Enershare

The Energy Data Space for Europe

European Common Energy Data Space Framework Enabling Data Sharing - Driven Across – and Beyond – Energy Services

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D2.4 Business requirements and functional Specification

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Authors	Caterina Sarno (ENG), Konstantinos Kotsalos (ED) and Volker Berkhout (FhG)
Quality Reviewer(s)	Massimo Bertoncini (ENG)
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List of Acronyms

CPO	Charge Point Operator
DER	Distributed Energy Resources
DSO	Distribution System Operator
DSSC	Data Spaces Support Centre
EC	European Commission
EO	Expected Outcome
EV	Electric Vehicle
ICT	Information and communication technology
IDS	International Data Space
IDSA	International Data Space Association
IEA	International Energy Agency
NILM	Non-Intrusive Load Monitoring
REC	Renewable Energy Community
RES	Renewable Energy Source
SGAM	Smart Grid Architecture Model
SLA	Service Level Agreement
TSO	Transmission System Operator

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Executive summary

Deliverable D2.4 is the first output of the Task 2.3 -Overall business concept design and functional specifications. The document is structured in two main chapters: the first one is dedicated to the new stakeholders' roles and their interactions in the Energy Data Value Chain; the second one concerns the overall business concept of the ENERSHARE project.

The project concept was born from the awareness that the data from the energy field can acquire an additional value if intelligently employed in other fields (e.g., e-mobility, health care etc.). Thus, in the aim of identifying all the ENERSHARE stakeholders, the analysis was carried out considering the following main domains:

- Energy domain which involves Electricity, Heat and Gas markets as well as the energy flexibility.
- Non-energy domain: all those sectors which could gain benefits from the sharing of the energy data.

Starting from the project sectors, the research was moved toward the definition of the stakeholders' roles, using the ISO 26000[1] as reference for their identification, and their interactions in the light of the International Data Space (IDS) interactions and roles. Moreover, a deep analysis carried out by FhG with the pilots' leaders allowed to provide information concerning their data infrastructures, which will be integrated to the ENERSHARE European Data Space once the solution is finalized.

The second main section of the deliverable was dedicated to the design of the overall business concept for the ENERSHARE solution. The treatise, in this case, began from a remote brainstorming performed through the whiteboard of the visual collaborative software MIRO[2]. The post-it method was used for collecting inputs from all the WP2 partners regarding their opinion on the value proposition offered by the project to its customers. The ideas carried out by this process were then elaborated and grouped into three main concepts which synthesized the ENERSHARE business offer. The three points were then compared with some existing technologies already present on the market for the energy management services. Moreover, thanks to the collaboration with the pilots' leaders and the analysis of the business cases presented in the D2.1 [23], it was possible to list the business requirements and the business building blocks.

[1] ISO 26000 - Guidance on social responsibility: Basic training material- https://uprdoc.ohchr.org/uprweb/downloadfile.aspx?filename=5752&file=Annexe4
[2] https://miro.com/it/

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The first draft of the overall business concept was the final step of the research work. It was inspired by the "sharing economy" principles and collaborative business models, following the idea that ENERSHARE could connect participants from different sectors for exchanging data and creating shared value. In this context, the Value proposition Canvas[3] was used as a suitable business model tool.

[3] A. Osterwalder, Y. Pigneur, G. Bernarda, A. Smith, *Value Proposition Design: How to Create Products and Services Customers Want*, 2014

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1 Introduction

1.1 About this document

Based on the description provided by the Grant Agreement, D2.4 aims to identify the new roles that emerge in the Energy Data Value Chain, depict the business interactions among the stakeholders and then, design the overall business concept of the project.

The document analyses the key stakeholders of the ENERSHARE ecosystem, including their existing data infrastructures and resources. Moreover, starting from the work conducted in the D2.1- Use cases' descriptions and list of minimum Data Space building blocks required for pilots – the business requirements have been extrapolated from the pilots' use case and used as information source for the definition of the business concept. This information, together with a clearer definition of the project offer and the comparative case study, has allowed to provide a first version of the overall business concept of the project, founded on the principle that the value created by one stakeholder can be forwarded to others through mutually beneficial cooperation.

Overall, this deliverable represents an important outcome of the ENERSHARE project since the knowledge here reported improves the development of the ENERSHARE framework and enables the creation of new business opportunities that leverage the benefits of data sharing and collaboration.

1.2 Intended audience

The document is marked as "Public", thus, beyond being consulted by the consortium partners and the European Commission (EC) representatives tasked with reviewing the project, it will be published on the project website and available for a wider access. This is a common practice in research projects where the dissemination of findings and outcomes is essential for the development and advancement of knowledge in the relevant field. Making project deliverables and reports publicly available can also help to foster collaboration, promote transparency, and facilitate the adoption of new technologies and practices.

1.3 Reading recommendations

The document is divided into 4 chapters:

- Chapter 1 is the introduction.

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- Chapter 2 is dedicated to the identification of the project stakeholders, their roles and business interactions, together with the identification of data infrastructures which currently exist.
- Chapter 3 concerns the steps for designing overall business concept. This chapter starts from the value proposition and the business requirements to get a common vision of the business model proposed for the project.
- Chapter 4 reports the document conclusions.

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2 Energy Data Value Chain: new roles and interactions

2.1 ENERSHARE sectors involved

Energy grids have a vital role for the evolution and growth of modern societies. The electricity grids, especially, play a leading role to ensure secure and economically sustainable energy, providing the continuous integration green renewable technologies. The latest energy crisis has shown the major dependence of European energy system on fossil fuels, a fact which is currently addressed amongst other measures with increased integration of renewables across the grids. Important contribution towards the realization of highly renewable dependent energy sector is to diversify the supply chains, by enabling coordination of flexibility potential among different energy vectors (e.g., gas, heat). Concurrently, the energy systems shall steer cross border energy flows, integrating green generation technologies and distributed flexibilities between TSOs and DSOs.

These evolving new approaches require the definition of cross-sectorial data services, interfaces and applications assuring the necessary interoperability requirements. The ENERSHARE project concept relies on the idea that the data, which came from the energy field, can acquire a value if intelligently employed in other fields, such as e-mobility and health care. Thus, in the aim of identifying all the ENERSHARE stakeholders, the analysis will consider the following project domains:

- Energy domain which involves Electricity, Heat and Gas markets as well as the energy flexibility, enabling cross-sectorial flexibility utilization.
- Non-energy domain: all those sectors which could gain benefits from the sharing of the energy data. A set of non-energy and citizen-centric services leveraging multiple data sources (smart meters, NILM devices, comfort sensors), such as: learning energy utilisation patterns to recognise potential problems and trigger alarms for vulnerable people; identification of energy poverty needs, cold homes and unhealthy environments, enabling the implementation of financial support schemes and alternative tariffs designs for electricity, water, heat, etc.; detect appliance retrofit opportunities in private rental sector and social housing.

Along the Demonstration areas explored in the project, the table below depicts the cross-vector energy coupling as well as the indication of cross-sector data exchanges identified throughout the Use Cases - as reported in D2.1 [23].

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Table 1: ENERSHARE's pilots across non-energy aspects

Pilot case	Energy vector (e.g., electricity, heat) or other	Non-energy data exchanges	Non-energy actors
P1-ES: Wind farm integrated predictive maintenance and supply chain optimization	Renewable energy generation: offshore/onshore wind farms connected to the electricity grid	-	-
Pilot 2 – Use Case 2a – Leveraging on consumer-level load data to improve TSO's operational and planning procedures	Electrical grid	-	-
Pilot 2 – Use Case 2b – Instantiation of energy communities and digital simulation of business models	Electrical grid focusing on energy communities' realization	-	• Min outlet water temp • Shower data (duration, number) • Water thermal capacity (temperature, inlet etc)
Pilot 2 – Use Case 2c - Detect irregularities in energy consumption in households with seniors living alone	Energy domain exploring occupants' well-being	• Humidity • ID Health Care • ID senior • Notification signal irregularity • Notification signal alarm	• Family member of senior • Health care provider

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Pilot 2 – Use Case 2d – Suggest maintenance of appliances based on NILM data	Energy domain: Improve quality of living and energy consumption in households	• NILM analysis results provided to consumers, maintenance services and to appliance producers to improve product design.	-
Pilot 3 – Use Case 3 – Optimal multi-energy vector planning - electricity vs heat	Multi-energy	• Weather data	• Weather service provider
Pilot 4 – Use Case 4 – Digital Twin for optimal data-driven Power-to-Gas planning	Assess and optimize the several quantities related with P2G investments (e.g., electrolyser, buffer and fuel cells optimal capacity and locations).	-	-
Pilot 5 – Use Case 5a – Cross-sector Flexibility Services for aggregators and DSO	Electrical grids: Reduction of reverse power flows into the distribution grid through optimization of self-consumption	-	-
Pilot 5 – Use Case 5b – Services for e-mobility CPOs, EVs drivers and DSO	Electrical grid and mobility sector	• Electric vehicle data	
Pilot 5 – Use Case 5c – Flexibility provision for electricity grid with water	Electrical grid and Water pump demand	• SCADA data of water pumps in network • Results of predictive	Water network operator Connector of Water Network Operator

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pumps and predictive maintenance of the pumps		maintenance analysis	Forecasting Service for Water Network Operator
Pilot 6 – Use Case 6 - Flexibility aggregation from behind-the-meter consumers	Electrical grid: flexibility enabling aggregating behind the meter flexibility	-	-
Pilot 7 – Use case 7 - Cross-value chain services for energy-data driven green financing	Green financing for energy efficiency services	• Mean temperature • Initial Assessment of carbon dioxide emissions • Carrying out construction works in the enclosing structures • Renovation or reconstruction of engineering systems • Installation of a new water heating system • Final building energy costs • Final building technical parameters • Open Weather Data Latvia	-

Currently, the identified services (more to be defined) under Task 6.3 for data-driven service for cross-sector Data Space implementation refer to:

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Table 2: Description of cross-sector data-driven services

Energy/ Non-energy	Service/component	Functions	Integration with ENERSHARE Data Space
Non-energy (mobility)	**EV charging monitoring and remote management** This services intends to address the remote management and Charging session real-time monitoring. Providing the cooperation mechanism between DSOs (Distribution System Operators), CPOs (Charging Point Operators) and EV users, it is possible to reduce the power grid upgrade magnitude by coordinating the electric vehicles charging. DSO monitors the electricity grid and, thanks to accurate forecasting systems, is able to identify how, when and where to charge electric vehicles to avoid congestion problems.	1. Real-time data collection with 1 second sample, frequency 2. Remote charging session start & termination, 3. Remote charging station power output modulation	Data Space allows us to provide real-time energy flexibility and energy balancing services via charging session management to network operators and end-users
Non-energy (environmental)	**Emissions and ecological footprint Service** This service is intended to support the decision-making process of national or local government departments. To achieve this an analytical service will	This service will calculate different types of emissions and ecological footprint based on building's energy consumption. It will also support spatial analysis output.	Data Space allows us to provide data on emissions and ecological footprint and their (spatial) models.

