MASTERPIECE -
Multidisciplinary Approaches and Software Technologies for Engagement, Recruitment and Participation in Innovative Energy Communities in Europe

Deliverable 4.2

REQUIREMENTS OF THE DIGITAL PLATFORM, CONCEPTUAL DESIGN AND DEFINITION OF THE TOOLS FOR FLEXIBILITY - UPDATE

Title	REQUIREMENTS OF THE DIGITAL PLATFORM, CONCEPTUAL DESIGN AND DEFINITION OF THE TOOLS FOR FLEXIBILITY - UPDATE
Document description	It describes the requirements of the digital platform and other preliminary conceptual designs. Within this deliverable, one could find the conceptual design of the different components that will be developed during the work of the WP. The document will be based on the findings of the necessities of the solution put together with the technical necessities to make sure that the technical barriers are overcome (update).
Nature	R (report)
Task	All tasks of WP4
Status	Final
WP	WP4
Lead Partner	UMU
Partners Involved	UMU, CERTH, R2M, RDIUP, AMU, ODINS
Date	18/12/2024

Revision history	Author	Delivery date	Summary of changes and comments
Version 1	UMU&ODINS	06/11/2024	ToC
Version 2	UMU&ODINS	08/11/2024	First tables contributions
Version 3	R2M &RDIUP&AMU&CERTH	05/12/2024	Table contributions
Version 4	UMU	09/12/2024	Final revision of tables. Rest of chapter contributions
Version 5	UMU	11/12/2024	Final contributions and editing
Version 6	CERTH & EXP	17/12/2024	Review
Version 7	UMU	18/12/2024	Final version. Ready to submit

Disclaimer:

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1 EXECUTIVE SUMMARY

Deliverable 4.2 builds upon the foundations established in Deliverable 4.1 "Requirements of the digital platform, conceptual design and definition of the tools for flexibility" and insights from Deliverable 4.3 "First implementation of the digital platform and tools" by presenting an updated conceptualisation and implementation of the components and tools of MASTERPIECE modular platform. It provides a comprehensive review of the progress made and focuses on the following key areas:

- An overview of the high-level update of the **digital platform architecture** with a focus in the tools and components.

- Enhancements to the **flexibility framework** within the context of the **Energy Community (EC) journey**, with specific focus to energy-related environment.

- **The internal component sheets** from Deliverable 4.1 have been **updated** and streamlined into a more concise structure, emphasising key aspects to enhance clarity and focus on critical information. Additionally, the **functional and non-functional requirements** defined in Deliverable 4.1 have been further **refined and completed** for each component to align with the updated structure.

- A concerted effort towards **interoperability**, reflected in the development of robust **data models** designed to enable seamless communication between the tools and the DLT secured based platform.

On this purpose, the document outlines how these updates strengthen the MASTERPIECE modular solution objectives and prepare it for deployment.

2 INTRODUCTION

This deliverable provides key outputs regarding the technical updates of the tools and components, and the security platform. The main objective is to show how the MASTERPIECE digital solution offers flexibility from a conceptual perspective related to energy communities to the technical level regarding internal component specifications and requirements.

Deliverable 4.2 is a key output of WP4 as it represents the first culminating deliverable regarding technical specifications developments which consists of a continuation of the work initiated in D4.1, and leverage from D4.3. While D4.1 outlined the initial requirements, conceptual design, and first list of components for addressing flexibility in the Energy Community environment, D4.2 provides a significant update of the components. This includes specifications refinements based on the updated tools outlined in D4.3 and presents the progress made in designing robust data models to enhance interoperability and communication across the platform.

The importance of this deliverable is to show the evolution from the technical aspect within the flexibility energy community ecosystem in the EC journey. Once submitted, last deliverable will be D4.4 and milestone **MS9 "Digital platforms and tools for energy communities - second version successfully released"** will be achieved.

2.1 Relation to other tasks and documents

This deliverable is intrinsically interconnected to tasks of WP4 and its deliverables as it is illustrated in Figure 1. WP4 is structured into two sets of deliverables: **D4.1 and D4.2**, and **D4.3 and D4.4**. **D4.1 and D4.2** focus on the **conceptual and technical design developments** which serves as **specs** for D4.3 and D4.4 which emphasise **deployment, functionalities offered, and evaluation** of the digital platform.

Deliverable 4.1 established the conceptual foundation for **Deliverable 4.3**, outlining the preliminary architecture, flexibility EC framework and preliminary components. **Deliverable 4.3** focused on the digital tools from the user functionality perspective describing the preliminary tools being developed and components forming the DLT based secure platform which inform the technical refinements and operational advancements detailed in **Deliverable 4.2**. This **Deliverable** in turn, will serve as the updated specs for **Deliverable 4.4**, to ensure that the updates in design, interoperability, and functionality are aligned with deployment and evaluation requirements.

This deliverable 4.2 incorporates insights from **WP3** regarding EC journey, as well as the constant coordination of WP3 tools to ensure the technical developments are aligned. On the other side, the work done in data models, embedding privacy and security mechanisms within the DLT-based platform are key to assure the best way to share and use data in a common and secure form. These and the interoperability efforts within D4.2 are essential for meeting **WP5** activities and objectives.
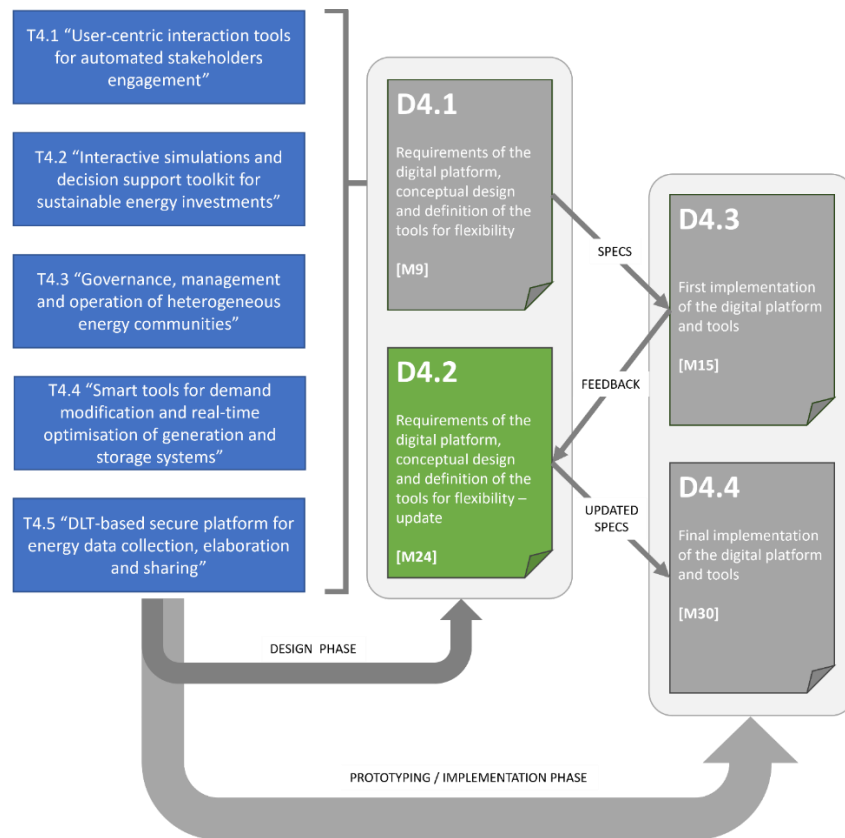
Figure 1 Interconnections within WP4

This iterative relationship ensures consistency and alignment between the conceptual design, technical development, and practical deployment of the MASTERPIECE tools, enabling their seamless evolution across deliverables. Therefore, the set of deliverables of WP4 will end with Deliverable 4.4, containing the last version of the digital modular platform and its tools.

2.2 Structure of the document

The document is organised in four main chapters without Chapter 1 composed by the Executive Summary and Chapter 2 with the introduction. Chapter 3 provides an updated view of the high-level architecture from the point of view of the tools and components, to understand their evolution from previous deliverables. Chapter 4 focuses on how MASTERPIECE digital solution offers flexibility within the EC journey and more specifically in the energy side. Chapter 5 is divided in two sections: *Internal Component Sheets update* and *Data models*. In Chapter 6, the functional and no-functional requirements are completed per each component. Chapter 7 corresponds to the conclusions, highlighting key points of the progress. Finally, Chapter 9 is the Annex.

3 TOOLS EVOLUTION IN THE HIGH-LEVEL ARCHITECTURE

The solution's digital evolution progressed from identifying isolated components to establishing cooperation between components and tools within the architecture. Therefore, there are two main points:

1. The high-level architecture presented in Figure 2 is focused on the smart services layer. The final complete architecture will be presented in Deliverable 2.8 together with the final findings of WP2. Deliverable 4.4 will present the final connection between tools.
2. The distinction (coming from Deliverable 4.3) between a tool and a component. A tool is visible and can be use by end-user, while a component forms part of a tool and can be used at the same time by another tool, or the main tool it is a component itself. Specifically, in the blue layer of Figure 2 there are ECOOP, COMPASS, MEET APP and MAPS DEM which are tools and component themselves. RECOMME, SIT and DR-FLEX are tools composed by several components. In the red layer it is located the DLT-based Secure Platform which is formed by four components.
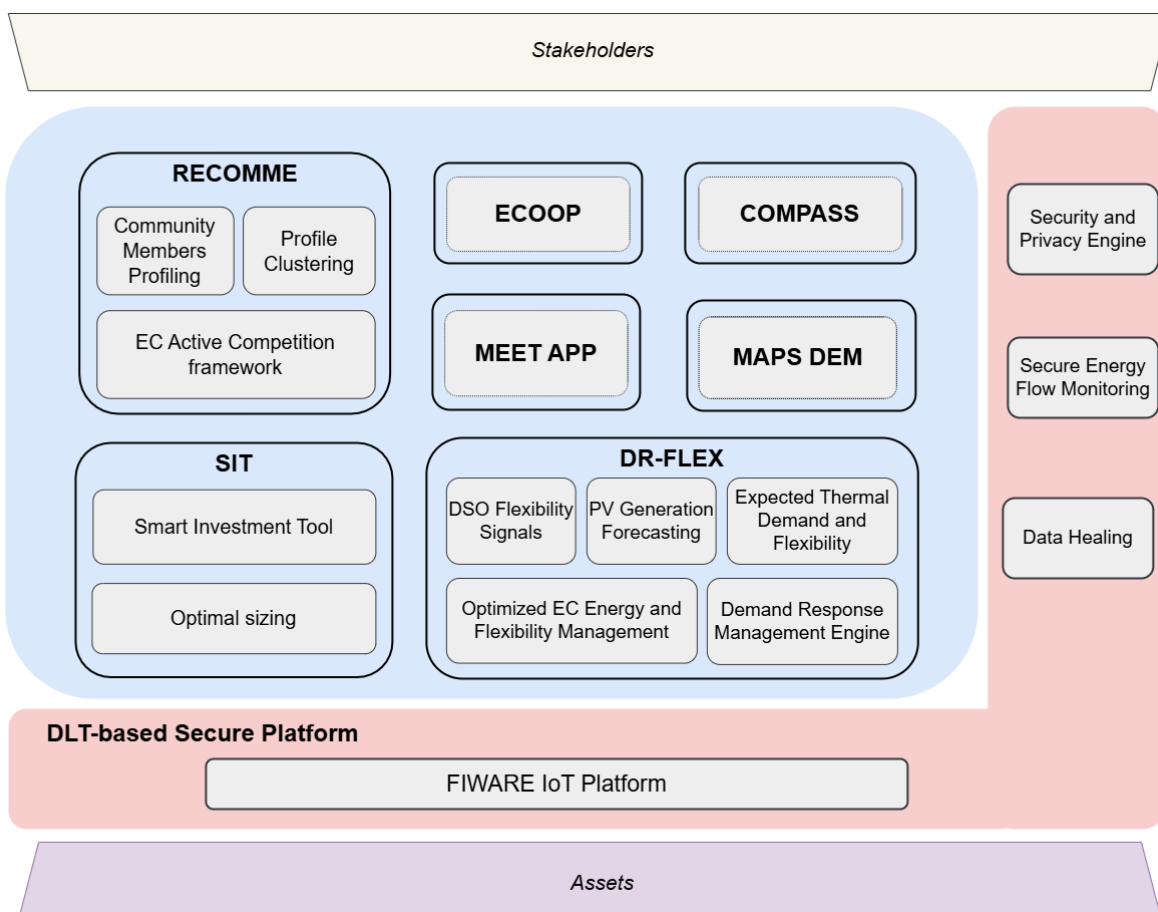
Figure 2 High-level Architecture - Smart Services Layer

4 FLEXIBILITY OF MASTERPIECE IN THE EC JOURNEY

Flexibility in MASTERPIECE from an overview point comes from the capacity of the modular platform to adapt and provide support at various stages of the EC journey. This modular flexibility ensures that MASTERPIECE is not only about energy demand management but also its ability to support and facilitate ECs through their entire lifecycle. Its final update will be given in Deliverable 4.4. This perspective combines technical adaptability with practical user-focused functionality.
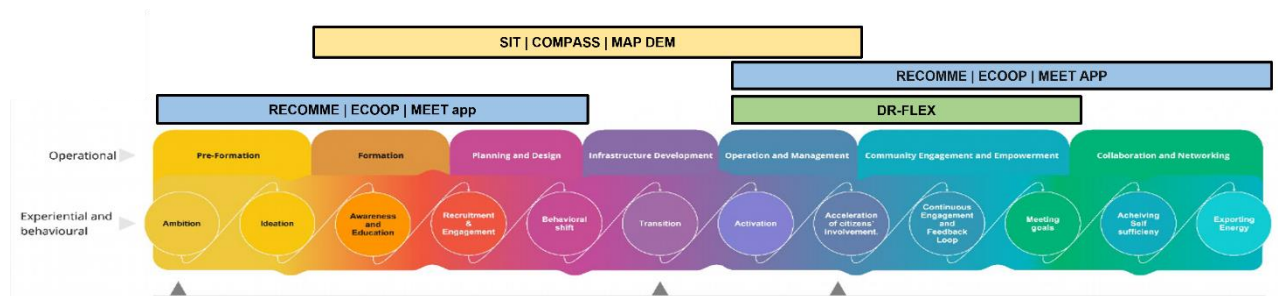
Figure 3 EC Journey Groups

The flexibility concept is tied to the ability of ECs to actively manage their energy demand and production. This includes both implicit and explicit demand-side flexibility as was already introduced in Deliverable 4.1. Therefore, here will be shown how this flexibility will be provided and supported by DR-FLEX tool.

