Settlement Message
Create BM Offers Message
Create Contracted Volumes Message
Create External Exchanges of BRP Message
Create External Exchanges of TSO Message
Create Frequency Bias Factors Message
Create Imbalance Netting Message
Create Internal Exchanges of BRP Message
Create Monthly Regulatory Notes Message
Create Ramping Energies Message
Create Realized Volumes Message
Create Settlement Report CNF Message for Amprion
Create Unintended Deviations Message
BRP Settlement
Public screens
Final System Imbalance - public
Final Imbalance Prices - public
Balance Checking - public
MRN Net Balancing Costs - public
MRN Costs and Revenues - public
BRP List - public
Visual Use Cases
BRP Settlement List
BRP Settlement Detail
BRP Settlement Create
BRP Settlement Reports Download
Non-Visual Use Cases
Store aFRR CB Flows
Store IGCC Prices
Store BRP Metering Data
Store BRP Settlement Evaluation Version
Set BRP Settlement Evaluation Version State
Load Balancing Data
Evaluate BRP Imbalance
Evaluate Real System Imbalance
Evaluate Net System Balancing Costs
Evaluate Initial BRP Obligations
Evaluate Final BRP Obligations
Evaluate Final Imbalance Price

Evaluate Additional Cost Distribution
Create Final Imbalance Prices Message for ETP
Create Final Imbalance Volumes Message for ETP
Create Financial Expenses and Income for Balancing Message for ETP
Internal Reports
Automatically Generate Preliminary Operator Reports
Initiate Generation of BRP Settlement Reports
Create MRN - Temporary BRP Cost XML Message
Create MSN - Temporary BRP Cost XML Message
Create MSN - BRP Final Imbalance XML
Create MRN - BRP Final Imbalance XML
Create MSN - BRP Distribution XML
Create MRN - BRP Distribution XML
Create MSN - Activated Balancing Energy XML
Create ANRE - MSN BRP Final Imbalance XML
Create ANRE - MRN BRP Final Imbalance XML
Create ANRE - MRN BRP Distribution XML
Create ANRE - MSN BSP Monthly Settlement XML
Public Reports
Create Final Imbalance Volumes XML Public Report
Create Final Imbalance Prices XML Public Report
Generate BRP Settlement Public Reports
Other
VUC
Manual file upload
Market Participant Master Data Download
Data File Downloads
Message to Participant
NVUC
Create Market Participant Master Data Message
Initiate Generation of Data File Downloads
Create Participant Message
XML
Create Accepted Balancing Energy Per Resource XML for Download Message
Create Availability Declarations XML Download Message
Create AnS Results XML Download Message
Create Balancing Bids Per Resource XML for Download Message
Create Balancing Energy Demand XML Download Message
Create BM Energy Selected XML Download Message
Create Capacity Transfer XML Message
Create Capacity Resale XML Message
Create Cross-border SOMA
Create Cross-Border Schedules XML Download Message

Create Dispatch Orders XML Download Message
Create Domestic Schedules XML Download Message
Create Imbalance Netting XML Download Message
Create Generation Schedules XML Download Message
Create LMOL XML for Download Message
Create Marginal Prices XML Download Message
Create Cross-border Metering Data XML Download Message
Create Net Positions XML Download Message
Create Total Allocation Results XML Message (CBT auction bids XML)
Create TSO-TSO Energy Exchange XML Download Message
XLS
Produce Accepted Balancing Energy Per Resource XLS for Download File
Produce AnS Results XLS Report
Produce Balancing Bids per Resource XLS Download
Produce Balancing Energy Demand XLS Report
Produce BM Energy Selected XLS Report
Produce Capacity Limits XLS Report
Produce Capacity Transfer XLS Report
Produce Imbalance Netting XLS Report
Produce Total Allocation Results XLS for Download
Produce TSO-TSO Energy Exchange XLS Report
Produce Marginal Prices XLS Report
Produce Net Positions XLS Report
User Management
Organizations
Participants
Participant Create
Participant Detail
Participant Update
Users
User List
User Create
User Detail
User Update

## 13.2 List of Custom Use cases to be Implemented for Moldelectrica

A. Emergency Operations
UC-EM-01 Trigger Emergency Market Mode
UC-EM-02 Process Emergency External Schedule
UC-EM-03 Apply Emergency PTR Reduction
UC-EM-04 Manually Override Confirmed Market Data