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	be created that calculates emissions and ecological footprint from buildings' energy consumption for heating and cooling, supporting different views and (e)valuations of buildings' energy consumption through emissions and ecological footprint.		
Energy (cross-vector/energy coupling)	**Cross-sector operators' portal** This data driven service will be leveraged with service developed on 6.2 (related to Flexibility Register), to provide an open portal to report flexibility services that can be used in cross-sector manner, e.g., raising awareness among operators	1. Collect Flexibility Register data if available. 2. Report grid issues (congestion management incident etc) 3. Provide access to other sector operators 4. Joint flexibility activation	Data spaces integration might allow the incorporation of Federated Catalogue to upscale the flexibility procurement among more operators and energy stakeholders.
Non-energy (seniors' safety)	**Health insurance alarms for senior living alone** The main purpose of this service is to identify these regular usage patterns and trigger alarms when there are significant changes from these patterns. By analysing the energy consumption, the service can support the end-user's independence and improve their quality of life. Additionally, it	• *Data Preparation: This function involves collecting and pre-processing all historical data from the mains meters of the senior citizens. The data is then cleaned, organized and prepared for training the Machine Learning algorithm.* • *Machine Learning Algorithm: In this function, the Random Forest algorithm for pattern*	The proposed service will be exposed to the Data Space with connector APIs allowing private and secure data exchange.

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	provides reassurance to their family and/or caregivers about the senior's safety.	*recognition is trained using the prepared datasets creating a model. The model then learns from the historical data and extracts patterns from the datasets, detecting the normal consumptions at any given time of day, from all the explorer cases.* • *Alarmistic definition: A normal deviation is then included in the recognized patterns allowing the definition of a normal margin of electricity consumption. The model has the function of deploying an alarm every time the consumptions do not follow the pattern (including deviation) for over an hour.* • *Identification: Once the model is trained, it is able to recognize the pattern of consumption from the main meter data. Secondly the model will be able to send an alarm message to the citizen's caretaker identifying the specific deviation and the time of occurrence.*	
Energy & appliance renovation	**Appliances maintenance or retrofit**	• *Data Preparation: This function involves collecting and pre-processing all historical*	The proposed service will be exposed to the Data Space connector APIs

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	This service aims to improve the quality of living and energy consumption in households by detecting higher energy consumption of appliances early on and increasing energy efficiency by suggesting maintenance or renewal of appliances. The service proposes using energy consumption data to suggest appliance maintenance or renewal. The information will be shared with consumers and housing providers, and the implementation will involve several actors, including consumers, housing providers, market information aggregators, energy service companies, maintenance and appliance retailers, and appliance producers.	*data from the mains meter and from the specific appliance plugs from the defined explorers. The data is then organized and prepared for training the Machine Learning model.* • *Machine Learning Algorithm: In this function, the Machine Learning classification model is trained using the prepared datasets. The model then learns from the historical data and extracts patterns, correlations, and similarities between the 2 different datasets (mains meter and appliance plug) from all the explorer cases. The model is based on Logistic Regression classifiers, best suited for supervised classification, which allows the recognition of the specific electric signatures of each appliance. A second interaction, to be defined, is the ability to detect irregularities among those signatures, which can lead to the identification of failures or malfunctions on the appliances.* • *Identification: Once the model is*	allowing private and secure data exchange.

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		trained, it can be able to firstly recognize the specific signature profile of each individual appliance from the main meter data. Secondly the algorithm will be able to identify major malfunctions or maintenance needs that the appliance may require by determining deviations of the normal functioning signature part for that type of appliance.	
Non-energy (building renovation & finance)	**ML-based models for assessing renovation actions in residential buildings** The aim of the service is to provide a solid methodological framework for assessing renovation actions in residential buildings. This service consists of two Machine Learning models for implementing two different tasks related to the domain of building retrofitting and energy autonomy in the residential scale. The first model is tailored for assessing specific actions in building level, while the second model aims at assessing the potential of installing rooftop solar panels in residential buildings.	*A list of functions of this service, it includes two different prediction tasks which are tackled with Machine Learning models and the use of novel techniques such as meta learning and data augmentation, aiming to address the problem of data scarcity and to improve the accuracy of the models. In this respect, the functions of this service are described as follows:* • *A supervised Machine Learning classification model for addressing the problem of predicting the optimal retrofitting actions in order to improve the energy class of the building.*	A summary of the combination of inputs/outputs will be available for integration and connection with the ENERSHARE Data Space, and for more user-friendly interactions via a graphical dashboard or interface. Such a summary will be extremely useful for stakeholders (outside the pilot) that are interested in implementing similar renovations (end-users) or similar service (energy agencies) at a pan-European level. This is expected to be an iterative process that will

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	The end users of this service include -but are not limited to- building owners, financing institutions, investment bodies and policy specialists.	• *A supervised Machine Learning regression model for predicting the annual potential of rooftop solar panel in terms of energy production and the level of energy autonomy of the residential building after the installation.*	incorporate the suggestions and validation of all the stakeholders, specifically focusing on the pilot requirements and needs.

2.2 Stakeholders' roles

The following paragraph provides the list of the identified roles of the ENERSHARE stakeholders and the relevant description. In order to identify who a stakeholder might be, ISO 26000[4] suggests that the following questions should be asked:

- To whom does the project have legal obligations?
- Who might be positively or negatively affected by the project's decisions or activities?
- Who is likely to express concerns about the decisions and activities of the project or project results?
- Who has been involved in the past when similar concerns needed to be addressed?
- Who can help the project address specific impacts?
- Who can affect the project's ability to meet its responsibilities?
- Who would be disadvantaged if excluded from the engagement?
- Who in the value chain is affected?

These questions have been used for drafting the first list of the stakeholders 'roles identified in the ENERSHARE context (Table 3).

[4] ISO 26000 - Guidance on social responsibility: Basic training material-
https://uprdoc.ohchr.org/uprweb/downloadfile.aspx?filename=5752&file=Annexe4

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Table 3: ENERSHARE stakeholders' role.

Stakeholders Role	Brief description
Energy prosumer	An end user that no longer only consumes energy, but also produces energy, typically using renewable energy sources.
Energy community	A legal entity that undertakes collective energy actions
Energy user	A user of electricity, gas and heat energy pays energy bills to the energy service provider. Residents and other building users are examples for this role.
Energy supplier	Its role is to supply energy, to buy the energy, hedge its position, manage the energy and the associated risks, and invoice energy to its customers.
Distribution System Operator (DSO)	A DSO is responsible for managing the distribution grid and ensuring the cost-effective and reliable distribution of energy to consumers within a specific geographic region or area.
Transmission System Operator (TSO)	A TSO is responsible for transporting electricity or other forms of energy from centralized producers to dispersed industrial consumers, prosumers, and DSOs over its high-voltage grid.
District heating network operator	It is responsible for managing and maintaining a system that distributes heat generated in a centralized location, such as a power plant, to multiple buildings or customers within a defined geographic area.
Energy Services Company (ESCO)	An ESCO is a company that provides a range of energy-related services to customers, typically with the goal of improving energy efficiency, reducing energy costs, and promoting sustainability.
Service consumer	The role of the service consumer is to consume services provided by a service provider, and to use the processed data or information in a way that meets the needs of the user or organization.
Service provider	This role refers both energy service (e.g., gas) providers and non-energy services provider such as CPOs and MaaS for e-mobility, care service providers for healthcare/wellness.
Researcher	The role refers to researchers of both private and public organizations.
Policy maker	Policy authorities at local to European level (e.g., urban planning department).
Smart city municipality	A urban area that uses different types of electronic methods and sensors to collect specific data. Information gained from that data is used to manage assets, resources and services efficiently; in return, that data is used to improve operations across the city.
RES Facility Owner	Wind farm or PV plant owners, who invested in the facility. Normally, they are the legal owners of the data produced since they are the owners of the assets.
RES Original equipment manufacturer (OEM)	Asset suppliers for the RES facility (e.g., wind turbines for wind farms). In most of the cases, they sign a contact with the facility owner

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	allowing the OEMs to collect, use and manage the data acquired from the assets.
RES Component manufacturer	Critical systems and components suppliers for the assets (e.g., wind turbines). Normally the do not have access to operational data from the RES facility.
Constructor and contractor	Construction companies and consulting firms which perform specific tasks or services within a construction project.
Data customer	A legal entity that uses the data in accordance with usage policies.
Data supplier	The business role Data Supplier is aggregating the three basic roles Data Creator, Data Owner and Data Provider. This means that the role is able to create data, has the means to define usage policies and payment models and provides access to the data via the data space.
Data Broker	Data Broker, providing metadata about different data, offers to provide a service that increases the findability of offered data resources.
Developer/ IT companies	This role involves the developers of services/app and data space connectors.
Data Space Owners	Entity which holds the data space ownership.
Data Space Enabler	Actor who *"technically and legally connects one or more data space members to the data space, thereby enabling them to establish relationships and execute data transactions with other members in the data space. Examples of enabling services include identity provisioning, vocabulary provisioning, interconnecting, clearing, etc."* [26]
Standardization Organization/bodies	Standardization organizations play a crucial role in creating and maintaining standards that ensure consistency, interoperability, and quality across different products and services. One of the fundamental roles of standardization organizations is to create a shared vocabulary or ontology that allows different stakeholders to communicate effectively and unambiguously.
Data Prosumer	It is a quite new Energy Data Value chain stakeholder. The role identifies entities able to provide and use data.
Data Aggregator	It is a new Energy Data Value chain stakeholder. It could bundle and refine data in order to be used in other sectors.
Energy Data Cooperative	It is a quite new Energy Data Value chain stakeholder. The Data Cooperative model, as a mechanism to look after members' data.

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For a full treatment, the following paragraphs provide a more extensive description of the roles which have been briefly mentioned in Table 3 whereas section 2.4 describes the match between the ENERSHARE stakeholders and the roles/components identified in the IDSA model.

Energy prosumer

An energy "prosumer" is an end user who not only consumes energy but also produces it, typically using renewable energy sources such as solar panels, wind turbines, or micro-hydro systems. The term "prosumer" is a combination of the word "producer" and "consumer," reflecting its double role. The emergence of prosumers comes in tandem with the decentralization of the energy system. Rather than relying solely on centralized power plants and energy utilities to provide energy, prosumers can generate their own energy and even sell excess energy back to the grid.

The rise of prosumers also presents challenges for energy utilities and grid operators, who more and more need to invest in new technologies and infrastructures to support the integration of decentralized energy sources and to manage the fluctuations in energy supply and demand that come with a more distributed system.

Energy community

According to the EU definition of energy community in Clean Energy Package (CEP), Energy Community refers to collective energy actions that foster citizens' participation across the energy system [2]. The most recent has been proposed in 2019, this definition is not restricted to renewable energies, as the definition of the 2018, and does not necessitate geographical adjacency to the resources which is described as follows *" a legal entity that is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises; has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; and may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders*" [4].

Energy user

Energy users typically consume electricity, gas, or heat energy to power their homes, businesses, or other facilities. They may use energy for a variety of purposes, such as lighting, heating, cooling, cooking, and operating electronic devices and appliances.

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Energy users typically pay energy bills to their energy service provider, which may be a utility company or other energy supplier. The cost of energy bills can vary depending on several factors, including the amount of energy consumed, the type of energy used, and the pricing structure of the energy service provider.