4.1 Flexibility in the Masterpiece concept and the role of DR-FLEX

This section updates and contextualises the concept of flexibility within the MASTERPIECE project, highlighting the progress made and the role of the DR-FLEX tool in this field. Significant developments have recently emerged in the implementation of flexibility strategies, promoting the active participation of Energy Communities (ECs) and improving the efficiency and sustainability of the energy system. In the energy market, flexibility remains an essential element for effective competition, system efficiency and consumer empowerment. The concepts of explicit and implicit flexibility have continued to serve as complementary approaches to achieve a more resilient system, as indicated in the previous version of this paper. With the introduction of DR-FLEX, the MASTERPIECE project has moved towards innovative technological solutions that facilitate greater participation in Demand Response (DR) programmes.

DR-FLEX: Optimization of energy demand and promotion of energy flexibility

The DR-FLEX tool is designed to optimise energy demand and promote Demand Response through both explicit and implicit flexibility signals. This solution plays a key role in the intelligent management of energy demand, aligning with the needs of the electricity grid and promoting more sustainable and efficient consumption among users. One of the most remarkable aspects of DR-FLEX is its ability to optimise demand according to the needs of the grid, allowing users to adjust their consumption in response to flexibility signals. This not only helps to balance supply and

demand on the grid, but also allows consumers to actively participate in Demand Response programmes, gaining economic benefits for their contribution to grid stability. In addition, DR-FLEX includes demand optimisation functionality for self-consumption. This encourages users to maximise the use of the energy they produce, whether through solar panels or other renewable sources, reducing their dependence on the traditional electricity grid and promoting green energy generation and consumption, contributing significantly to sustainability efforts.

Promotion of sustainable practices and participation in the energy transition

Another key feature of DR-FLEX is its intuitive and easy-to-use dashboard, designed to promote Demand Response programmes and encourage sustainable energy consumption. This dashboard provides users with valuable information about their energy consumption, offering them personalised recommendations to improve efficiency and participate in DR programmes. Through this interface, DR-FLEX aims to educate and motivate consumers towards more responsible consumption practices, emphasising the importance of collective participation in the energy transition. Figure 4 and Figure 5 illustrate the graphical interface of DR-FLEX, showing its user-friendly design and the personalised recommendations offered to members of the energy community as part of their optimisation tasks and Demand Response strategies.
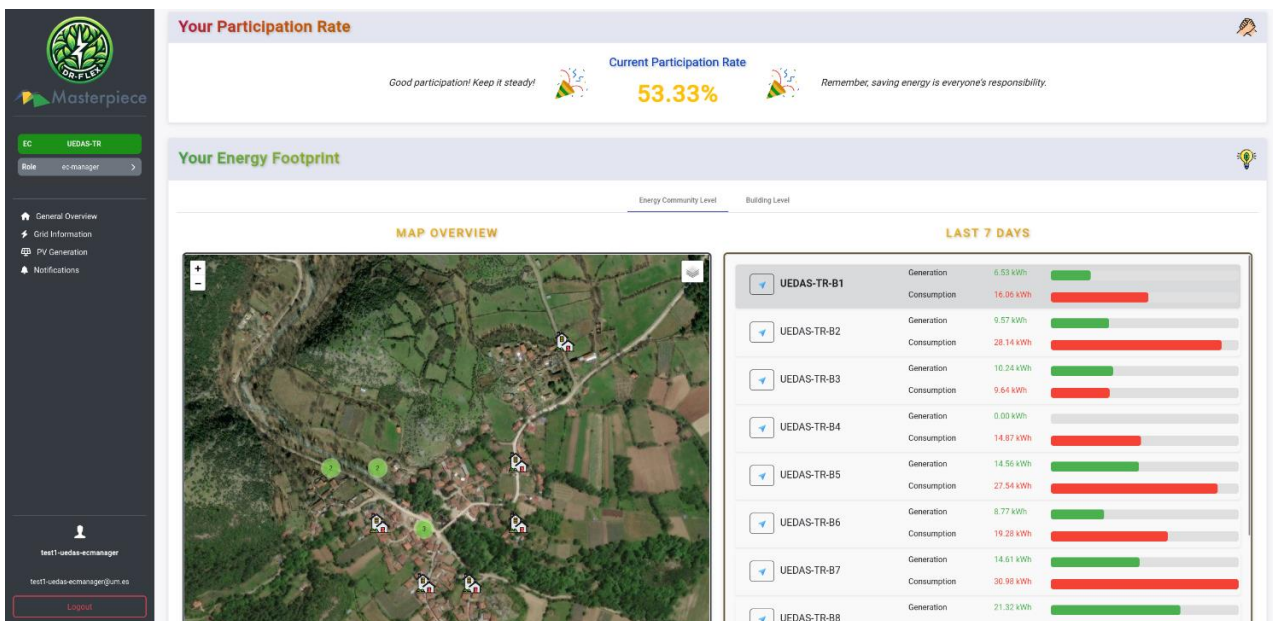
Figure 4 Home panel - DR-FLEX GUI
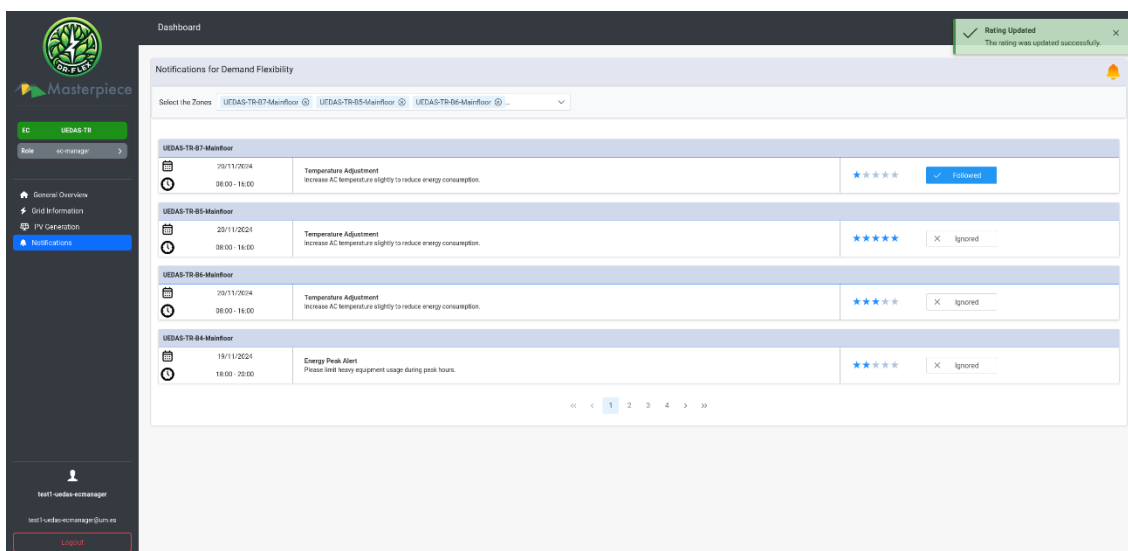
Figure 5 Notifications panel - DR-FLEX GUI

Integration and management of flexibility assets

DR-FLEX considers the ability to automatically integrate and manage "flexibility assets" within the energy community. This can include devices such as storage batteries, electric vehicle charging management systems and HVAC systems, which can be automatically controlled to participate in flexibility strategies. For non-automatable flexibility assets, DR-FLEX offers a solution by sending recommendations and notifications to users, allowing community members to make informed decisions about their energy consumption. This not only increases user awareness and participation in energy management, but also contributes significantly to the community's flexibility strategies.

Impact on Energy Communities (ECs)

Thanks to DR-FLEX, ECs can more effectively manage their energy demands, optimise self-consumption and actively participate in explicit and implicit flexibility programmes. This results in increased sustainability, optimised local energy resources and tangible economic benefits for their members. In conclusion, DR-FLEX represents a significant step forward in the framework of the MASTERPIECE project, consolidating its focus on energy flexibility and enabling ECs to play an active role in the transformation of the European energy system.

The results of Demand Response actions and flexibility recommendations generated by DR-FLEX are seamlessly integrated into the MASTERPIECE platform, allowing other tools, such as management systems, to consume and use this information. This integration encourages greater participation by members of the energy community, providing practical information and promoting collective engagement in community energy strategies.

5   TOOLS AND TECHNICAL COMPONENTS

The previous version of this document (D4.1) presented a preliminary overview of the isolated and independent components. Throughout WP4, these components have formed a series of tools which were for the first time provided in D4.3 in a conceptual way. In the present deliverable they are updated, and their technical aspects are provided (i.e. updated internal component sheet). Furthermore, Data models were created. These were developed and extended to structure input and output information, ensuring interoperability and reusability across tools and stages of the EC journey.

5.1   Internal Component Sheets update

In this section the final versions of the tables with the information of the components grouped in tools (Chapter 3) are shown. This section is focused on the updates of the tables, emphasising especially the efforts to ensure the interoperability and cooperation of the tools, with the connection to the DLT-based Secure platform through Data Models.

It is important to note that the functional and non-functional requirements indicated in the first versions of these component tables are in the next chapter, which shows the final version of these requirements.

5.1.1   MEET APP

Table 1 Internal component Sheet – MEET app

INTERNAL COMPONENT SHEET	
Component Name	**Meet App**
Associated tool	Meet App
Relevant Project Task	T4.1
Partner involves and their role	R2M – owner, designer, developer
Final users	Citizens (private, groups, organizations), EC members
ID	**MEETAPP**
Brief description of the component (100-200 words)	The Meet App is a mobile application that represents the first contact point for individuals with little or no background in Energy Communities. It targets different types of users: individual citizens

		can use the app to improve their knowledge about ECs and access shared data, while members of existing ECs can use the app to promote initiatives and boost the engagement of other citizens.
		From one side, the app offers provides a range of informative and training digital material (e.g., articles and public EU resources) that can help users become more familiar with the key concepts related to energy communities, from basic definitions to practical information on their benefits, available EU incentives, and so on. From the other side, it offers a collaborative space to create and participate in public group discussions, share knowledge, and promote public social events and initiatives. In this section, the app also provides a geo-based search functionality, which ensures users can easily find the most interesting discussions and events, among the ones available in the app.
Input Connections & Interfaces		FIWARE IoT Platform
Output Connections & Interfaces		FIWARE IoT Platform
Replicability level		Medium/High
Input Parameters		
User Details	**Short Description**	The user logged in the app through authentication. When the user is authenticated (not mandatory for most of the features in the app), the user attributes will be used to properly link the output data models with existing ones (e.g., link ResourceFeedback to the energy community of the person who expressed the feedback)
	Entities in the FIWARE NGSI-LD platform	Not applicable
	Source	Security & Privacy Engine
Output Parameters		
Social	**Short Description**	Social discussions and comments created by users in the Meet App.

discussions and comments	**_Entities in the FIWARE NGSI-LD platform_**	**Discussion** entities: these entities store discussions created by users to exchange information, opinions and knowledge among them. **DiscussionComment entities**: these entities store comments of a specific discussion.
Organized events	**_Short Description_**	Organized events and users interested in attending.
	Entities in the FIWARE NGSI-LD platform	**Event** entities: These entities store social events added by users in the app and the list of users interested in attending.
Results of quizzes on ECs	**_Short Description_**	Results of quizzes that evaluate knowledge of users on Energy Communities after engaging with the learning content in the app.
	Entities in the FIWARE NGSI-LD platform	**Questionnaire** entities: these entities store quizzes used to test the user knowledge on topics related to ECs and covered in the training/informative section of the app. **QuestionnaireQuestion** entities: these entities store the list of questions composing each quiz. **QuestionnaireAnswer** entities: these entities store user answers to quizzes.
Feedback from users on training and informative material	**_Short Description_**	Quantitative feedback from users on the learning and informative material in the app.
	Entities in the FIWARE NGSI-LD platform	**ResourceFeedback** entities: These entities store user feedback about a learning resource available in the application.

5.1.2 RECOMME

Table 2 Internal component sheet – RECOMME: Community Members Profiling

INTERNAL COMPONENT SHEET

Component Name	Community Members Profiling
Associated tool	RECOMME
Relevant Project Task	T3.4
Partner involves and their role	CERTH: Developer EXP: Designer, Support
Final users	EC Members
ID	**RCM-PROFILING**
Brief description of the component (100-200 words)	The initial stages of establishing an energy community often encounter challenges due to a lack of enthusiasm or a limited understanding among participants. This component aims to create profiles of the EC members according to various characteristics (social, demographics, behavioural, economic, energy profiling, etc.). This will ensure a smoother operation of the ECs by making them more resilient (according to the triangular EC ranking approach from WP2) and identifying which type of potential new members would benefit the ECs more. The mechanisms used may include a wide range of algorithms used for clustering, reformation of clusters and classification.
Input Connections & Interfaces	FIWARE IoT Platform (Temporal Data Repository)
Output Connections & Interfaces	FIWARE IoT Platform (Temporal Data Repository)
Replicability level	Medium

Input Parameters		
Questionnaires and Energy Data	**Short Description**	Information coming from RECOMME's interface. These will be the answers of the users to various questions about their knowledge, interests and behaviour regarding ECs, actions they have taken (or are willing to take) to reduce energy consumption, sociodemographic information and more. Also, the historical data of the user's energy consumption.