UC-EM-05 Record Emergency Actions for Settlement
B. Procurement of Grid Losses (GL)
UC-GL-01 Negotiation Procedure - Process Flow
UC-GL-02 Negotiation Procedure - Screen
UC-GL-02 Negotiation Procedure - Determine Final Tender Results Algorithm
C. Settlement (ST)
UC-ST-01 Grid Losses Settlement
UC-ST-02 Transnistrian Region Settlement
UC-ST-03 Settlement of Curtailment
UC-ST-04 Settlement of Electricity Transmission Service
UC-ST-05 Settlement of DAM IDM Market Coupling
D. Transnistria
UC-TN-01 Compensation schedule for Transnistrian region - Process flow
UC-TN-02 Compensation schedule for Transnistrian region - Algorithm
UC-TN-03 Compensation schedule for Transnistrian region - Screen
E. Data Flows
UC-DF-01 PX schedule (DAM / IDM)
UC-DF-02 External trade schedule (import/export)
UC-DF-03 Compensation schedule (Transnistrian region)
UC-DF-04 Emergency external schedule
UC-DF-05 PTR nomination
UC-DF-06 PTR reduction instruction
UC-DF-07 Offered capacity (NTC / ATC)
UC-DF-08 Allocation results
UC-DF-09 Already Allocated Capacity (AAC)
UC-DF-10 Metered consumption data
UC-DF-11 Metered generation data
UC-DF-12 Adjusted metering values (losses)
UC-DF-13 Settlement results

## 14. Comments and remarks

### INDICATIVE COMMENTS OF THE BIDDER ON THE DRAFT CONTRACT (NON-EXHAUSTIVE, SUBJECT TO FURTHER CLARIFICATION)

The Bidder respectfully submits the following indicative comments to the draft contract. These comments reflect standard market practice for IT system implementation projects and are provided to support effective project delivery, legal certainty, and balanced risk allocation. The Bidder remains available to further specify and discuss these points during the contract finalization stage.

#### 1. SCOPE OF SUPPLY (GCC 7)

It is proposed to clarify the scope of supply in order to ensure legal certainty and alignment with standard IT contracting practice.

In particular, the Supplier's obligations should be limited to:

- requirements explicitly set out in the Contract, Technical Requirements, and the agreed Project Plan.

Any additional requirements beyond this scope should be subject to a formal change process in accordance with Clause 39, including appropriate adjustments to price and timeline.

#### 2. ACCEPTANCE AND PAYMENTS (GCC 27, 12)

It is proposed to clarify the acceptance mechanism in order to ensure timely project execution, payment predictability, and alignment with standard IT project practices.

In particular:

- if the Purchaser does not provide a reasoned acceptance or rejection within a reasonable period (e.g. 10–15 business days), the relevant deliverable shall be deemed accepted;
- any rejection shall be duly justified and explicitly linked to non-compliance with agreed requirements.
- Payments should reflect the payment structure provided in the proposal, and already delivered milestones shall be paid as accepted (HW delivery, HW Installation, Damas MMS product installation).
- Payments are due 30 days after Invoice receipt

In addition, it is proposed to allow partial acceptance of deliverables and corresponding partial payments. The structure and amounts of such partial payments shall be subject to further agreement between the parties, taking into account the typical delivery flow of IT projects and the expected cost profile of the project.

#### 3. PROJECT PLAN (GCC 19)

It is proposed to clarify that the Project Plan shall be mutually agreed between the parties.

Any modifications requested by the Purchaser should be subject to the change management mechanism under Clause 39, including appropriate adjustments to the Contract Price and implementation timeline.

#### 4. INTELLECTUAL PROPERTY (GCC 15, 16)

It is proposed to clarify the intellectual property regime to reflect standard IT market practice.

In particular:

- all pre-existing know-how, tools, libraries, frameworks, and generic components of the Supplier ("Background IP") shall remain the property of the Supplier;
- the Purchaser shall be granted a non-exclusive, reasonably specific and limited license to use the delivered solution for its internal purposes.

#### 5. LIABILITY (GCC 33)

It is proposed to introduce an explicit limitation of liability in order to ensure proportional risk allocation.

In particular:

- the total aggregate liability of the Supplier should be capped at [80%] of the Contract Price;
- except in cases of wilful misconduct or fraud.

## 6. LOCAL PERMITS AND COOPERATION (GCC 9.4, 10)

It is proposed to clarify the allocation of responsibilities regarding permits and regulatory compliance.

In particular:

- the Supplier should be responsible for permits within its reasonable control;
- the Purchaser should provide necessary cooperation and assistance in obtaining permits and approvals related to the Project Site and local regulatory environment.

## 7. RELATIONSHIP WITH GENERAL TERMS AND SOFTWARE LICENSING CONDITIONS

The Bidder notes that the proposed solution includes standard software components and/or platform elements provided either by the Supplier or third parties.

The applicable general business terms and software licensing conditions for such components will be submitted as part of the Bid.

It is therefore proposed to include the following clarification:

“To the extent that the subject matter of the Contract includes standard software or platform solutions provided by the Supplier or third parties, the use of such software or platforms shall be governed by the applicable general business terms and licensing conditions of the Supplier and/or relevant third parties, which shall form an integral part of the Contract. In the event of any inconsistency between such terms and this Contract, the general business and licensing conditions shall prevail with respect to the relevant software or platform components.”

## 8. FINAL REMARK

These comments are indicative in nature and reflect standard market practice for IT implementation projects. The Bidder remains fully committed to cooperating in good faith to achieve a balanced and workable contractual framework.