Residential users, commercial users, and industrial users are all examples of energy users. Residential users typically consume energy in their homes for activities such as lighting, heating, and cooking. Commercial users may consume energy in offices, stores, or other commercial buildings for similar purposes. Industrial users may consume energy in manufacturing plants, factories, or other industrial facilities for processes such as heating, cooling, and machinery operation.

Energy supplier

The role of an energy supplier is to provide energy to customers, typically in exchange for payment. Energy suppliers may purchase energy from a variety of sources, such as power plants, natural gas fields, or renewable energy providers, and then sell that energy to customers through a variety of pricing models, such as fixed or variable rates.

In addition to supplying energy to customers, energy suppliers also play a critical role in managing the associated risks and costs of energy procurement and delivery. This may involve hedging their position by purchasing energy futures or other financial instruments to mitigate price fluctuations, managing the physical delivery of energy through pipelines or other infrastructure, and ensuring compliance with regulatory requirements and environmental standards.

Energy suppliers also typically invoice their customers for the energy they consume and may provide additional services such as energy management advice, energy efficiency audits, or renewable energy options. The role of an energy supplier is to ensure that customers have access to reliable, affordable energy while managing the associated risks and costs of energy procurement and delivery. This requires a combination of technical expertise, financial acumen, and customer service skills.

Distribution System Operator (DSO)

The DSO operates at the distribution level of the electricity grid, which is responsible for delivering electricity from the transmission grid to individual homes, businesses, and other end-users. The DSO ensures a reliable and efficient energy system which requires a combination of technical expertise, operational experience, and strategic planning skills. The key responsibilities of a DSO include:

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- Managing the distribution grid: the DSO is responsible for monitoring and controlling the distribution grid, including the operation of substations, transformers, and other equipment.
- Maintaining grid stability: the DSO must ensure that the distribution grid remains stable and balanced, with supply matching demand at all times.
- Planning and investment: the DSO is responsible for planning and investing in the distribution grid to ensure that it is able to meet future demand for energy and accommodate the integration of new renewable energy sources.
- Ensuring cost-effective distribution: the DSO must ensure that energy is distributed in a cost-effective manner, minimizing waste, and reducing energy losses.

Transmission System Operator (TSO)

A Transmission System Operator (TSO) is typically responsible for the transmission of energy across larger geographic areas, such as entire countries or regions. One of the primary roles of the TSO is to ensure the long-term reliability and stability of the energy transmission system. This includes maintaining and upgrading the infrastructure of the high-voltage grid to ensure that it can handle current and future energy transmission demands. The TSO is also responsible for managing the balance between energy supply and demand on the grid, which involves deploying regulating capacity, reserve capacity, and incidental emergency capacity to ensure that the system remains in balance and can respond to unexpected disruptions or changes in demand.

In addition to these technical responsibilities, TSO may also play a crucial role in managing the overall energy market and fostering the development of new energy technologies and infrastructure. This can involve collaborating with regulators, policymakers, and industry stakeholders to ensure that the energy system effectively meets customer demands while promoting sustainability and environmental protection. Overall, the role of the TSO is essential for ensuring the reliable and efficient transmission of energy across larger geographic areas and ensuring the long-term viability of the energy system.

District heating network operator

The district heating networks are typically used in urban areas, where there is a high concentration of buildings in a relatively small geographic area. It is responsible for managing and maintaining the infrastructure that allows heat to be distributed from the central source to individual buildings or customers. This may involve operating and maintaining pipelines, valves, and other equipment used to transport the heated water or steam to the customers, as well as managing the distribution of heat based on customer demand.

In addition to these technical responsibilities, the district heating network operator may be responsible for managing the pricing and billing for heat distribution services as well as

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promoting the development of new technologies and infrastructure to improve the efficiency and sustainability of the district heating network. Its role is crucial to ensuring the efficient and reliable distribution of heat to multiple customers within a defined geographic area, and to promoting sustainable energy use in urban areas.

Energy Service Company (ESCO)

The role of an Energy Service Company (ESCO) goes beyond just optimizing energy profiles in response to external inputs. An ESCO is a company that provides a range of energy-related services to customers, typically with the goal of improving energy efficiency, reducing energy costs, and promoting sustainability.

One of the key services that an ESCO may offer is energy profile optimization, which involves analyzing a customer's energy usage patterns and identifying opportunities to reduce energy consumption or shift energy usage to times when prices are lower. However, ESCOs may also provide a range of other services, such as energy audits, energy efficiency upgrades, energy management systems, and renewable energy solutions.

ESCOs may work with a range of customers, including commercial and industrial businesses, public institutions, and residential customers. In many cases, ESCOs may partner with other energy providers, such as utilities or energy suppliers, to offer a comprehensive range of energy services to customers. Moreover, the role of an ESCO is to provide energy-related services that help customers reduce energy consumption, lower energy costs, and promote sustainability. This may involve a range of services beyond just energy profile optimization, and may require a combination of technical expertise, financial acumen, and customer service skills.

Service consumer

In the service-oriented architecture (SOA) or web services, a service consumer is typically a software application or system that sends a request to a service provider over a network and receives a response containing processed data or other information. The service consumer may be a client application running on a user's computer or mobile device, or it may be a back-end system that consumes services provided by other systems within an organization.

Service provider

The term "service provider" can refer to any entity that provides a service to customers, whether it is an energy service provider, a transportation service provider, a healthcare service provider, or any other type of service provider. In the context of energy systems and mobility systems, service providers may include:

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- Energy service providers, such as gas or electricity providers, that supply energy to customers and may offer a range of services related to energy efficiency, energy management, or renewable energy solutions.
- Charge point operators (CPOs) and mobility-as-a-service providers, that provide charging infrastructure and mobility services for electric vehicles, respectively.
- Care service providers, such as healthcare or wellness providers, that offer a range of services related to healthcare and wellbeing.

In each case, the role of the service provider is to provide a service to customers that meets their needs and helps them achieve their goals. This may involve a range of activities, such as developing and maintaining infrastructure, delivering services to customers, and managing customer relationships. Service providers may also be responsible for ensuring the quality and reliability of the services they provide, and for complying with applicable regulations and standards.

Researcher

Researchers may work in a variety of settings, including both private and public organizations, and a variety of fields such as science, technology, engineering, mathematics, social sciences, humanities, and others.

Regardless of the specific setting, the role of a researcher is to conduct research, analyze data, and generate new knowledge or insights in their respective fields. This may involve designing and conducting experiments, surveys, or other research studies; collecting and analyzing data; and interpreting and communicating research findings to stakeholders. Researchers may also collaborate with others, such as other researchers, engineers, designers, or policymakers, to develop solutions or make recommendations based on their research findings.

Policy maker

A policy maker is an individual or group of individuals who are responsible for making decisions and creating policies that guide the actions and behavior of an organization, government, or society. Policy makers may be elected officials, appointed officials, or individuals who hold influential positions in various organizations or interest groups. Their role involves analyzing and understanding complex issues, considering various options and trade-offs, and ultimately making decisions that will shape the direction and outcomes of their respective domains. Effective policy makers must be knowledgeable, skilled at negotiation and collaboration, and able to balance competing interests and priorities to achieve desired outcomes.

Smart city municipality

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A smart city municipality is a local government that leverages technology and data to improve the quality of life and efficiency of services for its residents. This involves using various digital and communication technologies to enhance the city's infrastructure, transportation systems, utilities, public safety, and governance processes.

Smart city municipalities integrate sensors, analytics, and other advanced technologies into their systems to collect and analyze data in real-time. This allows them to make more informed decisions about how to allocate resources, improve services, and respond to emergencies. For example, a smart city municipality may use data from traffic sensors to optimize traffic flow or use smart water meters to monitor usage and identify leaks. Its aim is to create a more connected, sustainable, and livable city for its residents.

RES Facility Owner

The RES facility owners are companies that have invested in a windfarm or PV plant and therefore expect the maximum return on their investment. Usually, the owners are the facility developers themselves, that is, the companies that have undertaken all the development tasks to analyse, plan and develop the construction of the facility. In some cases, the facility owner could be just an investor that has purchased the facility from a developer after it has been commissioned, thus reducing the economic risks linked to the permitting and construction phases.

From a legal point of view, these companies are the owners of the data produced in the generation plant since they are the owners of the assets. They normally collect general data about energy production and quality parameters (energy, power, reactive power, voltage) of the facility and monitor operation warnings and alarms through SCADA systems. Presently, very few of them are making use of sensing and monitoring systems to predict the degradation and the remaining lifetime of the assets (e.g. offshore wind turbines).

RES Original equipment manufacturer (OEM)

Original equipment manufacturer (OEM) refers to a company that produces and supplies the most important assets for a RES facility. In the context of the renewable energy industry, an OEM might produce wind turbines, solar panels, or energy storage systems that are then sold to developers or integrators who use them to build renewable energy projects.

Once the commissioning of a RES facility is finished, and the guarantee period starts, in most of the cases the owner and the OEM sign a contract that allows the OEM to collect, use and manage the data obtained from every asset (e.g., wind turbine). Usually, the OEM is the only stakeholder that has full access to the data and makes use of it for business purposes.

RES Component manufacturer

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Component manufacturers produce specific systems and components that are used in renewable energy systems. For example, a component manufacturer might produce hydraulic pitch systems for a wind turbine or inverters, which convert the DC electricity produced by solar panels into AC electricity that can be used by homes or businesses. Other examples of components used in renewable energy systems include batteries, cables, and connectors.

Manufacturers of critical systems and components for wind turbines are implementing sensors and digital equipment in the products they supply, in order to evaluate their component performance in the field and offer additional services to their clients. Most of them are willing to become “Data users” in order to develop their own solutions and, as a consequence, offer more value to their present customers (OEMs) and in some cases also to the wind farm owners as a new customer segment.

Constructor and contractor

Constructor and contractor are two different terms used in the construction industry. A constructor is a professional responsible for overseeing and managing a construction project from start to finish. It typically works on large-scale projects, such as commercial buildings or infrastructure projects, and are responsible for coordinating all aspects of the project, including design, procurement of materials, hiring and managing subcontractors, scheduling, and budgeting. Constructors are responsible for ensuring that the project is completed on time, within budget, and to the required quality standards. A contractor, on the other hand, is a professional or company that is hired to perform specific tasks or services within a construction project. Contractors are typically specialized in a particular area, such as electrical work, plumbing, or HVAC installation. They work under the direction of the constructor and are responsible for completing their assigned tasks on time, within budget, and to the required quality standards.

Data customer

Data customer is a term used to refer to an individual or organization that purchases, subscribes to, or otherwise obtains access to data. In this context, data refers to any type of information that can be collected, analyzed, and used to inform decision-making or other business activities.

In recent years, the field of data analytics has grown significantly, and the demand for high-quality, accurate data has increased. As a result, the role of data customers has become increasingly important in many industries, and companies that are able to provide high-quality data have become valuable partners for businesses seeking to improve their decision-making processes.

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Data customers can be businesses, government agencies, non-profit organizations, or individual consumers. They may use data for a variety of purposes, such as market research, competitive analysis, trend analysis, risk management, or marketing campaigns.