	Entities in the FIWARE NGSI-LD platform	Questionnaire QuestionnaireAnswer QuestionnaireQuestion DeviceMeasurement
	Source	RECOMME
Output Parameters		
User profiling	Short Description	The profile of the user. It will be chosen from a predefined list of archetypes (i.e. all potential profiles) and based on the user's answers the most suitable profile will be assigned to him. Also, the user's forecasted energy consumption.
	Entities in the FIWARE NGSI-LD platform	User DailyEnergyReading

Table 3 Internal component sheet - RECOMME: Profile Clustering

INTERNAL COMPONENT SHEET	
Component Name	Profile Clustering
Associated tool	RECOMME
Relevant Project Task	T3.4
Partner involves and their role	CERTH: Developer EXP: Designer, Support
Final users	EC Members
ID	RCM-Clustering
Brief description of the component (100-200 words)	The purpose of the creation of this tool is to model social and behavioural determinants to support the guided capacity building of energy communities. These models will allow proper clustering of members towards EC coherency and resilience. For the aforementioned purposes, data from the pilots will be needed in

		order to include socio-demographic and energy consumption related data in the algorithm and to make a proper analysis of the potential actions.
Input Connections & Interfaces		FIWARE IoT Platform (Temporal Data Repository)
		Community Members Profiling
Output Connections & Interfaces		FIWARE IoT Platform (Temporal Data Repository)
Replicability level		Medium
Input Parameters		
Questionnaires	**Short Description**	Information coming from RECOMME's interface. These will be the answers of the users to various questions about their knowledge, interests and behaviour regarding ECs, actions they have taken (or are willing to take) to reduce energy consumption, sociodemographic information and more and their profiles that will have been generated in a previous step.
	Entities in the FIWARE NGSI-LD platform	**Questionnaire** **QuestionnaireAnswer** **QuestionnaireQuestion**
	Source	RECOMME
Output Parameters		
Clustering	**Short Description**	The cluster of the user. Each user can belong to multiple clusters and various clusters can be generated based on the input features of the clustering.
	Entities in the FIWARE NGSI-LD platform	Not Applicable. Stored Internally.

Table 4 Internal component sheet - RECOMME: EC Active Competition framework

INTERNAL COMPONENT SHEET	
Component Name	**EC Active Competition framework**
Associated tool	RECOMME
Relevant Project Task	T3.5
Partner involves and their role	CERTH: Developer EXP: Designer, Support
Final users	EC Members
ID	**RCM-Recommend**
Brief description of the component (100-200 words)	Energy communities' members tend to show low interest of participation in the activities that benefit the community. This tool aims to compliment the experimental plan by assessing effects and moderators of the intervention programs. The objective here is to leverage the outputs of the Members Profiling and Clustering components to create comparative schemes between homogeneous groups of prosumers. This tool will extract the competitive/similar group's average prosumer profile and bad and good outliers to inform and compare all other clustered prosumers
Input Connections & Interfaces	FIWARE IoT Platform (Temporal Data Repository) Profile Clustering
Output Connections & Interfaces	FIWARE IoT Platform (Temporal Data Repository)
Replicability level	Medium
Input Parameters	

Questionnaires and energy data	**_Short Description_**	Information coming from RECOMME's interface. These will be the answers of the users to various questions about their knowledge, interests and behaviour regarding ECs, actions they have taken (or are willing to take) to reduce energy consumption,

		sociodemographic information and more. Also, information that were produced in previous steps plus historical data of energy consumption.
	Entities in the FIWARE NGSI-LD platform	**Questionnaire** **QuestionnaireAnswer** **QuestionnaireQuestion** **DeviceMeasurement**
	Source	RECOMME
Output Parameters		
Recommendations	**Short Description**	Recommendations for each user's specific case
	Entities in the FIWARE NGSI-LD platform	**Recommendation_Answer**

5.1.3 DR-FLEX

Table 5 Internal component sheet - DR-FLEX: DSO Flexibility Signals Component

INTERNAL COMPONENT SHEET	
Component Name	**DSO Flexibility Signals Component**
Associated tool	**DR-FLEX**
Relevant Project Task	T4.4
Partner involves and their role	AMU: owner, developer UMU: developer USEF interpreter service
Final users	ECs members, DSOs, Flexibility market operators, Grid operators

ID	DSO-FLEX-SIM
Brief description of the component (100-200 words)	The tool utilizes a non-parametric stochastic approach to model load demand PDFs of the users connected to the grid, capturing the inherent variability of consumption patterns. We incorporate synthetic grid limits to generate congestion scenarios and consequently generate the flexibility requests from the DSO. The incentives and penalty are decided based on the extent of network congestion. The USEF interpreter microservice developed by UMU is in charge to store the resulting flexibility signals into NGSI-LD.
Input Connections & Interfaces	FIWARE IoT Platform (Real - Time Data Repository, Temporal Data Repository)
Output Connections & Interfaces	FIWARE IoT Platform (Real - Time Data Repository)
Replicability level	Medium

Input Parameters		
Consumption Data	**Short Description**	Energy consumption data from the pilot site over the past one year.
	Entities in the FIWARE NGSI-LD platform	**DeviceMeasurement** entities
	Source	**DeviceMeasurements** entities

Output Parameters		
Grid Signals	**Short Description**	Flexibility signals including the amount of power and flexibility periods. These signals are related directly to an EC.
	Entities in the FIWARE NGSI-LD platform	**DSOFlexibilityRequest** entities

Table 6 Internal component sheet - DR-FLEX: PV Generation Forecasting component

INTERNAL COMPONENT SHEET	
Component Name	**PV Generation Forecasting component**
Associated tool	DR-FLEX
Relevant Project Task	T4.4
Partner involves and their role	AMU (owner, developer)
Final users	ECs members, DSOs, Flexibility market operators, Grid operators
ID	**PVFORECAST**
Brief description of the component (100-200 words)	A forecasting tool which generates and sends automatically to the context broker 36 hours value of PV forecast based on the consumed generation value of different pilot sites.
Input Connections & Interfaces	FIWARE IoT Platform (Real - Time Data Repository, Temporal Data Repository)
Output Connections & Interfaces	FIWARE IoT Platform (Real - Time Data Repository, Temporal Data Repository)
Replicability level	Medium
Input Parameters	

Device Measurement	**Short Description**	We need real time generation measurements to train the model on it and to forecast accurate values of PV forecast.

s	**Entities in the FIWARE NGSI-LD platform**	**DeviceMeasurement** entities
	Source	FIWARE IoT Platform
Output Parameters		
PV Generation Forecast	**Short Description**	Forecast 36-hour values for each entity after training on historical data and real time data extracted from the context broker. Then it sends the forecasted values via a PATCH request to the context broker.
	Entities in the FIWARE NGSI-LD platform	**PVGenerationForecast** entities

Table 7 Internal component sheet - DR-FLEX: Optimized EC Energy and Flexibility Management

INTERNAL COMPONENT SHEET	
Component Name	**Optimized EC Energy and Flexibility Management**
Associated tool	DR-FLEX
Relevant Project Task	T4.4
Partner involves and their role	CERTH (owner, developer)
Final users	ECs members, DSOs, Flexibility market operators, Grid operators
ID	**EC-DR-OPTIMIZER**
Brief description of the component (100-200 words)	This component aims to address demand response (DR) events, modifying expected demand profiles to minimize impact on end-users while maximizing benefits such as cost savings primarily, PV

		produced energy extrapolation and peak reduction. Thus, this tool provides with the optimal aggregated demand at EC level.
Input Connections & Interfaces		FIWARE IoT Platform (Real - Time Data Repository, Temporal Data Repository)
Output Connections & Interfaces		FIWARE IoT Platform (Real - Time Data Repository, Temporal Data Repository)
Replicability level		Medium
Input Parameters		
Flexibility Market Signals (DSO DR Requests)	**Short Description**	This is practically the behaviour of the DSO market, where in fact it is the emulated DSO flexibility market signals-offers-incentives to impose offer-based demand request signals to energy aggregators. This means that there are scenarios that establish the behaviour of DSO where offers discounts to prompt users (EC members) to consume more or less during the day. Thus, they are signals/vectors/arrays of length 24 steps (for each hour or higher granularity) sending the request of how much more or less to be consumed and at the same the discount if that request will be met. Also, peak related signals would be helpful for peak reduction functionalities.
	Entities in the FIWARE NGSI-LD platform	**DSOFlexibilityRequest**
	Source	FIWARE IoT Platform (DSOFlexibilityRequest entities generated by DSO Flexibility Signals Component)
PV Generation Forecasts	**Short Description**	This is the PV energy produced forecast for the next day.
	Entities in the FIWARE NGSI-LD platform	**PVGenerationForecast**
	Source	FIWARE IoT Platform (PVGenerationForecast entities generated by

		PV Generation Forecasting Component)
Baseline Consumption and Flexibility Graphs	***Short Description***	These are the consumption profile forecasts (predictions of the baseline profiles per EC member) that help in the calculation of the flexibility graphs for each EC member, which set limits that, if not exceeded, ensure thermal comfort is maintained.
	Entities in the FIWARE NGSI-LD platform	**ExpectedThermalDemand**
	Source	FIWARE IoT Platform (ExpectedThermalDemand entities generated by *Expected Thermal Demand and Flexibility*)
Price tariffs	***Short Description***	Price tariffs for energy consumption.
	Entities in the FIWARE NGSI-LD platform	**DailyPrices**
	Source	FIWARE IoT Platform
Output Parameters		
Aggregated Demand for the EC and Demand for the EC member	***Short Description***	The output is the aggregated optimal demand for the EC, while also we formulated our approach to give also the per building demand. This way, it is like the functionality of producing the disaggregated load profiles/demands is incorporated also.
	Entities in the FIWARE NGSI-LD platform	**ECAggregatedDemandOptimisation** **OptimalLoadCurve**

Table 8 Internal component sheet - DR-FLEX: Expected Thermal Demand and Flexibility

INTERNAL COMPONENT SHEET	
Component Name	**Expected Thermal Demand and Flexibility**

Associated tool	DR-FLEX
Relevant Project Task	T4.4
Partner involves and their role	CERTH (owner, developer)
Final users	ECs members, DSOs, Flexibility market operators, Grid operators
ID	**EXPECTED-DEMAND-FLEX**
Brief description of the component (100-200 words)	This component aims to assess and predict demand-side flexibility in ECs. By integrating historical energy profiles, baseline consumption forecasts and PV generation forecasts, it provides accurate overall flexibility estimations. Daily updates from historical data and real-time data repositories ensure accurate forecasting and provide support for optimized energy consumption, renewable energy utilization, and strategic decision-making. The continuous data flow and extended collection periods improve to its reliability and functionality. This contributes to more effective energy management and increased energy efficiency, the management of DR events and the long-term sustainability of the EC.
Input Connections & Interfaces	FIWARE IoT Platform (Real - Time Data Repository, Temporal Data Repository)
Output Connections & Interfaces	FIWARE IoT Platform (Real - Time Data Repository, Temporal Data Repository)
Replicability level	Medium

Input Parameters		
PV Generation Forecasts	***Short Description***	This is the PV energy produced forecast for the next day.
	Entities in the FIWARE NGSI-LD platform	**PVGenerationForecast**
	Source	FIWARE IoT Platform (PVGenerationForecast entities generated by

		PV Generation Forecasting Component)
Baseline Consumption	*Short Description*	These are the consumption profile forecasts (predictions of the baseline profiles per EC member).
	Entities in the FIWARE NGSI-LD platform	**ExpectedThermalDemand**
	Source	FIWARE IoT Platform
Historical energy profiles of the EC members	*Short Description*	Historical energy consumption and production data of the pilot ECs, providing information on energy use patterns and renewable energy production.
	Entities in the FIWARE NGSI-LD platform	**DeviceMeasurement**
	Source	FIWARE IoT Platform
Output Parameters		
Demand side Flexibility Bounds/Graphs for EC members	*Short Description*	The expected outcomes of the tool are to provide accurate forecasts and estimates of demand flexibility bounds, contributing to optimizing energy management and energy efficiency, improving the efficiency of renewable energy sources and supporting strategic decision making for demand management.
	Entities in the FIWARE NGSI-LD platform	**ExpectedThermalDemand**

Table 9 Internal component sheet - DR-FLEX: Demand response Management Engine

COMPONENT SHEET	
Component Name	**Demand Response Management Engine**
Associated tool	DR-FLEX
Relevant Project Task	T4.4
Partner involves and their role	UMU (owner, developer)
Final users	ECs members, DSOs, Flexibility market operators, Grid operators
ID	**DR-MANAGEMENT-ENGINE**
Brief description of the component (100-200 words)	This component provides the necessary mechanisms to modify demand at the Energy Community (EC) member level for the execution of demand flexibility events by controlling and managing thermal flexibility assets, such as HVAC systems. It leverages the results from real-time optimization tools that deliver an optimized scheme at the EC and EC-member level, considering each EC's power/energy models, flexibility events like signals from the grid, and electricity tariff prices. Additionally, this component sends notifications to encourage users to adjust the operation of non-automated assets, motivating them to participate actively in demand flexibility events.
Input Connections & Interfaces	FIWARE IoT Platform (Real - Time Data Repository, Temporal Data Repository)
Output Connections & Interfaces	FIWARE IoT Platform (Real - Time Data Repository, Temporal Data Repository)
Replicability level	Medium

Input Parameters		
Aggregated	**Short Description**	Aggregated optimal demand for the EC. The optimisation tasks tend to optimise the load to meet the grid needs maintaining the

optimal demand for the EC		comfort requirements from users
	Entities in the FIWARE NGSI-LD platform	**ECAggregatedDemandOptimisation** entities
	Source	FIWARE IoT Platform (ECAggregatedDemandOptimisation entities generated by Optimized EC Energy and Flexibility Management)
Optimal Load Curve	***Short Description***	The optimal demand per building energy meter of the EC. It provides more deeper details about the optimisation task at building energy meter level. With upper and lower bounds of the energy profile
	Entities in the FIWARE NGSI-LD platform	**OptimalLoadCurve** entities
	Source	FIWARE IoT Platform (OptimalLoadCurve entities generated by Optimized EC Energy and Flexibility Management)
Output Parameters		
User Recommendations	***Short Description***	Personalised recommendations to encourage the users to participate in Demand Response mechanisms and self-consumption initiatives.
	Entities in the FIWARE NGSI-LD platform	**Recommendation** entities
Device Actuation	***Short Description***	Commands are sent to operate automatically over the actuable asset, managing the current operation of the actuable device during the Demand Response Event.
	Entities in the FIWARE NGSI-LD platform	**DeviceOperation** entities. These entities represent these actuations, providing the current information about the operation of one device accordingly

5.1.4 SIT

Table 10 Internal component sheet – SIT: Optimal sizing tool

INTERNAL COMPONENT SHEET	
Component Name	**Optimal sizing tool**
Associated tool	SIT
Relevant Project Task	T4.2
Partner involves and their role	AMU: owner RDIUP: UI and data provider
Final users	Operators of EC and participants, aggregators, DSOs, regulators
ID	**OPT-SIZING**
Brief description of the component (100-200 words)	The optimal sizing tool considers the historical PV and energy consumption data from the EC for computing the optimal sizes of the assets. It uses a stochastic model for the energy consumption, where the PDF for each interval is sampled to generate the scenario. Finally, the tool considers the flexibility potential of the connected loads defined by a simple flexibility index which denotes the fraction of load that can be reduced. The optimal sizes thus computed consider effect of EMS.
Input Connections & Interfaces	SIT API
Output Connections & Interfaces	SIT API
Replicability level	high
Input Parameters		
---	---	---
Asset metrics	*Short Description*	We receive the historical PV generation, energy consumption, flexibility index, OPEX and CAPEX for the assets mainly PV and Battery.

	Entities in the FIWARE NGSI-LD platform	None as of now, all the data is received via API from RDIUP.
	Source	SIT
Output Parameters		
Optimal Sizes	**Short Description**	We send optimal sizes of PV and battery to the SIT.
	Entities in the FIWARE NGSI-LD platform	None as of now**.**

Table 11 Internal component sheet - SIT: Smart Investment Tool

INTERNAL COMPONENT SHEET	
Component Name	**Smart Investment Tool**
Associated tool	SIT
Relevant Project Task	T4.2
Partner involves and their role	RDIUP: Designer, Developer and integrator AMU: API provider
Final users	Users, EC-Members
ID	**SIT**
Brief description of the component (100-200 words)	SIT aims to provide sophisticated analysis for the financial and environmental factors of an ECs. Today it is difficult to make clear decisions for the energy transition planning in ECs considering multi-parametric aspect. SIT can assist EC managers to optimize their ECs based on multi-objectives functions. Also, it allows users to share their lessons learnt and best practices in a federated way. Almost of technical parts have been developed User interfaces, Backend for simulation and optimization and planning generation, APIs and data storage. We are in the phases of improvement and

		including the feedback of pilots. The SIT is hosted in cloud WWW.SPTAPP.EU
Input Connections & Interfaces		AMU API and external API.
Output Connections & Interfaces		Fiware IoT Platform
Replicability level		High
Input Parameters		
User inputs for configuration	**_Short Description_**	We mainly receive user inputs when filling in the different forms for mainly the configuration of an EC, as well as the simulation and the optimization. Lessons and best practices will be provided via specific forms too. Also, we receive internally inputs from AMU API and from another external API for fetching historical weather data.
	Entities in the FIWARE NGSI-LD platform	The configuration/simulation and optimization inputs will be included in the entities.
	Source	SIT
Output Parameters		
Opmitization and Simulation Results	**_Short Description_**	Based on the user inputs and their configurations, SIT generates eight KPIs and six plots for simulation and optimization.
	Entities in the FIWARE NGSI-LD platform	**Simulation** **Optimization** **BestPractices**

5.1.5 ECOOP

Table 12 Internal component sheet - ECOOP: EC Joining and participation

INTERNAL COMPONENT SHEET

Component Name	**EC Joining and participation**
Associated tool	ECOOP
Relevant Project Task	T4.1
Partner involves and their role	RDIUP: Designer, Developer and integrator
Final users	EC-Members
ID	**ECOOP-001**
Brief description of the component (100-200 words)	ECOOP intends to match between ECs and EC-Members and provide them with all functionalities needed to manage their participating after joining. EC-Members can hold private discussions (chatting rooms), launch voting and establish events with the members of the same EC. ECOOP will monitor the data of the different assets. Also, it allows users to provide a rating for the ECs or the EC-members in a transparent way. Almost of technical parts have been developed User interfaces, backend for exploration, voting, rating, reporting and chatting, APIs and data storage. We are in the phases of improvement and including the feedback of pilots. The ECOOP is hosted in cloud WWW.ECOOP.CLOUD
Input Connections & Interfaces	SIT FIWARE IoT Platform
Output Connections & Interfaces	FIWARE IoT Platform
Replicability level	high

Input Parameters		
EC details and energy measuremen	*Short Description*	We mainly receive user inputs when filling in the different forms for mainly the creation of an EC or portfolio (device linked to EC-Members) of an EC. Also, we are consumed data from a unified API (French UC) and in static way from the NGSI-LD.

ts	***Entities in the FIWARE NGSI-LD platform***	**DeviceMeasurement**
	Source	FIWARE IoT Platform
Output Parameters		
Joining and Participation results	***Short Description***	Based on the user inputs and their configurations, ECOOP collects and shares all data linked to the joining process and participation of EC-members within the EC.
	Entities in the FIWARE NGSI-LD platform	**Discussion** **Event** **Voting** **Rating** **Reporting** **EnergyCommunityMember** **DeviceMeasurement**

5.1.6 COMPASS

Table 13 Internal component sheet - COMPASS

INTERNAL COMPONENT SHEET	
Component Name	COMPASS
Associated tool	COMPASS tool
Relevant Project Task	T3.1 T4.1
Partner involves and their role	R2M – owner, designer, developer

Final users	All stakeholders interested in developing an energy community project.
_ID_	**COMPASS**
Brief description of the component (100-200 words)	The COMPASS is a web-based tool that supports citizens and communities throughout the journey of developing community energy projects. It offers a user-friendly web UI to easily access and navigate a database of tailored funding schemes, technical assistance, capacity-building programs, and policy guidance, made available with the aim of enabling more accessible and sustainable community energy project development. Starting from the database of incentives that was created as part of T3.1, the idea behind the COMPASS is to provide a more engaging, user-friendly UI, where users can efficiently identify the type of incentives in the catalogue that better fit their needs. To achieve this goal, the COMPASS offers advanced search and filter capabilities, that users can leverage to search incentives using keywords and apply filters at different stages of the search. The COMPASS is conceived as a standalone tool. Direct connections with other tools will be evaluated through dedicated entry points, in the form of URLs, to display specific subset of incentives (e.g., through pre-applied filters and subfilters)
Input Connections & Interfaces	N/A
Output Connections & Interfaces	N/A
Replicability level	Medium/High

5.1.7 MAPS Digital Energy Manager

Table 14 Internal component sheet - MAPS

INTERNAL COMPONENT SHEET	
Component Name	**MAPS Digital Energy Manager**

Associated tool	MAPS Digital Energy Manager
Relevant Project Task	T4.3
Partner involves and their role	MAPS: *owner, designer, developer, support*
Final users	RECs managers and users
ID	**MAPS-DEM**
Brief description of the component (100-200 words)	ROSE DEC is dedicated to the management of self-consumption configurations for sharing renewable energy. These configurations include individual self-consumption systems of remote renewable energy, collective self-consumption groups from renewable sources and Renewable Energy Communities (RECs). MAPS DEC can simultaneously manage RECs with a variable number of PODs, with different types of users, both residential and non-residential, and with different renewable production plants and storage systems.
Input Connections & Interfaces	FIWARE IoT Platform, Security and Privacy Engine
Output Connections & Interfaces	*Not applicable due to the early stage of the component in MASTERPIECE. To be presented in the following documents*
Replicability level	*HIGH*

Input Parameters		
EC information and measurements	*Short Description*	Structured data representing interconnected entities such as communities, buildings, zones, devices, measurements, and members, required for energy management, monitoring, and optimization processes.
	Entities in the FIWARE NGSI-LD platform	**EnergyCommunity** **Building** **Zone** **Device** **DeviceMeasurement**

		EnergyCommunityMember
	Source	FIWARE IoT Platform

5.1.8 DLT Secure Platform

Table 15 Internal component sheet - DLT Secure Platform: FIWARE IoT Platform

INTERNAL COMPONENT SHEET	
Component Name	FIWARE IoT Platform
Associated tool	DLT Secure Platform
Relevant Project Task	T4.5
Partner involves and their role	ODINS: owner (leading partner)
Final users	MASTERPIECE components
ID	IoT-PLATFORM
Brief description of the component (100-200 words)	A platform with specific data models, based on standard data format, that offers an HTTP REST API to reduce the integration effort from other federated projects and future ECs. In this sense, it offers an environment where the data can be stored an obtained, ensuring their traceability.
Input Connections & Interfaces	- MASTERPIECE components can update the data stored in the platform (through the *Security and Privacy Engine*). - Integration agents feed the proper entities with information coming from multiple data sources.
Output Connections & Interfaces	- MASTERPIECE components can receive notifications when data is updated and can also read existing data. - Integration agents can receive commands from the platform to act on devices/systems which have actuation capabilities.

Replicability level		Medium

		Input Parameters
Input parameter	**_Short Description_**	Information coming from devices (sensors, meters, etc.) and other data sources (simplified version focused on the _Acquisition Layer_ of the architecture, although several types of entities can also be updated by MASTERPIECE Components).
	Entities in the FIWARE NGSI-LD platform	**DeviceMeasurementRaw.** **DailyEnergyReading.**
	Source	Both types of entities are provided by Integration agents.
		Output Parameters
Output parameter	**_Short Description_**	Commands sent to devices/systems with actuation capabilities (simplified version focused on the _Acquisition Layer_ of the architecture, although any entity can be accessed by MASTERPIECE Components either by reading it directly or using the subscription system, through a notification).
	Entities in the FIWARE NGSI-LD platform	**Device**

Table 16 Internal component sheet – DLT Secure Platform: Security and Privacy Engine

INTERNAL COMPONENT SHEET	
Component Name	Security and Privacy Engine
Associated tool	DLT Secure Platform
Relevant Project Task	T4.5
Partner involves and their role	ODINS: owner (leading partner) RDIUP: Keycloak manager

Final users	Data consumers/providers (Integration agents and MASTERPIECE components). End users (Keycloak).	
_ID_	S&P-ENGINE	
Brief description of the component (100-200 words)	An engine, based on DLT, that provides access to distributed data. This engine will be based on an authentication/authorization scheme, which comprises several technologies/components that offer the different needs that are required, such as secure communication, preservation of identity privacy, data privacy, and financial transactions.	
Input Connections & Interfaces	- Security administrators to configure the access control system using a graphical user interface. - Users, to login when required to get access to the MASTERPIECE components (Keycloak integration). - Data consumers/providers requesting access to protected resources.	
Output Connections & Interfaces	- Responses to data consumers/providers to get credentials and other security parameters. - Responses coming from protected resources that need to be sent back to the data consumers/providers when an operation is executed.	
Replicability level	Medium	

Input Parameters		
Input parameter (authentication request)	**_Short Description_**	Credentials of the user or any backend (data consumers/providers, etc.)
	Entities in the FIWARE NGSI-LD platform	Not applicable
	Source	User. Backend.

Input parameter (authorization request)	**_Short Description_**	Authentication token and other authorization parameters	
	Entities in the FIWARE NGSI-LD platform	Not applicable	
	Source	Backend.	
Input parameter (access to protected resource request)	**_Short Description_**	Authorization token and original request.	
	Entities in the FIWARE NGSI-LD platform	Not applicable	
	Source	Backend.	
Output Parameters			
Output parameter (authentication response)	**_Short Description_**	Authentication token	
	Entities in the FIWARE NGSI-LD platform	Not applicable	
Output parameter (authorization response)	**_Short Description_**	Authorization token	
	Entities in the FIWARE NGSI-LD platform	Not applicable	
Output parameter (access to protected resource)	**_Short Description_**	Either the response coming from the protected resource, if the access is authorized, or a well-known error response, if it is not.	
	Entities in the FIWARE NGSI-LD platform	Not applicable	

Table 17 Internal component sheet - DLT Secure Platform: Data Healing

INTERNAL COMPONENT SHEET	
Component Name	**Data Healing (Data-Quality Assurance)**
Associated tool	DLT Secure Platform
Relevant Project Task	T4.5
Partner involves and their role	CERTH: developer ODINS: data provider & support
Final users	Data consumers (MASTERPIECE components)
ID	**CERTH-DATA-FILTERING-TASK4.5**
Brief description of the component (100-200 words)	Data healing/filtering refers to the process of identifying and correcting errors or inconsistencies in the data collected from sensors and other measurement devices (raw data) within a smart building system. This process is essential for maintaining the integrity and accuracy of the data used for monitoring, control, and analysis within the smart building ecosystem.
Input Connections & Interfaces	FIWARE IoT Platform
Output Connections & Interfaces	FIWARE IoT Platform
Replicability level	Medium
Input Parameters		
Raw Measurements	**Short Description**	The healing module will continuously request real-time data from NGSI-LD, primarily focusing on entities of type "DeviceMeasurementRaw" where the "needsHealing" property is set to 1. Additionally, certain attributes from entities of type "DeviceMeasurement" are required for effective healing analysis, such as the "unit" attribute, which specifies the measurement unit

		associated with each entity or measurement to be healed.
	Entities in the FIWARE NGSI-LD platform	**DeviceMeasurementRaw** **DeviceMeasurement** (certain properties may be needed to enhance the accuracy of the healing analysis)
	Source	Both types of entities are provided by FIWARE IoT Platform component.
Output Parameters		
Healed Measurements	*Short Description*	After applying healing mechanisms to detect and correct erroneous data (such as duplicates, gaps, and outliers), the healing component will update in the NGSI-LD the "DeviceMeasurement" entities with the curated data for all relevant entities and available timestamp-value pairs.
	Entities in the FIWARE NGSI-LD platform	**DeviceMeasurement**

Table 18 Internal component sheet - DLT Secure Platform: Secure Energy Flow Monitoring

INTERNAL COMPONENT SHEET	
Component Name	Secure Energy Flow Monitoring
Associated tool	DLT Secure Platform
Relevant Project Task	*T4.5*
Partner involves and their role	AMU: owner
Final users	MASTERPIECE components
ID	SEC-ENERGY-FLOW
Brief description of the component (100-200 words)	This tool aggregates energy consumption/generation data from devices over specified periods, aggregates to the blockchain according to the aggregation type (daily/ weekly/monthly) and

			updates the Context Broker.
			Provide API wrapper to make blockchain reading accessible to the public.
Input Connections & Interfaces			FIWARE IoT Platform
Output Connections & Interfaces			FIWARE IoT Platform
Replicability level			Medium
Input Parameters			
Device Measurements	*Short Description*		Information coming from device measurements for each entity
	Entities in the FIWARE NGSI-LD platform		**DeviceMeasurementRaw.** **DailyEnergyReading.**
	Source		FIWARE IoT Platform
Output Parameters			
Aggregated Energy Data	*Short Description*		Given the entity id, start and end date, the output will be the aggregations performed for the entity in the time frame given.
	Entities in the FIWARE NGSI-LD platform		**AggregatedEnergySeries.** The information provided by this output are series of aggregated values per meter on a daily/weekly/monthly format

5.2 Data Models

As mentioned above, The tool's components have been updated to align their inputs and outputs with MASTERPIECE platform's specific requirements.