Data supplier

A data supplier is a company, organization, or individual that provides data to others. This data can come in various forms, such as raw data, processed data, or analyzed data, and can be used for various purposes, such as research, business operations, or decision-making. This role can include companies that collect and process data, such as market research firms, data analytics companies, and social media platforms. These companies typically gather data from various sources, including surveys, online behavior, customer databases, and other sources, and then process the data to provide insights and analysis.

In addition to these specialized data providers, there are also companies and organizations that generate data as part of their regular operations, such as e-commerce sites, financial institutions, and government agencies. These organizations may provide access to their data through APIs or other data sharing mechanisms, allowing other companies and individuals to use the data for their own purposes.

Data Broker

A data broker is a company or organization that collects, analyses, and sells data to other businesses or organizations. Data brokers typically gather data from a wide variety of sources, including public records, surveys, social media, and online behaviour, and then aggregate and analyse the data to provide insights and predictions about consumer behaviour and trends.

Data brokers may offer a range of services, such as data cleansing, data integration, data enhancement, and data segmentation. The data provided by data brokers can be used by businesses and organizations for a variety of purposes, such as marketing, advertising, risk assessment, and fraud detection. For example, a marketing company might purchase data from a data broker to target specific consumer segments based on their demographic and behavioral characteristics.

Developer

A developer, in general terms, is a person or company that creates, designs, and builds software applications, computer systems, or other technology products. Developers use programming languages and other tools to create software applications, websites, mobile applications, and other digital products. A developer is a person or company that creates, designs, and builds software applications or other technology products. There are different types of developers

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with specialized roles depending on the type of software application or product being developed.

Data Space Owners

Data Space Owners are individuals, organizations, or entities that own or manage a physical or digital space where data is stored, processed, or transmitted. Data Space Owners may own or lease these facilities and are responsible for ensuring that they are secure, reliable, and meet the necessary compliance requirements. Data Space Owners may also be responsible for setting policies and procedures related to data access, security, and usage. They may work closely with other stakeholders, such as data space operators, data processors, data controllers, and data subjects, to ensure that data is managed in accordance with applicable laws, regulations, and industry standards.

Data Space Enabler

According to the definition of the Data Spaces Support Centre (DSSC) glossary [26]**,** a data space enabler is a data space member that provides a (technical or non-technical) service enabling data transactions for the transaction participants while not directly participating in that transaction itself.

It is a intermediary role in the data space since it connects one or more data space members to the data space, thereby enabling them to establish relationships and execute data transactions with other members in the data space.

Examples of enabling services include identity provisioning, vocabulary provisioning, interconnecting, clearing, etc.

Standardization bodies

Standardization bodies are organizations that develop and publish technical standards and specifications that define how products, processes, and services should be designed, produced, tested, and used. These standards can cover a wide range of topics, including quality management, environmental management, safety, health, and information technology.

There are many different standardization bodies around the world, ranging from international organizations to national, regional, or industry-specific bodies. Some of the most well-known standardization bodies include:

- International Organization for Standardization (ISO)
- International Electrotechnical Commission (IEC)
- European Committee for Standardization (CEN)
- European Committee for Electrotechnical Standardization (CENELEC)

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- Institute of Electrical and Electronics Engineers (IEEE)
- American National Standards Institute (ANSI)
- National Institute of Standards and Technology (NIST)
- International Telecommunication Union (ITU)

These standardization bodies play an important role in promoting global trade and facilitating innovation by establishing common technical requirements and best practices that enable interoperability, compatibility, and safety. Standardization bodies also help to ensure that products and services are of high quality and meet customer needs and expectations.

International Data Space Association (IDSA)

The International Data Space Association (IDSA) is a special type of standardization organization that focuses on creating standards for data exchange and data governance in industrial contexts. One of the key standards developed by IDSA is the IDS Reference Architecture Model (IDS-RAM), which provides a blueprint for building secure and trustworthy data ecosystems.

While IDSA is not directly involved in the actions of different data spaces, its role as a standardization organization is crucial in ensuring that different data spaces can communicate effectively and operate seamlessly. By providing a common set of standards and guidelines, IDSA helps to create a shared language that allows different data spaces to interoperate and exchange data securely and efficiently.

Data Prosumer

The term "Data Prosumer" is a combination of "producer" and "consumer" and refers to a person or organization that both produces and consumes data. In this context, "producing" data means generating, collecting, and storing data, while "consuming" data means analysing, using, or sharing data for various purposes.

Data Prosumers may include individuals, businesses, government organizations, and other entities that produce and use data as part of their day-to-day operations. For example, a business that collects customer data for marketing purposes can be considered a Data Prosumer because it both produces the data by collecting it and consumes the data by using it to create targeted marketing campaigns. Similarly, a government agency that collects and analyses data on public health can be considered a Data Prosumer because it both produces the data by collecting it and consumes the data by analysing it to make policy decisions.

Data Prosumers can also include individuals who use and generate data through their use of technology platforms and social media. For example, a person who uses a fitness tracker to record their exercise activity is both producing and consuming data.

Data Aggregator

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A Data Aggregator is a person or organization that collects and combines data from various sources into a single data set for further analysis, processing, or distribution. Data Aggregators can be found in many industries and can collect data from a variety of sources, including public data sources, private data sources, and other data aggregators. The primary function of a Data Aggregator is to simplify data access and management for organizations that require large and complex data sets for analysis or other purposes.

Data Aggregators can help organizations to reduce the cost and effort associated with collecting data from multiple sources. Some examples include financial data providers that collect and aggregate financial data from multiple sources to provide a comprehensive view of market trends, and marketing data providers that collect and aggregate customer data from various sources to provide insights into customer behaviour.

In addition, they can play a role in data sharing and collaboration by providing a central repository for data that can be accessed and used by multiple organizations. In some cases, Data Aggregators may provide data management and analysis services to their clients as well.

Energy Data Cooperative

An Energy Data Cooperative is a type of organization that brings together energy data producers and users to share energy-related data and insights. The cooperative is typically a non-profit entity that is owned and controlled by its members, who are typically energy producers, consumers, and other stakeholders in the energy sector.

Its primary goal is to enable better decision-making in the energy sector by providing members with access to a shared pool of data and analytics. Members can use this data to gain insights into energy production and consumption patterns, identify opportunities for efficiency improvements, and optimize their energy usage. Moreover, Energy Data Cooperatives can help to promote transparency in the energy sector by making data available to the public, which can help to inform policy decisions and public discourse about energy issues.

Some examples of Energy Data Cooperatives include the Midwest Energy Efficiency Alliance[5], which is a regional non-profit organization that promotes energy efficiency through research, education, and advocacy, and the Energy Web Foundation, which is a non-profit organization that is developing a blockchain-based platform for energy-related transactions and data sharing.

Energy Data Cooperatives can be an important resource for organizations in the energy sector, providing access to valuable data and insights that can inform decision-making and help to optimize energy usage. By bringing together energy data producers and users, these

[5] https://www.mwalliance.org/

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cooperatives can help to promote collaboration, innovation, and transparency in the energy sector.

2.3 Stakeholders' data infrastructures

Within the data value chain, the IT infrastructure of data space participants is relevant in the early stages of the development of data spaces as the data that can be shared with other participants is stored and managed in existing on-premise or cloud-based systems. These systems need to be linked to the data space connector of the respective organisation and data pipes between these systems and the connector need to be set up. These systems are the endpoints of the data infrastructure that is built by the data space.

As this integration is an upfront effort for organisations it is relevant to understand which systems will be used in which pilots. This may facilitate the sharing of experience and best practices for specific systems.

Relevant information is in identifying the different systems with their names and some characteristics. For categorising the systems, it is described whether the system is applied at the operational or analytical level. Operational level means direct involvement with operational processes. Analytics refer to systems that are designed for processing often large amounts of data for analytical purposes without interaction with direct operations.

The second classification refers to the system environment. There usually are three different system environments, namely a development system, a test system, and the operational system. Even though pilots will go through all stages to reach market maturity, it may be relevant for the further specification of requirements, if test or operational systems will be connected.

With regard to the smart grid architecture model (SGAM) the zones are also of interest. SGAM includes six zones:

1. Process (physical asset)
2. Field (monitoring, control, and protection)
3. Station (local aggregation of field zone)
4. Operation (higher level system operation)
5. Enterprise (commercial and organisational processes)
6. Market (sales and procurement of assets and services)

For ENERSHARE the use case descriptions provided in D2.1 [23] include systems as actors and information items that are to be used in the use cases. Based on this information a list of systems at the different project use cases can be created as is shown in Table 4.

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Table 4: System infrastructure in ENERSHARE's use cases with SGAM Zone

Use Case	System name	Station	Operation	Enterprise	Market
P1-ES	Anomaly interpretation engine	2			
	Federated Predictive Maintenance App	1			
	High frequency Scada System	3			
	SCADA Systems	1			
P2-PT-A	Analysis system of Grid Operator / System Operator		2		
	Operative system of Market information aggregator			7	
P2-PT-B	Operative system of Market information aggregator			31	
P2-PT-C	Assisted Living Energy Service system				5
	EMS of relevant household		6		
P2-PT-D	API or Web-Portal				3
	Consumer App / Portal				1
P3-SI	Flexibility service			2	1
	Grid analysis service		2		
	Grid Asset Management System			1	
	Metering Data System		1		

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	Weather Service				1
P4-GR	API or Web-Portal				1
	Gas network operating system			1	
	Grid Asset Management System			1	
	IPTO and Eurostat Statistics				1
	Part of the deployment environment		7		
P5-IT-A	AI modeling: Power forecasting		2		
	DSO grid asset management system			1	
	Edge Management	2			
	Meter Data System		1		
	MLaaS Grid Optimization		1		
	Mobile App „I miei KW"				1
P5-IT-B	Analysis systems of System Operator		2		
	Italian Pilot Electric Mobility System	19	2		
	Meter Data System	3			
P5-IT-C	Analysis systems of System Operator		1		
	Forecasting Service for Water Network Operator		1		1
	SCADA System of water network	1			

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P7-LV	SLLC "Latvian Environment, Geology and Meteorology Centre"		2		
	The Ministry of Economics		23		
Total		**32**	**53**	**44**	**15**

2.4 Business interactions

For identifying the business interactions in the European Energy Data Space, the analysis started from the IDSA documentation [27] which provides an overview of all the possible interactions which exist among dataspace roles/components. They include the business interactions which can be defined as those which aim of reaching a business objective and can be represented by IT or not IT interactions, involving economic transactions, legal procedures, contractual relations and so on.

The IDSA considers the following roles in its model (Figure 1):

- **Data provider:** the entity which makes data technically available in the IDS for being transmitted to a data consumer. The provider uses software components for submitting metadata to a broker or exchanging data with a data consumer.
- **Data consumer** receives data from a data provider, and, from a business process modelling perspective, the activities performed by the data consumer are the mirror of those executed by the data provider.
- **Clearing house** is an intermediary that provides clearing and settlement services for all financial and data exchange transactions. In the IDS, clearing activities are separated from any broker services since they are technically different from maintaining a metadata repository.
- **Identity provider** consists of the Certification Authority, the Dynamic Attribute Provisioning Service, and the Participant Information System. In the IDS, each participant owns an identity and uses it for authentication.
- **Service provider** receives data from a data provider and returns the calculation result or directs it to an indicated data consumer.
- **App provider** is the role assumed by the App Store which is the first responsible for managing information about apps. The App Store should provide interfaces for publishing and retrieving apps plus corresponding metadata.
- **Metadata Broker** is a service for publishing and searching metadata of connectors and resources between IDS participants.