To achieve this, a series of Data Models have been designed to define the structure of the input and output information of each component. The main objective of this approach is to foster interoperability and reusability of both the platform and the ecosystem of services and tools, which are linked to different stages of the EC journey.

Consequently, any instance of any stage of the EC journey will make use of a unified Information Model. D4.3 presented the initial data models related to Energy Communities, EC Members, as well as data models for infrastructures, including buildings, zones, and devices.

In this document, these data models are extended by incorporating the outputs generated by the developed tools. Figure 6 shows the schematic representing the different entities and the relationships between them within the MASTERPIECE platform.

Figure 6 Data Model Summary

For the MEET APP tool, Table 19 shows the outputs generated along with the corresponding entities within the Context Broker.

Table 19 Outputs and generated types by MEET APP

Output	Description	Outputs / Generated types of entities
1	Feedback from users on training and informative material	**ResourceFeedback** entities: These entities store user feedback about a specific training resource available in the application. They are related to an EC.
2	Results of quizzes on ECs	**QuestionnaireAnswer** entities: These entities store quizzes to test the user knowledge on topics related to ECs and covered in the training/informative section of the app. They are related to an EC.

3	Social discussions and comments	**Discussion** entities: These entities store discussions created by users to exchange information, opinions and knowledge among them. They are related to an EC. **DiscussionComment** entities: These entities stored comments of a specific discussion. They are linked to a discussion.
4	Organized events and users interested in attending	**Event** entities: These entities store social events added by users in the app. They are linked to an EC. When a new person expresses their interest to participate, a new relationship with the corresponding user entity is created.

For the RECOMME tool, Table 20 shows the outputs generated along with the corresponding entities within the Context Broker.

Table 20 Outputs and generated types by RECOMME

Output	Description	Outputs / Generated types of entities
1	Energy Profiling	**Recommendation**: For this functionality, this entity will be used to store an extensive description of the users based on their timeseries energy consumption. Updated on demand
2	Recommendation	**Recommendation**: This entity will store the recommendation produced after the user has fully completed his interaction with RECOME. Updated each time the user interacts with RECOME
3	User Answers	**QuestionnaireAnswer** entities: For each Questionnaire and its QuestionnaireQuestion entities we'll have the answers of the users stored in the respective QuestionnaireAnswer entities. These data are used to produce the recommendations
4	Forecasted Energy Consumption (1 day)	**DailyEneryReading:** Each forecasting generates all the reading for the next day, combined in one entity

For the DR-FLEX tool, Table 21 shows the outputs generated along with the corresponding entities within the Context Broker.

Table 21 Outputs and generated types by DR-FLEX

Output	Description	Outputs / Generated types of entities
1	PV Generation Forecasting Component	**PVGenerationForecast entities:** These entities store the result of the generation forecast for a generation meter connected to a photovoltaic installation. Calculated/Updated periodically.
2	DSO Flexibility Signals Tool & USEF interpreter	**DSOflexibilityRequest entities:** These entities store flexibility signals coming from the DSO simulation. It includes the amount of power and flexibility periods. These signals are related directly to an EC.
3	Expected Thermal Demand and Flexibility Tool	**ExpectedThermalDemand** entities: These entities include the expected thermal demand based on prediction mechanisms and comfort requirements. It provides the baseline load of one building energy meter, with upper and lower bounds.
4		**ECAggregatedDemandOptimisation entities:** These entities provide the agreggated optimal demand

	Optimized EC Energy and Flexibility Management	for the EC. Considering the previous outcomes, the optimisation tasks tend to optimise the load to meet the grid needs maintaining the comfort requirements from users. This type of entity stores the outcome of this optimisation task, at EC level.
		OptimalLoadCurve entities: These entities provide the optimal demand per building energy meter of the EC. It provides more deeper details about the optimisation task at building energy meter level.
5	Demand Response Management engine	**Recomendation** entities: In the use case with non-actuable assets, personalised recommendations are created and sent to the users of each specific zone. These recommendations try to encourage the users to participate in Demand Response mechanisms and self-consumption initiatives.
		DeviceOperation entities: In the use case with actuable assets, commands are sent to operate automatically over the actuable asset, managing the current operation of the actuable device during the Demand Response Event. These entities represent these actuations, providing the current information about the operation of one device accordingly

For the SIT tool, Table 22 shows the outputs generated along with the corresponding entities within the Context Broker.

<div align="center">

Table 22 Outputs and generated types by SIT

</div>

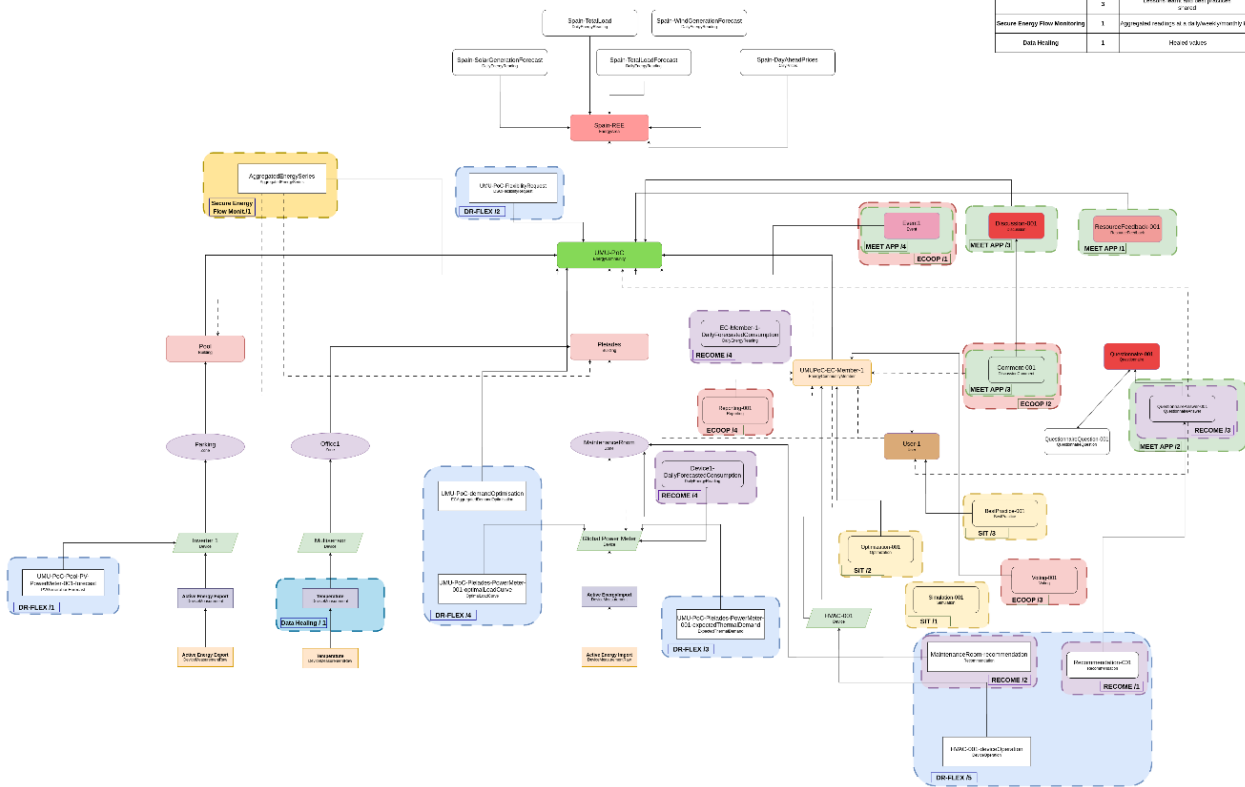| Output	Description	Outputs / Generated types of entities
1	Results of simulations	**Simulation** entities: it stores all the outcomes of simulation including its financial and environmental indicators and URL link for plots (csv, png). They are related to an EC.
2	Results of asset sizing optimizations	**Optimization** entities: the outcomes of optimization (based on the method selected by users) including the optimal sizes of assets, the financial (Payback, IRR, savings) and environmental metrics (carbon footprint, decarbonization, abatement cost), and URL link of plots (csv and or png). The outputs are linked to a unique configuration each time.
3	lessons learnt and best practices shared	**BestPractices** entities: Each EC or operator can share best practices and lessons learnt to be added in the final planning report. These entities can be shared between all SIT Users. It is linked to all Ecs for federated learning

For the ECOOP tool, Table 23 shows the outputs generated along with the corresponding entities within the Context Broker.

<div align="center">

Table 23 Outputs and generated types by ECOOP

</div>

Output	Description	Outputs / Generated types of entities
1	Organize events for specific and linked to the EC	**Event** entities (or OnboardingEvent entities): These entities store the information (title, date, desciption, type, link of public, invited members) linked to the events organized by a member from the same EC. A member can select the members concerned by this event or it will be broadcasted to

	between the members of the same EC	all members in the same EC. Members concerned will receive a notification for this event
2	Discussions between the members of the same EC	**Discussion** entities: These entities store the number of discussions and implications of each member in each chat room linked to an EC. If the members decide to make it public the content of discussions can be shared too
3	Votes of decisions or actions	**Voting** entities: EC manager can launch a vote. These entities store the title, date, description and results of vote. EC_members involved in this action will receive notification for voting. It will store the answer and date of voting of each member.
4	Monthly shares of benefits, advantages and energy	**Reporting** entities: depending on the type of EC and method of sharing, the EC manager will set up monthly the benefits that will be shared between the same EC members. It tracks the shares of members and key actions done within the EC (e.g. new investment etc ...). Here, If it is a trading energy EC so shares will be monetized, if self-consumption EC mainly energy production will be shared.

For the Secure Energy Flow Monitoring component in DLT Secure Platform, Table 24 shows the outputs generated along with the corresponding entities within the Context Broker.

Table 24 Outputs and generated types by Secure Energy Flow Monitoring

Output	Description	Outputs / Generated types of entities
1	Aggregated readings	**AggregatedEnergySeries**: The information provided by this output are series of aggregated values per meter on a daily/weekly/monthly format

For the Data Healing component in DLT Secure Platform, Table 25 shows the outputs generated along with the corresponding entities within the Context Broker.

Table 25 Outputs and generated types by Data Healing

Output	Description	Outputs / Generated types of entities
1	Healed Values	**DeviceMeasurement**: The output of this component is a healed data series for those raw series that need healing

Once all the outputs and data models have been defined, and since we follow the NGSI-LD standard using linked data semantics, a *context.jsonld* file has been created. This file includes all the previously mentioned entities and links them with their respective JSON schema. This allows to interpret, validate and understand the meaning of each of the entities generated in the platform.

An example of a schema is shown below:

```
{
    "$schema": "http://json-schema.org/schema#",
    "$schemaVersion": "0.0.1",
    "$id": "https://masterpiece.odins.es/data-models/Building-schema.jsonld",
```

```
"title": " Masterpiece Data Models - Building schema",

"description": "Stores information about a building",

"type": "object",

"allOf": [

  {

    "properties": {

      "type": {

        "type": "string",

        "enum": [

          "Building"

        ],

        "description": "NGSI Entity type. It has to be Building"

      },

      "address": {

        "type": "Property",

        "description": "Property. Address of the building, including locality, postal code and street"

      },

      "area": {

        "type": "Property",

        "description": "Property. Area of the building (Polygon with 3 or more coordinates)"

      },

      "category": {

        "type": "Property",

        "description": "Property. Category of the building (see https://github.com/smart-data-models/dataModel.Building/blob/master/Building/doc/spec.md for the latest list of well-known values)"

      },

      "refEnergyCommunity": {

        "type": "Relationship",

        "description": "Relationship. Link to the Energy Community"

      },

      "description": {

        "type": "Property",

        "description": "Property. Description"

      },

      "location": {

        "type": "Property",

        "description": "Property. Location of the building (1 point)"

      }

    }

  }
```

```
  ],
  "required": [
    "id",
    "type",
    "address",
    "area",
    "category",
    "refEnergyCommunity",
    "description",
    "location"
  ]
}
```

This schema belongs to the representation of a building, in which you can see its different attributes such as address, area or category among others.

By aligning all component inputs and outputs with a common, integrated data model based on a recognized standard, interoperability and seamless integration between various tools is facilitated. This allows any tool to seamlessly consume data from any other tool.

6 FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS

This chapter aims to provide the functional and non-functional requirements of each component. The original template was in Deliverable 4.1 and the updated version is provided in Section 8.2 of the Annexes. In this chapter these templates are already completed by each component.

These requirements are crucial for guiding the development, integration, and validation of the MASTERPIECE digital platform's components. These requirements ensure that each component (and therefore tool) aligns with the platform's overall technical objectives and supports the needs of energy communities.

The definition of both types of requirements and templates were already presented in section 3 of Deliverable 4.1 which can be summarised as follows:

- **Functional requirements** outline the specific behaviours and interactions of components, such as interfaces, data flows, or other assumptions.
- **Non-functional requirements** focus on critical aspects like performance, scalability, interoperability, security, and usability, ensuring that the platform meets industry standards, supports adaptability, and complies with regulations.

6.1 Functional Requirements

6.1.1 MEET APP

Table 26 Functional requirement – MEETAPP-01

ID	FR-MEETAPP-01
REQUIREMENT	Create social discussions and events in the app
DESCRIPTION	The app should allow users to create new social discussions and events to share knowledge and organize community initiatives.
COMPONENT(S)	Meet App
SCOPE	Group 2
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	The app will provide a social section, where users can create a new discussion or event. Once the details of the discussion or event have been added, they will be created and stored in the backend.
ACCOMPLISHMENT	IN PROGRESS

Table 27 Functional requirement – MEETAPP-02

ID	FR-MEETAPP-02
REQUIREMENT	Visualize geo-localized social discussions and events in a map

DESCRIPTION	The app should have a section dedicated to the visualization of the social discussions and events in a map, for users to be able to easily identify the ones closest to them.
COMPONENT(S)	Meet App
SCOPE	Group 2
PRIORITY	MEDIUM
MANDATORY	NO
VALIDATION METHOD	The Discover section will contain a subsection to visualize social discussions and events in the map in their actual location.
ACCOMPLISHMENT	IN PROGRESS

Table 28 Functional requirement – MEETAPP-03

ID	FR-MEETAPP-03
REQUIREMENT	Include a geo-based search functionality
DESCRIPTION	In the social section, the Meet App should allow users to search discussions and events close to them thanks to a geo-based search functionality
COMPONENT(S)	Meet App
SCOPE	Group 2
PRIORITY	LOW
MANDATORY	NO
VALIDATION METHOD	The user will be able to insert a given location and easily see discussions and events close to it.
ACCOMPLISHMENT	IN PROGRESS

Table 29 Functional requirement – MEETAPP-04

ID	FR-MEETAPP-04
REQUIREMENT	Include a learning section
DESCRIPTION	The app should have a section with a range of digital learning material (technical knowledge, public resources, success stories) to help users become more familiar with the key concepts related to energy communities
COMPONENT(S)	Meet App
SCOPE	Group 2
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	The content should be visible in the section and users should be able to access it
ACCOMPLISHMENT	IN PROGRESS

Table 30 Functional requirement – MEETAPP-05

ID	FR-MEETAPP-05

REQUIREMENT	Include a quiz in the learning section
DESCRIPTION	In the learning section, the Meet App should provide a quiz feature to engage users and allow them to assess their knowledge acquisition
COMPONENT(S)	Meet App
SCOPE	Group 2
PRIORITY	MEDIUM
MANDATORY	NO
VALIDATION METHOD	The user will be able to complete the quiz, submit it, and view their score immediately after submission. Once created through the app, quiz results will be stored in the backend.
ACCOMPLISHMENT	IN PROGRESS

Table 31 Functional requirement – MEETAPP-06

ID	FR-MEETAPP-06
REQUIREMENT	Collect user feedback on the learning content
DESCRIPTION	In the learning section, the Meet App should collect user feedback on the quality or usefulness of a given resource
COMPONENT(S)	Meet App
SCOPE	Group 2
PRIORITY	LOW
MANDATORY	NO
VALIDATION METHOD	The user will be able to give a score to the quality of a given learning resource. These will be stored in the backend.
ACCOMPLISHMENT	IN PROGRESS

6.1.2 RECOMME

Table 32 Functional requirement - RCM-Profiling-01

ID	FR-RCM-Profiling-01
REQUIREMENT	Produce profiles of existing and potential members
DESCRIPTION	Produce profiles and adequately characterise the users based on their answers inside RECOMME
COMPONENT(S)	Community Members Profiling
SCOPE	GROUP-2
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Test generated outcomes once users start using RECOMME
ACCOMPLISHMENT	IN PROGRESS

Table 33 Functional requirement - RCM-Clustering-01

ID	FR-RCM-Clustering-01
REQUIREMENT	Generate clusters of existing members
DESCRIPTION	Group similar users together based on their generated profiles or their answers inside RECOMME
COMPONENT(S)	Profile Clustering
SCOPE	GROUP-2
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Test generated outcomes once users start using RECOMME
ACCOMPLISHMENT	IN PROGRESS

Table 34 Functional requirement - RCM-Recommend-01

ID	FR-RCM-Recommend-01
REQUIREMENT	Send personalized recommendations to users
DESCRIPTION	Send tailored recommendations to EC members to encourage them to adopt a more eco-friendly behaviour
COMPONENT(S)	EC Active Competition framework
SCOPE	GROUP-2
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Test generated outcomes once users start using RECOMME
ACCOMPLISHMENT	IN PROGRESS

6.1.3 DR-FLEX

Table 35 Functional requirement - DSO-FLEX-SIM-01

ID	FR-DSO-FLEX-SIM-01
REQUIREMENT	To generate the flexibility signals coming from the distribution system operator
DESCRIPTION	The DSO emulator tool generates flexibility requests based on the energy consumption data of the EC. It generates synthetic congestion scenarios and generates flexibility requests for the energy management system.
COMPONENT(S)	DSO flexibility signal
SCOPE	DR-FLEX
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	We sent test signals to the DLT Secure Platform

ACCOMPLISHMENT	Yes

ID	FR-PVFORECAST-01
REQUIREMENT	Collect and preprocess data for training the model
DESCRIPTION	Retrieve historical PV generation from the context broker and retrieve real time weather data then preprocessing it and join it together.
COMPONENT(S)	PV Generation Forecast
SCOPE	DR-FLEX
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	After receiving the data from the context broker, the PV generation forecast has successfully consumed it.
ACCOMPLISHMENT	YES

ID	FR-PVFORECAST-02
REQUIREMENT	Forecast 36-hour values of PV generation and send them to the context broker.
DESCRIPTION	After training on historical data and real time data collected from device measurements entities the model forecast 36 hour values of PV generation. Then those values are sent automatically to the context broker every day at midnight via patch request to the context broker.
COMPONENT(S)	PV Generation Forecast
SCOPE	DR-FLEX
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	The forecasted values were sent successfully to the context broker. When sending a get request to the context broker we can visualise them.
ACCOMPLISHMENT	YES

ID	FR-EC-DR-OPTIMIZER-01
REQUIREMENT	Data availability to feed the optimiser for adequate time period.
DESCRIPTION	Ensure availability of data in an offline manner for the required inputs and establish scenarios regarding the operation of market, for adequate period. These actions will provide sufficient feedback towards adding operational and objective-related functionalities to the optimization scheme.
COMPONENT(S)	Optimized-EC-Energy-and-Flexibility-Management

SCOPE	Management-Operativity
PRIORITY	**HIGH**
MANDATORY	**YES**
VALIDATION METHOD	Establish a dedicated optimizer per EC-member based on each pilot needs and validate the performance at EC-member and at EC-member-level under a wide set of metrics.
ACCOMPLISHMENT	**IN PROGRESS**

Table 39 Functional requirement - EXPECTED-DEMAND-FLEX-01

ID	**FR-EXPECTED-DEMAND-FLEX-01**
REQUIREMENT	Provide accurate demand-side flexibility predictions.
DESCRIPTION	Predict demand-side flexibility for EC members.
COMPONENT(S)	Expected-Thermal-Demand-and-Flexibility
SCOPE	Management-Operativity
PRIORITY	**HIGH**
MANDATORY	**YES**
VALIDATION METHOD	Test predicted demand flexibility bounds values using the forecasted values for the next day.
ACCOMPLISHMENT	**IN PROGRESS**

Table 40 Functional requirement - DR-MANAGEMENT-ENGINE-01

ID	**FR-DR-MANAGEMENT-ENGINE-01**
REQUIREMENT	Modify demand based on EC optimisation
DESCRIPTION	Adjust demand dynamically for flexibility assets based on optimized EC demand data.
COMPONENT(S)	DR-Management-Engine
SCOPE	Management-Operativity
PRIORITY	**HIGH**
MANDATORY	**YES**
VALIDATION METHOD	Test load adjustments during simulated events.
ACCOMPLISHMENT	**IN PROGRESS**

Table 41 Functional requirement - DR-MANAGEMENT-ENGINE-02

ID	FR-DR-MANAGEMENT-ENGINE-02
REQUIREMENT	Send personalised recommendations to users
DESCRIPTION	Send tailored recommendations to EC members to encourage participation in DR events.
COMPONENT(S)	DR-Management-Engine
SCOPE	Management-Operativity
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Generate personalised recommendations and validate their delivery by monitoring notifications on the user dashboard. Check for accuracy, relevance, and user engagement metrics to assess effectiveness.
ACCOMPLISHMENT	IN PROGRESS

Table 42 Functional requirement - DR- MANAGEMENT-ENGINE-03

ID	FR-DR-MANAGEMENT-ENGINE-03
REQUIREMENT	Actuate on controllable devices during events
DESCRIPTION	Automatically control actuable devices like HVAC to meet optimised demand during events.
COMPONENT(S)	DR-Management-Engine
SCOPE	Management-Operativity
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	During simulated demand response events, send control commands to actuable devices and monitor their response in real-time. Ensure devices adjust as per optimised demand settings. Validate through system logs and device feedback to confirm successful and timely actuation.
ACCOMPLISHMENT	IN PROGRESS

6.1.4 SIT

Table 43 Functional requirement – OPT-SIZING-01

ID	FR-OPT-SIZING-01

REQUIREMENT	Optimal sizing under demand response consideration
DESCRIPTION	Compute optimal sizes for the assets considering demand response capability of the EC members.
COMPONENT(S)	Optimal sizing tool
SCOPE	SIT
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	We received PV generation, energy consumption, capex, OPEX data for PV and battery from RDIUP in the form of a compatible JSON file. The data was used to compute optimal sizes.
ACCOMPLISHMENT	YES

Table 44 Functional requirement - SIT -01

ID	FR-SIT-01
REQUIREMENT	Trade-offs for maximizing savings and increasing decarbonization with multi-parametric factors
DESCRIPTION	Generate a sustainable planning including all KPIs, simulation and optimization results
COMPONENT(S)	SIT
SCOPE	GROUP-1
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Already tested with ALEC and it will tested through guidelines with NGENIC, SEIN and SUST
ACCOMPLISHMENT	IN PROGRESS

6.1.5 ECOOP

Table 45 Functional requirement - ECOOP-01

ID	FR-ECOOP-01
REQUIREMENT	Digitalise the joining process and automate the process of participation and reporting
DESCRIPTION	Generate a sustainable planning including all KPIs, simulation and optimization results
COMPONENT(S)	Joining and participation
SCOPE	GROUP-2
PRIORITY	HIGH
MANDATORY	YES

VALIDATION METHOD	Guidelines will be defined to test ECOOP with Solévent and les Mureaux pilots. Workshops and meetings will be organized to collect feedback
ACCOMPLISHMENT	IN PROGRESS

6.1.6 COMPASS

Table 46 Functional requirement – COMPASS-01

ID	FR-COMPASS-01
REQUIREMENT	Include a catalogue of incentives
DESCRIPTION	The website should offer a section with a range of incentives for energy community projects, including tailored funding schemes, technical assistance, capacity-building programs, and policy guidance resources.
COMPONENT(S)	COMPASS
SCOPE	Group 1
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	The app will provide a Resources section, where users can easily browse incentives, see relevant information and get details
ACCOMPLISHMENT	IN PROGRESS

Table 47 Functional requirement – COMPASS-02

ID	FR-COMPASS-02
REQUIREMENT	Search and filter functionality for incentives
DESCRIPTION	The website should allow users to enter keywords and apply tailored filters to obtain relevant incentive results.
COMPONENT(S)	COMPASS
SCOPE	Group 1
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	The website UI will offer users the possibility to browse and filter incentives by using keywords or applying a selection of tailored filters (e.g., the targeted EC phase, the location, and so on)
ACCOMPLISHMENT	IN PROGRESS

Table 48 Functional requirement – COMPASS-03

ID	FR-COMPASS-03
REQUIREMENT	Provide sub-filters to further refine search results
DESCRIPTION	After the search, the website should allow users to further refine results using sub-filters

COMPONENT(S)	COMPASS
SCOPE	Group 1
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	The search results page will also include a box to apply sub-filters to refine the results (e.g., type of funding, status)
ACCOMPLISHMENT	IN PROGRESS

Table 49 Functional requirement – COMPASS-04

ID	FR-COMPASS-04
REQUIREMENT	Offer possibility to contact Energy Community experts
DESCRIPTION	The website should offer the possibility to contact experts to get help build and sustain a successful community energy initiative
COMPONENT(S)	COMPASS
SCOPE	Group 1
PRIORITY	LOW
MANDATORY	NO
VALIDATION METHOD	The website will include an Expert section where the user will be able to connect to a network of professionals with specialized knowledge in the technical, legal, social, and financial aspects of energy communities
ACCOMPLISHMENT	IN PROGRESS

6.1.7 MAPS Digital Energy Manager

Table 50 Functional requirement - MAPS-DEM-1

ID	FR-MAPS-DEM-1
REQUIREMENT	Estimate the incentive of the Renewable Energy Community (REC) or Collective Self-Consumption groups (CSC)
DESCRIPTION	Estimate the economic incentive of the REC or CSC and divide it among the members based on a custom algorithm defined by the REC manager
COMPONENT(S)	MAPS-DEM
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	The correctness of the calculations carried out is checked through simulations and validated during the pilot project (Berchidda - IT) by comparing it with the actual incentives paid.
ACCOMPLISHMENT	IN PROGRESS

Table 51 Functional requirement - MAPS-DEM-2

ID	FR-MAPS-DEM-2
REQUIREMENT	Monitor the energy of members of a renewable energy community
DESCRIPTION	MAPS DEC must be able to incorporate the field measurements of the main smart meter of the building belonging to a community and represent them correctly.
COMPONENT(S)	MAPS-DEM
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	The correctness of the calculations carried out is checked through simulations and validated during the pilot project (Berchidda - IT).
ACCOMPLISHMENT	IN PROGRESS