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- **Vocabulary provider** specifies the content of data packages and resources via using external vocabularies and catalogues. The vocabulary indicates the ontologies, the reference data models, or the metadata elements that can be used to describe datasets, usage policies, apps, services data sources etc.
- **Certification body** as well as the **Evaluation Facilities**, takes care of the certification process and issue certificates, in both regard to organizations that want to participate and software components that are to be used.

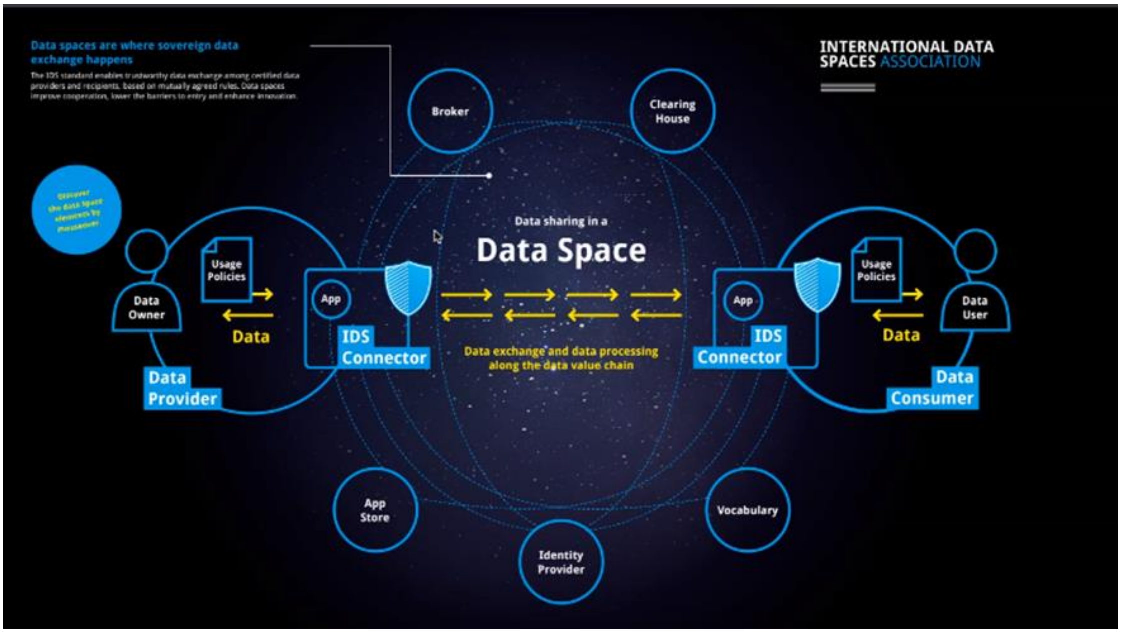

Figure 1: Data space representation of IDS [6]

Data user and data consumer can coincide as well as data owner and data provider, thus the data shared by the data provider can be directly transferred to the data consumer. However, there are many scenarios in which these roles are assumed by different participants, for example, a patient could use a software tool for managing his personal health data and grant access to this data to a health coach. In this case, the health coach would be the data user and the provider of the software tool would be the data consumer whereas the patient is the data owner.

Table 5 shows the possible interactions taking place among the roles briefly described. The mandatory interactions are marked with X whereas the optional ones are marked with (X). The IDS roles have been then matched with the stakeholders' roles identified in the section 2.2. This process makes it possible to build the interactions among actors for reaching a business

[6] https://internationaldataspaces.org/why/data-spaces/

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objectives case by case also in the light of the four categories in which the roles can be summed up: Core Participants, Intermediaries, Software and services and Governance body.

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Table 5: Possible interaction taking place in the IDS [4]

	Data Owner	Data Provider	Data Consumer	Data User	Metadata Broker	Clearing House	Identity Provider	Service Provider	App Provider	App Store	Vocabulary Provider	Certification Body	Evaluation Facility
Data Owner	-	X	-	-	-	(X)	-	(X)	(X)	(X)	(X)	-	(X)
Data Provider	X	-	X	-	X	(X)	X	(X)	(X)	(X)	(X)	-	X
Data Consumer	-	X	-	X	(X)	(X)	X	(X)	(X)	(X)	(X)	-	X
Data User	-	-	X	-	-	(X)	-	(X)	(X)	(X)	(X)	-	(X)
Metadata Broker	-	(X)	(X)	-	-	-	X	(X)	-	-	?	-	X
Clearing House	(X)	(X)	(X)	(X)	-	-	X	(X)	(X)	(X)	(X)	-	X
Identity Provider	-	X	X	-	X	X	Federation	-	(X)?	(X)?	-	-	X
Service Provider	(X)	(X)	(X)	(X)	(X)	(X)	-	-	(X)	(X)	(X)	-	X
App Provider	(X)	(X)	(X)	(X)	-	(X)	(X)	(X)	-	(X)	-	-	(X)
App Store	(X)	(X)	(X)	(X)	-	(X)	(X)	(X)	(X)	-	(X)	-	(X)

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Vocabulary Provider	(X)	(X)	(X)	(X)	?	(X)	(X)	(X)	(X)	(X)	-	-	X
Certification Body	-	-	-	-	-	-	-	-	-	-	-	-	X
Evaluation Facility													

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Data Owner, Data Provider, Data Consumer, and Data User are part of the "Core participants" category. More generally, the category includes any organization that owns, wants to provide, and/or wants to consume/use data. In the light of the stakeholders' roles, energy consumer, prosumer, TSO, DSO, District heating network operator, energy communities, energy data cooperatives as well as researchers and ESCO fall in this category.

Metadata Broker, Service Provider, App store, Clearing House, Vocabulary Provider, and Identity Provider are part of the "Intermediary" category. Some of the stakeholders identified in the previous category can be found here as well, indeed, entities such as system operators, both in the electric and heating network, can be responsible for the financial and data exchanges (clearing house). Data Broker and data aggregator can be considered new roles within the intermediary category since they usually are organizations that collect, analyse, and sell data to other businesses or organizations.

All software and/or services (e.g., in a software-as-a-service model) provided to the IDS participants are subsumed under the "Software and services" category. Roles as app developer and connector developer, which implement the functionalities required by the data space, correspond in the stakeholders list to the software providers, IT companies and developers.

"Governance body" category contains the Certification Body and Evaluation Facilities as well as the Standardization Organisation which make sure that only compliant organizations may participate in this trusted business ecosystem. The stakeholder list in Table 3 reports the voices such as policy maker, smart city municipalities and standardization organizations/bodies which are related to this specific category. The Governance Bodies make sure that only compliant organizations are granted access to the trusted business ecosystem, and, in this process, the Certification Body supervises the actions and decisions of the evaluation facilities.

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3 Business concept design

3.1 Value propositions: post-it method

To design the overall business concept of the project, this section has collected inputs from all the WP2 members regarding their opinion on the value proposition offered by ENERSHARE to its clients. This section presents the output of what could be considered a kind of remote brainstorming with the aim of identifying the main aspects of the ENERSHARE business offer. For collecting the different ideas, the post-it method has been used because it allowed partners to provide one, or more, brief sentences describing the value offered by the ENERSHARE in their perspective.

The software tool that used for this scope is MIRO[7] where ENG has created a whiteboard[8] accessible by partners through their e-mail addresses. Figure 2 shows the results of this activity in which FhG, ENG, LEIF, FORTUM, EMOT, DEPA, ACE and TECNALIA have chosen a post-it colour and shared their ideas. This process has shown the different perspectives present in the consortium which have given increased value as well as complexity to the elaboration of the overall business concept.

[7] https://miro.com/it/
[8] https://miro.com/welcomeonboard/dlhvMUlZUFhXSTVJNDBiVjlwSFpkT1RxN1dWbVp2Z2JTZERTYmRURDE3bHRrVXZSU3pBcU4wWmdqY1BBYlJ2OXwzNDU4NzY0NTM3ODkwMTA0MjgwfDI=?share_link_id=603089593695

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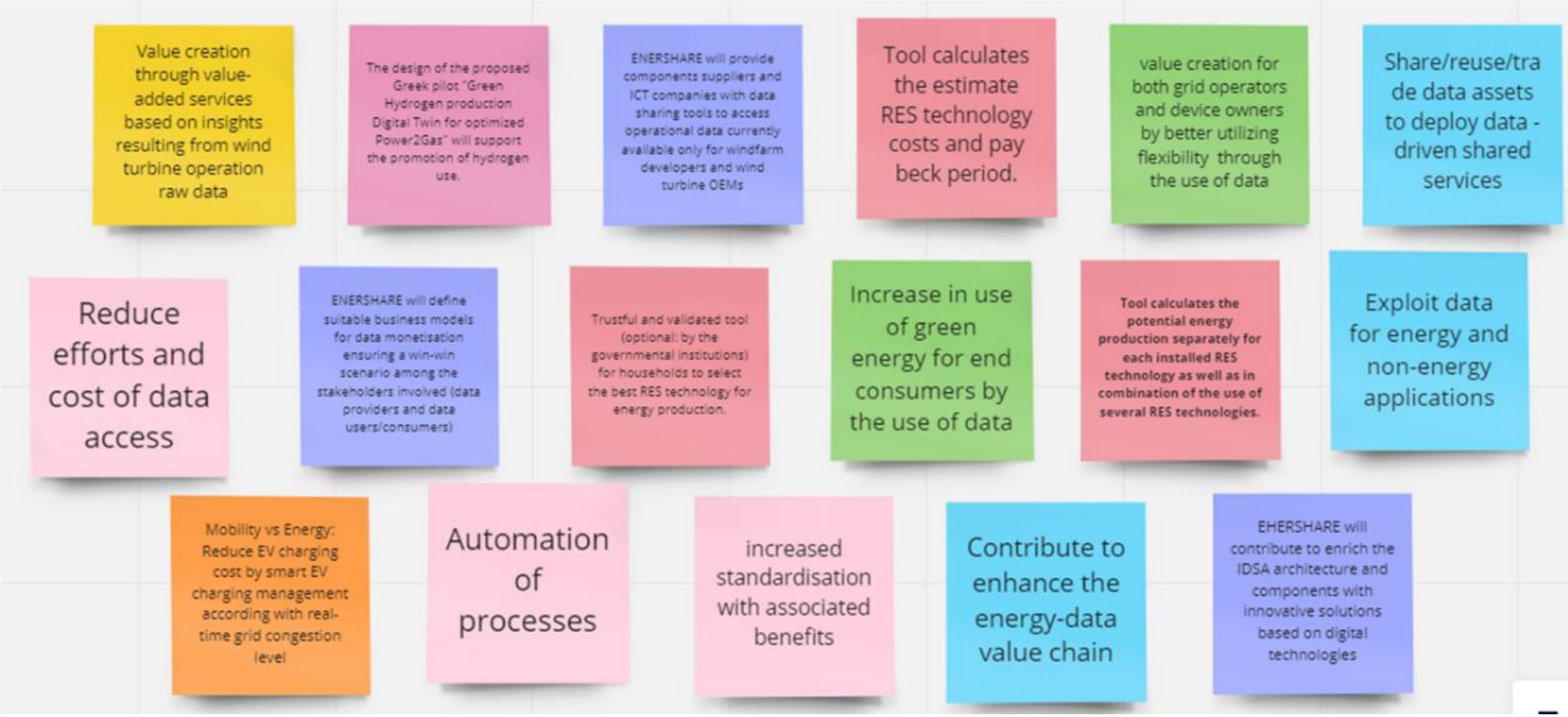