Table 52 Functional requirement - MAPS-DEM-3

ID	FR-MAPS-DEM-3
REQUIREMENT	Optimize resource use through Artificial Intelligence algorithms
DESCRIPTION	MAPS DEC should provide forecasts and optimizations, using algorithms provided by other tools, based on Artificial Intelligence, for energy efficiency and to improve the balance of production and consumption to maximise shared energy and incentives.
COMPONENT(S)	MAPS-DEM
SCOPE	GLOBAL
PRIORITY	MEDIUM
MANDATORY	NO
VALIDATION METHOD	The correctness of the calculations carried out is checked through simulations and validated during the pilot project (Berchidda - IT).
ACCOMPLISHMENT	IN PROGRESS

Table 53 Functional requirement - MAPS-DEM-4

ID	FR-MAPS-DEM-4
REQUIREMENT	Carry out energy aggregates
DESCRIPTION	MAPS DEC should be able to provide energy aggregates of the resources underlying a REC to ensure the energy flexibility necessary to maximize incentives
COMPONENT(S)	MAPS-DEM
SCOPE	GLOBAL
PRIORITY	MEDIUM

MANDATORY	YES
VALIDATION METHOD	The correctness of the calculations carried out is checked through simulations and validated during the pilot project (Berchidda - IT).
ACCOMPLISHMENT	IN PROGRESS

6.1.8 DLT Secure Platform

Table 54 Functional requirement - IoT-PLATFORM-01

ID	FR-IoT-PLATFORM-01
REQUIREMENT	Real-Time Data storage / management
DESCRIPTION	The FIWARE IoT platform must store/share real-time data.
COMPONENT(S)	FIWARE IoT PLATFORM - Real-Time Data Repository
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	A Jenkins Pipeline process, through API requests, monitors frequently updated entities (such as device measurements) to detect if the data is being stored.
ACCOMPLISHMENT	IN PROGRESS

Table 55 Functional requirement - IoT-PLATFORM-02

ID	FR-IoT-PLATFORM-02
REQUIREMENT	Historical Data storage / management
DESCRIPTION	The FIWARE IoT platform must store/share historical data.
COMPONENT(S)	FIWARE IoT PLATFORM - Historical Data Repository
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	A Jenkins Pipeline process, through API requests, monitors frequently updated entities (such as device measurements) to detect if the data is being stored.
ACCOMPLISHMENT	IN PROGRESS

Table 56 Functional requirement – S&P-ENGINE-01

ID	FR-S&P-ENGINE-01
REQUIREMENT	Authentication (anonymous credentials)
DESCRIPTION	The security process, exposed by the "Security and Privacy Engine", must offer an authentication process that uses anonymous credentials.
COMPONENT(S)	Security and Privacy Engine
SCOPE	GLOBAL

PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Jenkins Pipeline accesses the component API (test case included in deliverable D5.7).
ACCOMPLISHMENT	YES

Table 57 Functional requirement – S&P-ENGINE-02

ID	FR-S&P-ENGINE-02
REQUIREMENT	Authorization (access control policies)
DESCRIPTION	The security process, exposed by the "Security and Privacy Engine", must offer an authorization environment, based on access control policies, for data authorization purposes.
COMPONENT(S)	Security and Privacy Engine
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Jenkins Pipeline accesses the component API (test case included in deliverable D5.7).
ACCOMPLISHMENT	YES

Table 58 Functional requirement – S&P-ENGINE-03

ID	FR-S&P-ENGINE-03
REQUIREMENT	Cryptography (public key)
DESCRIPTION	The privacy process, exposed by the "Security and Privacy Engine", must offer a secure environment, based on encryption/decryption policies, for data confidentiality purposes.
COMPONENT(S)	Security and Privacy Engine
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Component developers will decide where the privacy support can be activated and at least one of them will be chosen to demonstrate how only users with valid credentials (attribute-based) can access to encrypted data.
ACCOMPLISHMENT	IN PROGRESS

Table 59 Functional requirement - Data-Healing-01

ID	FR-Data Healing-01
REQUIREMENT	Anomaly Detection and Correction

DESCRIPTION	Detect outliers, missing values, and duplicates in IoT data, and correct them using advanced statistical, ML, and DL imputation techniques.
COMPONENT(S)	Data Healing
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Since ground-truth data is not available for real-time data streams, the requirement's success will be evaluated in relation to benchmarks from similar applications in existing literature, acknowledging an intrinsic and abstract measurement of accuracy.
ACCOMPLISHMENT	IN PROGRESS

Table 60 Functional requirement - Data-Healing-02

ID	FR-Data-Healing-02
REQUIREMENT	Integration and Communication
DESCRIPTION	Securely retrieve data from the Fiware IoT platform, process it, and synchronize corrected data back to the platform in real-time or batch mode.
COMPONENT(S)	Data Healing
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Conduct integration tests by evaluating data retrieval and correction operations, verifying the accuracy and synchronisation of corrected data with the IoT Fiware platform and ensuring secure data transfer protocols are operational.
ACCOMPLISHMENT	IN PROGRESS

Table 61 Functional requirement - SEC-ENERGY-FLOW-01

ID	FR-SEC-ENERGY-FLOW-01
REQUIREMENT	Data preparation before storing them in the blockchain/Data aggregation
DESCRIPTION	Aggregates energy consumption/generation data from devices over specified periods, aggregates to the blockchain according to the aggregation type (daily/ weekly/monthly) and updates the Context Broker. Provide API wrapper to make blockchain reading accessible to the public.
COMPONENT(S)	Secure Energy Flow Monitoring
SCOPE	Global
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Testing for a given timestamp if the data is fetched from the device measurement properly, if the data format is set according to aggregation type,

	and if data is successfully stored in the blockchain, context broker updated successfully
ACCOMPLISHMENT	YES

6.2 Non-functional Requirements

6.2.1 MEET APP

Table 62 Non-functional requirement – MEETAPP-01

ID	NFR-MEETAPP-01
REQUIREMENT	Clear interface
DESCRIPTION	The app should provide a clear interface, for user to easily familiarize with the concept of energy communities. All available content should be easily reachable and browsable.
COMPONENT(S)	Meet App
SCOPE	Group 2
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	The interface will be friendly, usable and easy to understand and interact with. Minimal designs will be preferred.
ACCOMPLISHMENT	IN PROGRESS

Table 63 Non-functional requirement – MEETAPP-02

ID	NFR-MEETAPP-02
REQUIREMENT	Compatibility with multiple devices
DESCRIPTION	The app functionalities should be available on a large number of devices, to maximize the user reach.
COMPONENT(S)	Meet App
SCOPE	Group 2
PRIORITY	MEDIUM
MANDATORY	NO
VALIDATION METHOD	The technological stack of the app is chosen to ensure cross-platform compatibility with Apple and Android devices.
ACCOMPLISHMENT	YES

Table 64 Non-functional requirement – MEETAPP-03

ID	NFR-MEETAPP-03
REQUIREMENT	High interoperability
DESCRIPTION	The app will ensure high interoperability for data exchanges with other tools and platforms (e.g., Real-Time Data Repository)
COMPONENT(S)	Meet App

SCOPE	Group 2
PRIORITY	MEDIUM
MANDATORY	NO
VALIDATION METHOD	The app will use APIs and the JSON data format for all external communications
ACCOMPLISHMENT	YES

6.2.2 RECOMME

Table 65 Non-functional requirement – RCM-Profiling-01

ID	NFR-RCM-Profiling-01
REQUIREMENT	Member profiling availability
DESCRIPTION	The Member Profiling service must ensure that it will always be available to users
COMPONENT(S)	Community Members Profiling
SCOPE	Group-2
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	Test responses and availability of outcomes once RECOMME becomes available to users
ACCOMPLISHMENT	IN PROGRESS

Table 66 Non-functional requirement – RCM-Clustering-01

ID	NFR-RCM-Clustering-01
REQUIREMENT	Clustering of members availability
DESCRIPTION	The Clustering service must ensure that it will always be available to users
COMPONENT(S)	Profile-Clustering
SCOPE	Group-2
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	Test responses and availability of outcomes once RECOMME becomes available to users
ACCOMPLISHMENT	IN PROGRESS

Table 67 Non-functional requirement – RCM-Recommend-01

ID	NFR-RCM-Recommend-01
REQUIREMENT	Availability of generated recommendations
DESCRIPTION	The component must always be ready to produce recommendations when users want them
COMPONENT(S)	EC-Active-Competition-framework
SCOPE	Group-2
PRIORITY	MEDIUM
MANDATORY	YES

VALIDATION METHOD	Test responses and availability of outcomes once RECOMME becomes available to users
ACCOMPLISHMENT	IN PROGRESS

Table 68 Non-functional requirement - RCM-Recomend-02

ID	NFR-RCM-Recommend-02
REQUIREMENT	Scalability of generated recommendations
DESCRIPTION	The system must be capable of scaling to manage hundreds of users inside an EC and perform as expected when the users are increased
COMPONENT(S)	EC-Active-Competition-framework
SCOPE	Group-2
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	Test responses and availability of outcomes once RECOMME becomes available to users
ACCOMPLISHMENT	IN PROGRESS

6.2.3 DR-FLEX

Table 69 Non-functional requirement - DSO-FLEX-SIM-01

ID	NFR-DSO-FLEX-SIM-01
REQUIREMENT	Availability
DESCRIPTION	Every day at midnight, the DSO flexibility signal should be sent to the USEF interpreter and created into the platform
COMPONENT(S)	DSO Flexibility Signals Component
SCOPE	DR-FLEX
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	Periodically, check the most recent flexibility signals to ensure the daily operation of the service.
ACCOMPLISHMENT	YES

Table 70 Non-functional requirement - PVFORECAST-01

ID	NFR-PVFORECAST-01
REQUIREMENT	Data Availability
DESCRIPTION	The PV generation forecast must ensure the availability of forecasted data for 36 hours everyday
COMPONENT(S)	PV Generation Forecast
SCOPE	DR-FLEX
PRIORITY	HIGH

MANDATORY	YES
VALIDATION METHOD	Query the system using GET requests at random intervals over 24 hours to check for forecast data availability.
ACCOMPLISHMENT	YES

Table 71 Non-functional requirement - EC-DR-OPTIMIZER-01

ID	NFR-EC-DR-OPTIMIZER-01
REQUIREMENT	Ensure beneficial performance based on the desired objectives per pilot, i.e., cost minimization, maximization of PV energy produced utilization etc.
DESCRIPTION	The component should be able to deliver demand profiles at both EC-level and EC-member-level to subsequently be used from DR-Management-Engine.
COMPONENT(S)	Optimized-EC-Energy-and-Flexibility-Management
SCOPE	Management-Operativity
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	Validation will be performed through performance evaluation, assessing cost reduction, energy reduction. PV self-consumption, PV self-sufficiency and other related metrics to achieve the defined objectives per pilot case.
ACCOMPLISHMENT	IN PROGRESS

Table 72 Non-functional requirement - EXPECTED-DEMAND-FLEX-01

ID	NFR-EXPECTED-DEMAND-FLEX-01
REQUIREMENT	Ensure high performance, reliability, scalability and accuracy for demand-side flexibility predictions.
DESCRIPTION	The component should be able to deliver accurate predictions of demand-side flexibility with high reliability and usability.
COMPONENT(S)	Expected-Thermal-Demand-and-Flexibility
SCOPE	Management-Operativity
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	Validation will be performed through performance evaluation, assessing prediction accuracy and responsiveness under different operational conditions.
ACCOMPLISHMENT	IN PROGRESS

Table 73 Non-functional requirement - DR-MANAGEMENT-ENGINE-01

ID	NFR-DR-MANAGEMENT-ENGINE-01
REQUIREMENT	Scalability to Support High Volume of Devices
DESCRIPTION	The system must be capable of scaling to manage hundreds of devices and actuators within the Energy Community, ensuring performance is maintained even as the number of controlled assets increases.
COMPONENT(S)	DR-Management-Engine
SCOPE	Management-Operativity
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	Validate scalability by simulating distributed and asynchronous task queues for device control commands. Ensure the queuing mechanism effectively handles high volumes, with load balancing across distributed workers.
ACCOMPLISHMENT	IN PROGRESS

6.2.4 SIT

Table 74 Non-functional requirement - OPT-SIZING-01

ID	NFR-OPT-SIZING-01
REQUIREMENT	Availability
DESCRIPTION	When receiving requests, the tool should return the optimal sizes.
COMPONENT(S)	Optimal sizing tool
SCOPE	SIT
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	When querying the tool more than one time, we receive the optimal sizes.
ACCOMPLISHMENT	YES

Table 75 Non-functional requirement – SIT-01

ID	NFR-SIT -01
REQUIREMENT	Planning explainability and clarity
DESCRIPTION	The SIT will ensure that interfaces are user friendly, and results are relevant, clear, comprehensive and explained
COMPONENT(S)	Sustainable-Planning
SCOPE	Group-1
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	Questionnaire for user experience and clarity will be provided
ACCOMPLISHMENT	IN PROGRESS

6.2.5 ECOOP

Table 76 Non-functional requirement – ECOOP-01

ID	NFR- ECOOP-01
REQUIREMENT	Attractiveness and ease of use
DESCRIPTION	ECOOP is offering a gamified way of joining in order engage and facilitate the joining processes. ECOOP must be guarantee simplicity during utilization and increase the participation of EC-members in the digital EC.
COMPONENT(S)	Joining and participation tool
SCOPE	Group-2
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	A survey will be prepared to assess the usability and evaluate the retention of EC-Members
ACCOMPLISHMENT	IN PROGRESS

6.2.6 COMPASS

Table 77 Non-functional requirement – COMPASS-01

ID	NFR-COMPASS-01
REQUIREMENT	Clear interface
DESCRIPTION	The aim of the website is to allow an easy incentive search and discovery. Therefore, the UI should be clear and comfortable, and incentives should be presented in a clever way.
COMPONENT(S)	COMPASS
SCOPE	Group 1
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	The web UI will be friendly, usable and easy to understand and interact with. Incentives will be easy to search and navigate.
ACCOMPLISHMENT	IN PROGRESS

Table 78 Non-functional requirement – COMPASS-02

ID	NFR-COMPASS-02
REQUIREMENT	Easily updatable and extensible content-wise
DESCRIPTION	The COMPASS addresses a large audience by gathering a variety of incentives, that need continuous updates. The tool should be easily edited and maintained, even by people without an IT background.
COMPONENT(S)	Compass
SCOPE	Group 1
PRIORITY	HIGH

MANDATORY	YES
VALIDATION METHOD	The COMPASS web tool allows the insertion, update and removal of incentives with flexible attributes with a simple interface and no programming skills required.
ACCOMPLISHMENT	YES

6.2.7 MAPS Digital Energy Manager

Table 79 Non-functional requirement – MAPS-DEM-01

ID	NFR-MAPS-DEM-01
REQUIREMENT	Simple and intuitive user interface
DESCRIPTION	MAPS DEC should guarantee a simple and intuitive user interface that allows the users to view the fundamental elements of the system (energy and economic incentives) at a glance.
COMPONENT(S)	MAPS DEM
SCOPE	GLOBAL
PRIORITY	MEDIUM
MANDATORY	NO
VALIDATION METHOD	The correctness of the calculations carried out is checked through simulations and validated during the pilot project (Berchidda - IT).
ACCOMPLISHMENT	IN PROGRESS

Table 80 Non-functional requirement – MAPS-DEM-02

ID	NFR-MAPS-DEM-02
REQUIREMENT	Availability 24 hours a day
DESCRIPTION	MAPS DEC must guarantee 24-hour availability of the system to be able to receive all measurements without interruptions
COMPONENT(S)	MAPS DEM
SCOPE	GLOBAL
PRIORITY	LOW
MANDATORY	NO
VALIDATION METHOD	The correctness of the calculations carried out is checked through simulations and validated during the pilot project (Berchidda - IT).
ACCOMPLISHMENT	IN PROGRESS

Table 81 Non-functional requirement – MAPS-DEM-03

ID	NFR-MAPS-DEM-03
REQUIREMENT	Security
DESCRIPTION	MAPS DEC should implement OWASP best practices on security in order to guarantee the confidentiality and security of data both at-rest and in-transit.
COMPONENT(S)	MAPS DEM
SCOPE	GLOBAL

PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	The correctness of the calculations carried out is checked through simulations and validated during the pilot project (Berchidda - IT).
ACCOMPLISHMENT	IN PROGRESS

Table 82 Non-functional requirement – MAPS-DEM-04

ID	NFR-MAPS-DEM-04
REQUIREMENT	Performance
DESCRIPTION	MAPS DEC must provide suitable performance to guarantee an adequate user experience.
COMPONENT(S)	MAPS DEM
SCOPE	GLOBAL
PRIORITY	MEDIUM
MANDATORY	YES
VALIDATION METHOD	The correctness of the calculations carried out is checked through simulations and validated during the pilot project (Berchidda - IT).
ACCOMPLISHMENT	IN PROGRESS

6.2.8 DLT Secure Platform

Table 83 Non-functional requirement - IoT-PLATFORM-01

ID	NFR-IoT-PLATFORM-01
REQUIREMENT	Real-Time Data storage availability
DESCRIPTION	Real-Time Data stored in the FIWARE IoT Platform must always be available to allow read and write actions.
COMPONENT(S)	FIWARE IoT PLATFORM - Real-Time Data Repository
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Jenkins Pipeline accesses the component API (test case included in deliverable D5.7).
ACCOMPLISHMENT	IN PROGRESS

Table 84 Non-functional requirement - IoT-PLATFORM-02

ID	NFR-IoT-PLATFORM-02
REQUIREMENT	Historical Data storage availability
DESCRIPTION	Historical Data stored in the FIWARE IoT Platform must always be available to allow read and write actions.
COMPONENT(S)	FIWARE IoT PLATFORM - Historical Data Repository

SCOPE	GLOBAL
PRIORITY	**HIGH**
MANDATORY	**YES**
VALIDATION METHOD	Jenkins Pipeline accesses the component API (test case included in deliverable D5.7).
ACCOMPLISHMENT	**IN PROGRESS**

Table 85 Non-functional requirement - IoT-PLATFORM-03

ID	**NFR-IoT-PLATFORM-03**
REQUIREMENT	Historical Data storage scalability/efficiency
DESCRIPTION	The FIWARE IoT platform must ensure the scalability of the system.
COMPONENT(S)	FIWARE IoT PLATFORM - Historical Data Repository
SCOPE	GLOBAL
PRIORITY	**HIGH**
MANDATORY	**YES**
VALIDATION METHOD	Following the recommendations of the internal software module used by the Data Repository (Elasticsearch): HTTPS://WWW.ELASTIC.CO/GUIDE/EN/ELASTICSEARCH/REFERENCE/CURRENT/SIZE-YOUR-SHARDS.HTML For integration purposes, historical data for all entities of the same type is stored in the same fragment. When this fragment reaches 20 GB, a new fragment will be used. This solution ensures scalability and efficiency so that limitations will be linked to the resources dedicated to the historical storage environment, not to the component itself. As part of the *Verification Plan* mentioned in D5.1, a Jenkins Pipeline will check whether the creation of new fragments works as documented.
ACCOMPLISHMENT	**IN PROGRESS**

Table 86 Non-functional requirement - S&P-ENGINE-01

ID	**NFR-S&P-ENGINE-01**
REQUIREMENT	Security process availability
DESCRIPTION	The security process, exposed by the "Security and Privacy Engine", must offer mechanisms that allow access to its functionality.
COMPONENT(S)	Security and Privacy Engine
SCOPE	GLOBAL
PRIORITY	**HIGH**
MANDATORY	**YES**
VALIDATION METHOD	Jenkins Pipeline accesses the component API (test case included in deliverable D5.7).
ACCOMPLISHMENT	**IN PROGRESS**

Table 87 Non-functional requirement - S&P-ENGINE-02

ID	NFR-S&P-ENGINE-02
REQUIREMENT	Security process scalability
DESCRIPTION	The security process, exposed by the "Security and Privacy Engine", must consider solutions that support a high number of requests (network traffic).
COMPONENT(S)	Security and Privacy Engine
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	To be confirmed whether a specific tool will be used (i.e. Apache Bench) or a Jenkins Pipeline will be created for this purpose
ACCOMPLISHMENT	IN PROGRESS

Table 88 Non-functional requirement- S&P-ENGINE-03

ID	NFR-S&P-ENGINE-03
REQUIREMENT	GDPR compliance
DESCRIPTION	The security and privacy processes, exposed by the "Security and Privacy Engine", must be compliant with GDPR.
COMPONENT(S)	Security and Privacy Engine (KeyCloak, PAP, PDP, Capabi
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Confirm consistency between the security policies defined and the Consent Forms obtained from the owners of the data, and test that they grant access to data only to authorized users, selecting randomly one of each pilot for this test
ACCOMPLISHMENT	IN PROGRESS

Table 89 Non-functional requirement - Data Healing-01

ID	NFR-Data Healing-01
REQUIREMENT	Reliability and Speed
DESCRIPTION	Ensure highly accurate data correction with minimal downtime and maintain low-latency processing to support real-time applications.
COMPONENT(S)	Data-Healing
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	Test the system under varying conditions, referencing benchmarks from literature, to evaluate data correction accuracy and response times, ensuring compliance with real-time processing and applications requirements.
ACCOMPLISHMENT	IN PROGRESS

Table 90 Non-functional requirement - SEC-ENERGY-FLOW-01

ID	NFR-SEC-ENERGY-FLOW-01
REQUIREMENT	Data availability and transparency
DESCRIPTION	Data stored in the blockchain must always be available to allow read and write actions.
COMPONENT(S)	Secure Energy Flow Monitoring
SCOPE	GLOBAL
PRIORITY	HIGH
MANDATORY	YES
VALIDATION METHOD	test case included in deliverable D4.5.
ACCOMPLISHMENT	YES

7 CONCLUSIONS

Deliverable 4.2 marks a point in the development of the MASTERPIECE digital platform, building on the foundations laid in D4.1 while integrating key insights from D4.3. This deliverable focused on refining the platform's architecture, updating the tools and components, and providing the data models necessary to ensure interoperability and adaptability. These updates underscore the platform's capacity to support various stages of the EC journey while aligning with the project's technical and operational objectives.

One of the most significant contributions of this deliverable is the formalisation and completion of functional and non-functional requirements for each component and the creation of the data models. This effort ensures that every tool is aligned with the overarching goals of flexibility, scalability, and user-centric design. Additionally, the focus on data models further strengthens the platform's modularity and reusability, enabling seamless communication between tools and components while being preparing for potential integration with external systems.

Looking forward, the general next steps involve:

1. Refining and finalising development of tools and components to ensure their readiness for deployment.

2. Establishing and refining connections between tools and components to maximise their interoperability and overall functionality.

3. Continuing close collaboration with WP5 to gather both technical and practical feedback, particularly from pilot, ensuring that the digital solution of MASTERPIECE is aligned with end-users.

These steps will set the stage for Deliverable 4.4, which will provide the final modular digital platform and tools. By incorporating both technical advancements and practical validations, D4.4 will represent the culmination of WP4's contributions to the MASTERPIECE project.

8 ANNEXES

8.1 Summary of the evolution of the components ID (D4.1 to D4.2)

MEET APP					
Component Name	**Component ID**	**Old Name**	**Old ID**	**Partner**	**Task Related**
Meet App	**MEETAPP**	Same	Same	R2M	T4.1

RECOMME					
Component Name	**Component ID**	**Old Name**	**Old ID**	**Partner**	**Task Related**
Community Members Profiling	**RCM-PROFILING**	Same	CERTH-MEMBERS-PROFILING-TASK3.4	CERTH	T3.4
Profile Clustering	**RCM-Clustering**	Same	EXP-MEMBERS-CLUSTERING—EC-MODELING-TASK3.4	CERTH	T3.4
EC Active Competition framework	**RCM-Recommend**	Same	EXP-COMMUNITY-COMPETITION-TASK-3.5	CERTH	T3.5

DR-FLEX					
Component Name	**Component ID**	**Old Name**	**Old ID**	**Partner**	**Task Related**
DSO Flexibility Signals Component	**DSO-FLEX-SIM**	NEW	NEW	AMU	T4.4
PV Generation Forecasting component	**PVFORECAST**	PV Generation Forecasting Tool	PVforcast	AMU	T4.4
Optimized EC Energy and Flexibility Management	**EC-DR-OPTIMIZER**	Real-time aggregated flexibility policy optimization	CERTH-END-TO-END-DR-TASK4.4	CERTH	T4.4
Expected Thermal Demand and Flexibility	**EXPECTED-DEMAND-FLEX**	NEW	NEW	CERTH	T4.4
Demand Response Management Engine	**DR-MANAGEMENT-ENGINE**	Demand Response Management Framework	DR-MANAGEMENT-FRAMEWORK	UMU	T4.4

SIT					
Component Name	**Component ID**	**Old Name**	**Old ID**	**Partner**	**Task Related**
Optimal sizing tool	**OPT-SIZING**	NEW	NEW	AMU	T4.2
Smart Investment Tool	**SIT**	Same	Same	RDIUP	T4.2

ECOOP					
Component Name	**Component ID**	**Old Name**	**Old ID**	**Partner**	**Task Related**
EC Joining and participation	**ECOOP-001**	Same	COOP4U	RDIUP	T4.1

COMPASS					
Component Name	**Component ID**	**Old Name**	**Old ID**	**Partner**	**Task Related**
COMPASS	**COMPASS**	NEW	NEW	R2M	T3.1, T4.1

MAPS Digital Energy Manager					
Component Name	**Component ID**	**Old Name**	**Old ID**	**Partner**	**Task Related**
MAPS Digital Energy Manager	**MAPS-DEM**	NEW	NEW	MAPS	T4.3

DLT Secure Platform					
Component Name	**Component ID**	**Old Name**	**Old ID**	**Partner**	**Task Related**
FIWARE IoT Platform	**IoT-PLATFORM**	Same	Same	ODINS	T4.5
Security and Privacy Engine	**S&P-ENGINE**	Same	Same	ODINS	T4.5
Data Healing (Data-Quality Assurance)	**CERTH-DATA-FILTERING-TASK4.5**	Same	Same	CERTH	T4.5
Secure Energy Flow Monitoring	**SEC-ENERGY-FLOW**	Same	Same	AMU	T4.5

8.2 Templates functional and non-functional requirements

Table 91 Functional requirement template-ID

ID	FR-NAME-NUMBER
REQUIREMENT	<SIMPLE REQUIREMENT STATEMENT>
DESCRIPTION	<SHORT REQUIREMENT DESCRIPTION>
COMPONENT(S)	<UNIVOCALLY IDENTIFIED INVOLVED COMPONENT(S) **NAME**>
SCOPE	< UNIVOCALLY IDENTIFIED **EC JOURNEY GROUP***> <***In case your component** is related not directly to a group as it **forms part of** the **DLT Secure platform** and **not a tool**, put here **GLOBAL**>
PRIORITY	<ONE VALUE AMONG {LOW - MEDIUM - HIGH} >
MANDATORY	<ONE VALUE AMONG {YES - NO} >
VALIDATION METHOD	<HOW THE REQUIREMENT WAS ACCOMPLISHED>
ACCOMPLISHMENT	<ONE VALUE AMONG { YES - IN PROGRESS - NO } >

Table 92 Non-functional requirement template-ID

ID	NFR-NAME-NUMBER
REQUIREMENT	<SIMPLE REQUIREMENT STATEMENT>
DESCRIPTION	<SHORT REQUIREMENT DESCRIPTION>
COMPONENT(S)	<UNIVOCALLY IDENTIFIED INVOLVED COMPONENT(S) **NAME**>
SCOPE	< UNIVOCALLY IDENTIFIED **EC JOURNEY GROUP**> <***In case your component** is related not directly to a group as it **forms part of** the **DLT Secure platform** and **not a tool**, put here **GLOBAL**>
PRIORITY	<ONE VALUE AMONG {LOW - MEDIUM - HIGH} >
MANDATORY	<ONE VALUE AMONG {YES - NO} >
VALIDATION METHOD	<HOW THE REQUIREMENT WAS ACCOMPLISHED>
ACCOMPLISHMENT	<ONE VALUE AMONG {YES - IN PROGRESS - NO} >