Figure 2: Value propositions for ENERSHARE solutions: ideas collected through post-it method in MIRO whiteboard

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The result of this remote brainstorming has given important inputs for proceeding the research on the most suitable business concept for the ENERSHARE solution. As the second step, the post-it have been grouped according to the concepts expressed (see Figure 3). Within the whiteboard, there are two main perspectives of concepts that can be identified. On one hand, there is the vision that recognizes open access data as a crucial element of the value proposition. This perspective acknowledges the importance of making data easily accessible to drive innovation and create value. On the other hand, there is a focus on promoting RES and enhancing energy efficiency. This perspective emphasizes the need to transition towards sustainable energy practices. However, ENERSHARE aims to go beyond these two concepts and incorporate additional elements. The project recognizes the significance of not only focusing on energy-related sectors but also considering non-energy sectors. This broader approach acknowledges that sustainability and efficient resource management extend beyond energy alone and encompass various interconnected sectors. In summary, ENERSHARE seeks to combine the ideas of open access data, promotion of RES and energy efficiency, and the inclusion of non-energy sectors in order to achieve its goals.

The final step of the brainstorming process has been to define the main points from which the project offer will be composed. These points will be at the same time the central focus of the overall business concept and the goal toward addressing the effort of the project partners. Thus, the ideas shared on the whiteboard have been synthesized in the following three points:

1. Providing a platform for open access data, this openness is strongly tied to the standardization, the use of open-source architecture and tools, with the aim of reducing the effort and costs of data access as well.
2. Offering a solution which could increase and improve the RES use, creating benefits not only for the consumers who could better exploit their energy resources but also for the system operators (TSO/DSO), who could exploit the ENERSHARE solution for providing flexibility to the grid.
3. Exploiting the data for providing services in energy and non-energy sectors such as e-mobility. A smart management of the energy data could, indeed, reduce costs in other sectors.

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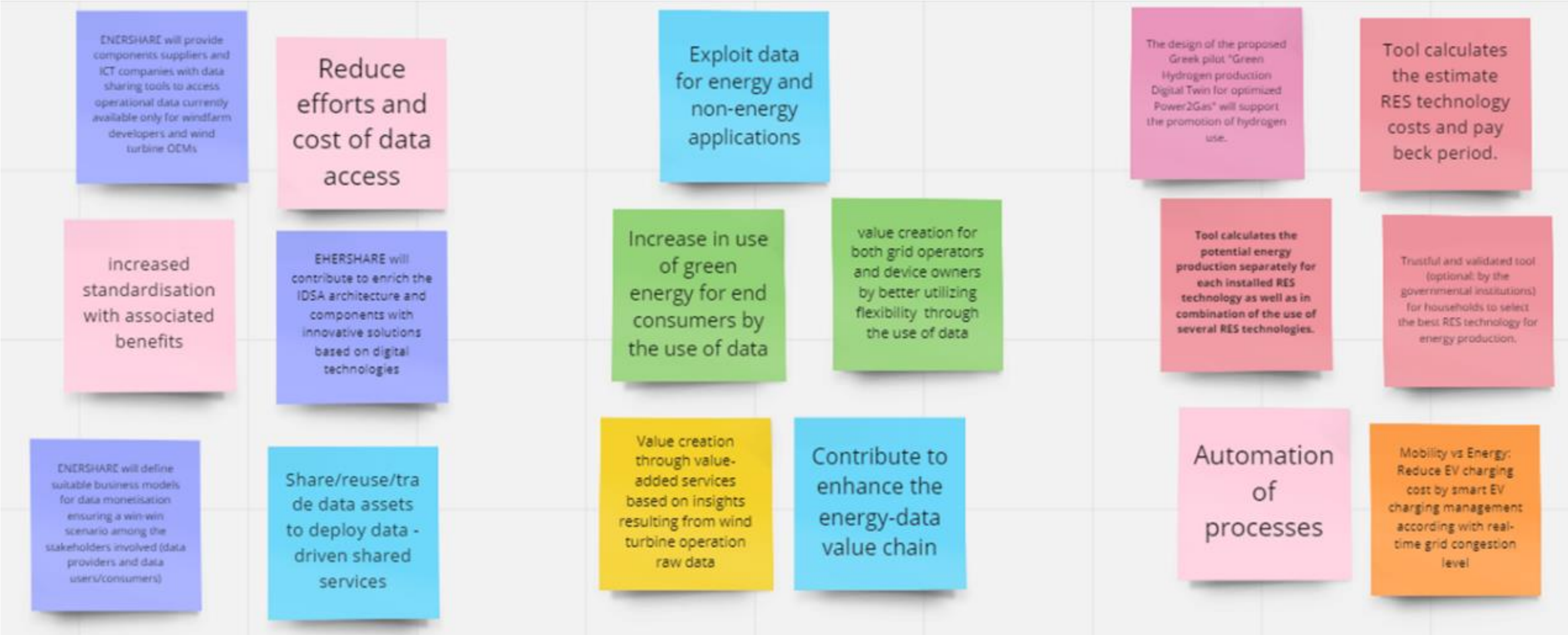

Figure 3: Value propositions for ENERSHARE solutions: ideas grouped by the main concepts.

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These value propositions, which compose the ENERSHARE possible offer, have been used as starting point for the building of the business concept in paragraph 3.4.

3.2 Comparative case studies

The following section reports a few case studies concerning the software companies which sell their own services for energy based on data as well as organizations which focus exclusively on energy data itself.

- **Opower** is a software company that provides cloud-based data analytics and customer engagement solutions for the utility industry [5]. The company was founded in 2007 and is headquartered in Arlington, Virginia. Opower's platform helps utilities better understand their customers' energy usage patterns and preferences and uses this information to provide personalized recommendations for reducing energy consumption and saving money on utility bills. The company's solutions also include customer engagement tools such as mobile apps, email notifications, and social media integration to help utilities communicate with their customers more effectively. Opower's technology has been adopted by over 100 utilities worldwide, serving more than 60 million households. The company has received numerous awards for its innovative solutions, including recognition from the White House as a Champion of Change for Climate Equity in 2016. In 2016, Opower was acquired by Oracle, a leading provider of enterprise software solutions [6].
- **Bidgely** is another software that provides utilities with data analytics and machine learning solutions to help them understand their customers' energy usage patterns [7] [3]. The company's platform uses advanced algorithms to analyse smart meter data and provide insights into energy consumption, allowing utilities to offer targeted energy efficiency programs and personalized recommendations. The company also offers solutions for EV-managed charging, grid management with gas load disaggregation, and sharing consumers' experience. Bidgely's solutions also enable utilities to engage with customers in new ways, such as through mobile apps and other digital channels, to increase customer satisfaction and drive energy savings. This company was founded in 2011, Bidgely is located in Mountain View, California, and serves utilities around the world.
- Also, some software is bound with specific products. **SimpleEnergy** is an example of such software that comes its proprietary hardware which is located between the grid and the electrical panel without requiring any change in wiring or infrastructure [8]. SimpleEnergy is a software company that provides energy efficiency and customer engagement solutions for utilities. The company's platform enables utilities to engage

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their customers in energy-saving behaviours by providing personalized recommendations, incentives, and real-time feedback on energy usage. Simple Energy's software uses data analytics and behavioural science to help customers understand their energy usage and make informed decisions about how to reduce their energy consumption. The platform also provides utilities with insights into customer behaviour, allowing them to design more effective energy efficiency programs and improve customer satisfaction.

- Another similar solution which is proposed by EnelX is **EnerNOC** which provides energy management services to businesses and organizations. They help their clients reduce their energy consumption and costs by analysing their energy usage and identifying areas where improvements can be made. EnerNOC offers a variety of services including energy procurement, demand response, and energy intelligence software. They work with a wide range of industries including healthcare, manufacturing, and retail. EnerNOC's goal is to help its clients become more efficient and sustainable while saving them money in the process.

In the transportation sector, Uber is a well-known company that uses a variety of data (from customer experience and feedback to traffic alerts) to improve the quality of its services. Waze and google maps also use and analyse a combination of data to offer the best route according to the used vehicle, live traffic, the latest state of roads, accidents, etc. they also have the ability to interact with the users to gather new data in the way that the users can report their feedbacks, traffic state, police deployment, accidents, speed trappers, and speed bumps.

However, almost all mentioned software companies use data and propose their own service for energy based on those data, and do not provide pure data for the use of other tasks. While there are other companies or organizations which focus exclusively on energy data itself. As an instance, Open energy data is one of the data domains of European Data Portal which provides many valuable open access datasets collected and aggregated from different federal, national, local and academic institutions within 36 countries. In addition, as declared in *data.europa* use cases[9], there are currently 906 cases that reused the mentioned dataset to address the concerns in various sectors as companies, projects, platforms, etc. International Energy Agency (IEA) is a paragon of such an organization. IEA is an intergovernmental organization that was established in 1974 in response to the oil crisis that provides policy recommendations, analysis, and data on the entire global energy sector. The IEA's mission is to promote sustainable energy policies that ensure reliable, affordable, and clean energy for its member countries and the world. The IEA has 30 member countries and conducts research and analysis on global energy markets, energy security, and energy technology. It also provides policy recommendations (based on data and analysis) to its member countries and works with non-member countries to promote energy cooperation and sustainable development. The IEA disseminates thorough data,

[9] https://data.europa.eu/en/publications/use-cases

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statistics, and analysis to enable long-term planning for energy sector investments and to guide national energy policies. Data and information on changes in energy supply, demand, prices, public research and development, and energy efficiency indicators are analysed and made public by the IEA. The data is also used to monitor both short- and long-term trends in the energy transitions of various nations. Data on government policies and initiatives to lower carbon emissions, promote energy efficiency, and advance the development and use of renewable and sustainable energy sources are made publicly available through the Policies and Measures Database. The database offers details on previous, present, and proposed policy actions. It gathers data from several IEA and International Renewable Energy Agency data sources going back to 1999.

"Datacie**"** is also a company located in the EPFL innovation park that works on customized data requests from organizations and companies. They give financial institutions, large enterprises, and non-profit organizations distinctive, usable, and completely configurable datasets [9]. Datacie is currently specialized in developing datasets covering the world's public firms to address the information demands of its financial and regulatory clients. They create exclusive datasets from reliable sources and modify them to assist their clients succeed. Datacie aspires to create an accessible social and environmental database to provide decision-makers with trustworthy and timely information to address some of humanity's most critical concerns. SetId, which resembles Datacie, is an information solutions company that empowers its clients to reduce risk and make better and more profitable decisions by harnessing the full potential of the data [10]. Their main activities include geographical studies and infrastructure data analysis.

It is worth mentioning that similar companies cover other sectors like oil, gas, geographical infrastructures, etc. For instance, Sulpetro, which has been a Canadian company since 1983, works on plant-level LPG-NGL volumetrics data of North America [11]. SpaceKnow is a Silicon Valley venture capital-backed startup that brings transparency to the global economy by tracking global economic trends from space. They develop products for monitoring economic activity for a wide variety of both consumer and enterprise clients [12]. They empower decision-makers with large-scale planetary analysis using a proprietary, AI-powered analytics engine combined with a comprehensive collection of earth observation imagery. Also, they have developed products concerning environmental and utilities [13], defence and intelligence [14], energy and commodities [15], and economic analysis [16].

According to the definition of "Energy Data Cooperatives" and its attributes, it can be inferred that the mentioned companies are not a pure example of data cooperatives, but they mostly resemble data trust entity. There are some data cooperatives all around the world (not restricted to the energy field) which are a combination of their traits and energy data companies which can provide a more precise model of Energy Data Cooperative. For instance, MiData and Salus Coop enable their members to pool and share health data [17]. Swash is an ecosystem of tools and services that allows individuals, corporations, and developers to harness the latent

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value of data by pooling, securely sharing, and monetizing it. Through novel incentivization streams, unique data monetization techniques, and a collaborative development framework, Swash enables internet users, developers, and enterprises to nurture new realities of data ownership and profit generation [18]. Driver's Seat is a driver-owned cooperative that collects work-related data from gig-economy workers' smartphones. The cooperative's goal is to provide drivers with more control over their data and to assist them to gain profit via their data [19]. Data Worker's Union aims to shift the unbalance between the ownership, control and profit of data produced by the workers versus the companies [20]. The union strives to develop a network of unions that elaborates a series of political proposals articulating and pursuing Data Labour Rights (introduced on their website). Fairbnb, which can be considered a data cooperative, is a platform that aims to provide an ethical alternative to Airbnb by promoting sustainable tourism and supporting local communities. It is a cooperative that is owned by its members [21], [22]

Figure 4 demonstrates a brief visual comparison between the companies that could be categorized as data cooperatives. In addition to the field of activity, they can be classified by the type of their service. In other words, these companies may extract and analyse various data to implement and improve their specific product (contractually named “service providers”), or they may act as data providers for other businesses and enterprise clients (contractually named “data providers”).

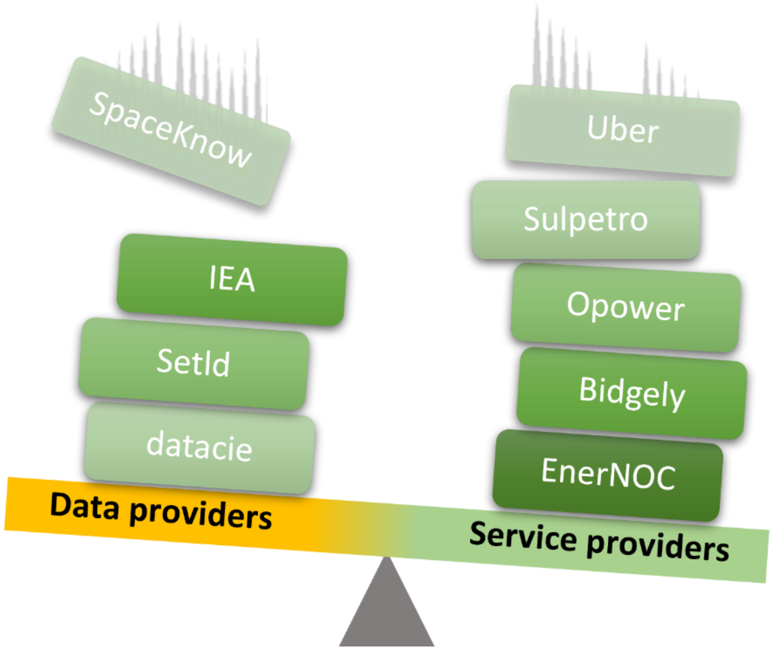

Figure 4: Visual comparison between the companies that could be categorized as data cooperatives

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3.3 Value proposals and business requirements

In D2.1 [23] the use case descriptions have been collected and summarised. This also included information on the business cases and the mentioning of business building blocks such as service level agreements, accounting schemes, billing or charging schemes or smart contracts. These requirements have been reported in this document since they could affect the design of the overall business concept presented in section 3.4.

Table 6 summarizes the value proposals that the pilots participating in the ENERSHARE project would like to reach. The list comes from the combination of the work carried out in the D2.1 and the collaboration with the pilots' leaders. Further business requirements are described in the following subsections.

Table 6: Business requirements list for ENERSHARE pilots

Pilot	Business requirement	Use Case (UC)
Pilot 1 - Spain	• Increase availability and reduce maintenance costs for wind farms thanks to the provision of predictive maintenance services based on new data analytics tools and digital twins. • Anticipate and improve fault detection and diagnosis on some critical wind turbine subsystems (generator, gearbox, pitch system and power converter) based on a data-driven approach.	Wind farm integrated predictive maintenance and supply chain optimisation
Pilot 2 - Portugal	• Reduce load forecasting errors by combining data from different owners. • Improving the TSO operational planning procedures by accounting with a more accurate definition of the evolution of the load. • Enhance local energy usage with cross-sector (electricity & gas) alternatives to relief the upstream electric network stress.	2A: Leveraging on consumer-level load data to improve TSO’s operational and planning procedures.
	• Design (DER capacity) in an optimal way local energy communities. • Estimate internal price of the energy community and estimate benefits for different types of consumers.	2B: Instantiation of energy communities and digital simulation of business models.

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	• Study the benefits of assets sharing business models.	
	• Offering living digital services.	2C: Detect irregularities in energy consumption in households with seniors living alone
	• Offering digital services for preventive maintenance for home appliances with value creation pathways for different actors.	2D: Suggest maintenance of appliances based on NILM data.
Pilot 3 - Slovenian	• Improving energy supply in the power grid. • Planning of infrastructure coupling (heat and electricity distribution) by utilizing flexibility potential	Optimal multi-energy vector planning - electricity vs heat
Pilot 4 - Greece	• Creating a Digital Twin for optimal data -driven Power-to-Gas.	Digital Twin for optimal data-driven Power-to-Gas planning.
Pilot 5 - Italy	• Reduction of reverse power flows into the distribution grid through optimization of self-consumption.	5A: Cross-sector Flexibility Services for aggregators and DSO.
	• Providing services for e-mobility CPOs, EVs drivers and DSO.	5B: Services for e-mobility CPOs, EVs drivers and DSO
	• Increasing efficiency in grid operation by tapping the flexibility potential of water pumps. • Reducing cost of water system operations through water demand forecasting and electricity consumption in lower price periods.	5C: Flexibility provision for electricity grid with water pumps and predictive maintenance of the pumps.
Pilot 6 - Finland	• Optimizing the management of flexible demand and green production for end consumers.	Data-driven eco-system of green production, flexible consumption, and storage capacity.
Pilot 7 - Latvia	• Creating information for public reporting and controlling of success in RE and Energy Efficiency funding schemes. • Adjustment of funding condition according to empirical data. • Creating information for energy efficiency measures: primary overall energy consumption, primary non-renewable energy consumption and greenhouse gas emissions before and	Cross-value chain services for energy-data driven green financing.

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	after the implementation of the planned measures, as well as for the reduction of primary energy and CO_2 emissions to evaluates the support from EU fund and national budged programmes.	

3.3.1 Service Level Agreements

A Service Level Agreement (SLA) determines the standards that the provision of services between participants in the data space shall meet. Such a contractual agreement is in general relevant to all use cases. It is increasingly relevant the more mature and operational the use case is and the larger the number of customers participating and affected by the use case are.

Within the use case descriptions in D2.1 SLAs have mainly been mentioned and detailed in pilots P2 - Cross-value chain smart buildings/ mobility/ grid services for Local Energy Communities and power network operator - and P5 - Cross-value chain data community-centred services for optimising DSO-level grid operation while coordinating with electric vehicles (EV) and water sectors. Table 7 summarises the requirements and the indicators for the service levels. The requirements deal mainly with response times and latency of systems and with the services uptime and availability; the last column indicates that the requirement is likely relevant to all use cases.

Table 7: Requirements on Service Levels

Req. ID	Requirement name and description	Requirement indicator	General Relevance.
P2-QoS-1	Elapsed time response requirements for exchanging data	< 1 minute	X
P2-QoS-2	Contractual timelines for exchanging data is required	< 1 minute	X
P2-QoS-3	Availability of information flows	> 99.9% Allowed outage: 9h per year	X
P2-QoS-4	Accuracy of data requirements	quality flag (normal / not normal); Age of data; Time skew of data ;	X

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P2-QoS-5	Frequency of data exchanges	Upon request (for service provision); Periodicity greater than a few seconds (for data acquisition)	
P5A-NF-06	Elapsed time response requirements for interaction of the mobile application	Less than 30 seconds	X
P5B-NF-03	Login Latency - Electric Mobility platform login shall be processed by	<3 seconds	X
P5B-NF-04	Charging Station Latency – Charging station ping	< 200 ms	X
P5B-NF-05	Electric Vehicle Latency Electric vehicle ping	< 200 ms	X

Furthermore, techniques and processes for meeting quality of service have been mentioned in the requirements such as:

- Failure detection
- Automatic restart
- Automatic failover to second source of data or function
- Automatic failover of communication channels to secondary channel
- Backup of data
- Transaction rollback
- QoS monitoring
- Alarming on QoS failure

Most of these requirements will be relevant to other use cases as well and may be generalised. The service level as per the value of the indicator may differ across the use cases. However, it will be beneficial to have measurements for these indicators and the techniques and processes implemented.

3.3.2 Accounting Scheme

The accounting scheme specifies the parameters that should be logged and reported for every business actor and transaction of the data space for accounting purposes [24]. It is thus relevant to the operation and financing of the data space if the business models build on payments based on usage and transaction of participants. Billing and charging schemes may depend on the availability of logs from transaction and are closely related to the accounting scheme. It may also be relevant for the segmentation of customers and participants as it may provide data on activity and usage patterns.

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Within ENERSHARE the accounting of data usage and transaction is planned in Pilot 5, use case 5A. In the Scenario “Grid congestion problem avoided” step 2 is “DSO remunerates CPO for service provided”. This implies that the provision of the service has to be documented and logged within the data space to provide the basis for the remuneration.

In use case 5B the functional requirement “P5B-F-15 Micro-Payment Electric mobility platform must be able to process micro-payments” is included as part peer-2-peer trading of flexible charging services between DSO, CPO and EV user. Similarly, to use case 5A payments for services depend on the logging of the service provision. With the EV user being involved in this case also consumer-oriented processes need to be covered.

Data Accounting is likely relevant to further pilots and the overall operation and governance of the data space. As business models mature, requirements need to be fed back into the design of this building block.

3.3.3 Billing / Charging Scheme

The billing / charging scheme specifies how billing/charging for the use of data and services shall take place. In addition to simple flat schemes, common schemes may depend on the data volume, the number of requests for, or connections to, a service or the time period of the availability of the service and can be combined into hybrid schemes [24].

In ENERSHARE no explicit mention of billing nor charging schemes have been mentioned in the use case descriptions. The example in Pilot 5B including micro-payments in peer-to-peer trading indicates that there is an underlying scheme. Requirements for the project may be expanded at later planning stages of this pilot.

Billing and charging schemes may also be relevant for the inclusion of data from third parties if external schemes need to be complied with. If these kinds of schemes are in used within the data space this would implicate the requirement to integrate them into the systems of participants for invoicing and settlement processes.

3.3.4 Data valuation method

Methods and processes to determine the value of data are relevant to define usage policies and price setting for data assets in a data space. Therefore, data valuation is mainly linked to the marketplace to be developed in work package 5 in ENERSHARE.

There are three common approaches to assess the value of data assets. Data can either be valuated based on input cost, market comparisons or value based.

The first costing approach builds on the input factors to create the data asset in terms of cost for data collection, storage, and processing. An additional profit margin may then be added to

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the total cost. As cost for setting up data assets are characterized by a high share of upfront costs, assumptions on the duration, volume and scaling of data products have large impact on the cost-based pricing.

The market-based method determines the value by the market price of comparable data on mature data markets. This approach relies on the assumption that there is a market for data with a number of data provider and data users. As data is often very specific it might be difficult to determine which data may be used to determine the price for a data asset. Similarly, on the buyer side there need to be several potential buyers to make use of an efficient market pricing process.

The value-based method determines the value by the future income or cost savings based on the availability of a data asset. It aggregates the expected future cash-flows to calculate the benefits from access to the data asset. Making assumptions on the effect of data on future business operation will often have large uncertainties which will proliferate into the valuation of data. However, this method provides the most business oriented perspective on data valuation.

3.3.5 Smart Contract

Smart contracts provide a protocol for implementation of agreements between Data Provider and Data Consumer and possibly further parties. They specify data usage policies, legal aspects, SLAs and other agreements in a machine-readable and cryptographically signable manner [24].

Use case 5B with the micropayment platform is demonstrating this business building block within ENERSHARE. The smart contract is executed between the DSO and the CPO and coordinated by the electric mobility platform on the agreed schedules for EV-charging. The smart contract then provides information on payment methods and processes for settlement through a peer-to-peer trading platform.

As Pilot 5 has a high ambition to demonstrate flexibility services on the technical and business side it may become a reference implementation for the use of smart contracts. Other use cases may benefit and draw from the experience and include solutions for the advancement of their business models.

3.4 Overall business concept

In the light of the contributions and information collected in the previous paragraphs, this section provides the design of the overall business concept proposed for the ENERSHARE solution. The first reasonable step is to create the Value proposition Canvas involving the offers identified in section 3.1 and the stakeholders identified in the paragraph 2.2.

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The “Value proposition Canvas” (Figure 5) is a business tool used for clarifying the value proposition of the product or service intended to sell in the light of the further commercialization of the project solution [25]. The tool is composed of two parts: the Customer Profile, in which the potential customers and their needs are fully described, and the Value Proposition reporting the product/service tailored for that customer.

As shown in Figure 5, the “Value Proposition” is represented as a square composed of three sections:

- Product or service: in which a brief description is reported.
- Gain creators: which identifies the gains that the offer can provide to the customers.
- Pain relievers: in which, parallelly to the gain creators, are reported the pains that the offer can relieve.

The “Customer profile” is contained in a circle with three slices:

- Customer jobs: which reports the role of the customers.
- Gains: which reports the gains that the customers would like to buy.
- Pains: what the customers want to overcome through the offered solution.

The two areas – Customer and Offer – have to be interconnected: the services reported on one side must find one or more correspondences in the square and vice versa.

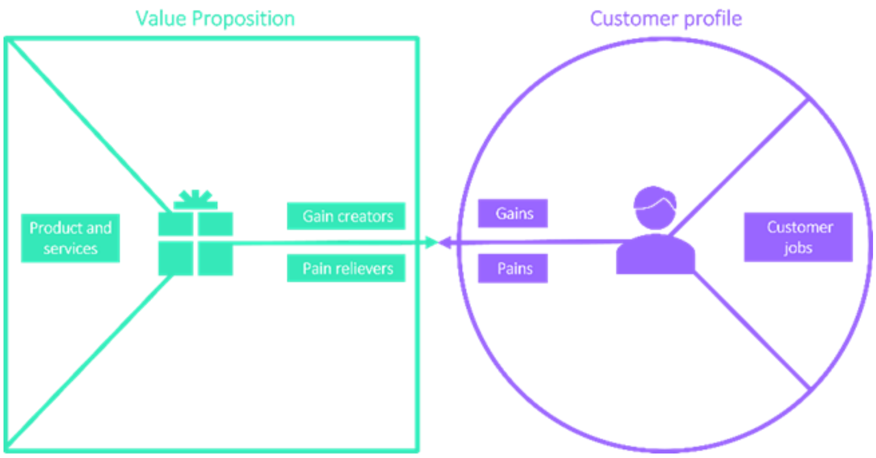

Figure 5: Value proposition Canvas template

Figure 6 shows the Value proposition Canvas for the ENERSHARE solution. The main points of the offer involve the tools for increasing the RES use and value-added services for non-energy sectors. With this aim, the platform will mainly exploit the energy data, managed accordingly with the European energy standards, and will contribute to the reduction of the costs and effort

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for the data access. The project solution will also provide a tool for the clear detection of the energy production and consumption of the energy users.

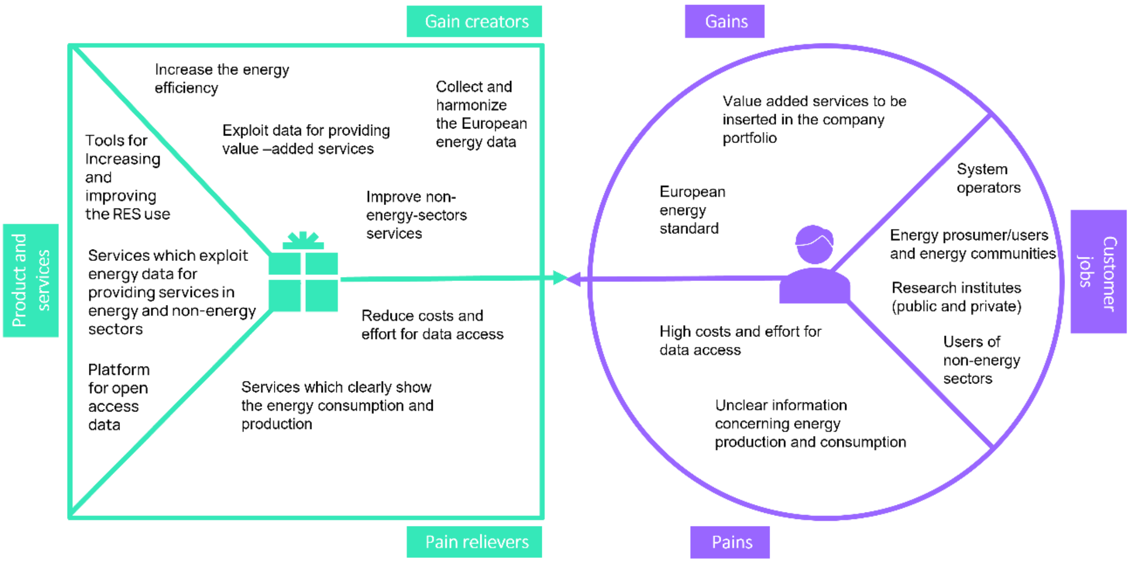

Figure 6: ENERSHARE value proposition Canvas

The overall business concept of the project will be inspired by the “sharing economy” concept which is proposed as a new economic and cultural model capable of promoting a form of conscious consumption that favours the rationalization of resources based on the use and exchange of goods and services rather than on their purchase, therefore on access rather than possession. Indeed, this economic system is based on social networks in which people interact with work, time and resources. The most typical and widespread example of "sharing mobility" are services such as car sharing, bike sharing or shared micro-mobility (electric scooters). A symbol of the sharing economy is undoubtedly blablacar[10], founded in France in 2006 and rapidly becoming a global phenomenon of carpooling thanks to the shared use of private cars. The basic idea is always to restore value to otherwise "wasted" products and services by promoting social community and efficiency. From these few examples of "circular economy" appears that a fundamental role is attributed to the platform which connects the members of the community and, in some cases, "founds" it.

The idea that gave shape to ENERSHARE intrinsically comprises the sharing enhancement: the European database for the energy data, which contains information which would be lost, will be exploited to create added value services which will provide benefits to intermediate and final users.

[10] https://www.blablacar.it/

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It is noteworthy here that the importance of data lies not just in collecting it but also in analysing it effectively to achieve desired outcomes. Therefore, it is critical to understand how to harness the power of data to drive growth and progress. Good data and analysis can bring wealth to companies by providing them with valuable insights into their business operations and customer behaviour. By collecting and analysing data, companies can identify areas of improvement, optimize their processes, and make informed decisions that lead to increased efficiency, productivity, and profitability. Moreover, data-driven insights can help companies identify new opportunities, develop new products and services, and enter new markets. With the right data and analysis, companies can gain a competitive edge, improve customer satisfaction, and ultimately increase their bottom line.

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4 Conclusions

D2.4 contributes to reach the expected outcome 3 (EO3) - Enable new market roles, market participants and energy communities – and some of the goals of T2.3 such as the identification of the new stakeholders' roles, their business interactions, and the overall business concept. Beyond being strictly related to the research conducted in the D2.1 [23] and the discussions of the WP2 tasks, the document represents a reference material for the elaboration of the exploitation strategy and the definition of the ENERSHARE business models (WP11).

The document has pointed out the main roles and interactions of the Energy data Value chain. The research has also been dedicated to the business interactions which exist among the stakeholders according to the roles/components reported in the IDSA documentation. In addition to the energy sector, other sectors, and related services, have been identified in section 2.1. For each pilot case, the analysis has provided the energy vectors (e.g., electricity, heat), the non-energy data exchanges, and the non-energy actors. About the cross-sectors data driven services, the analysis has described, for example, the "Emissions and ecological footprint" service, which falls within the environmental sector and intends to support the decision-making process of national or local government departments. Another aspect addressed in the deliverable is the knowing of the IT infrastructures of data space participants, particularly relevant in the early stages of the development. Thus, section 2.3, provides information on the different systems with their names and some characteristics which will be used in the pilots.

The third chapter is dedicated to the steps needed for defining the overall business concept. It comes from the result of i) partners brainstorming, ii) state-of-the-art analysis and iii) elaboration of documentation produced by the consortium. This process has allowed to build a business concept aligned with the work already conducted, the partners common idea of value proposition as well as the solutions present on the market. In this context, MIRO application has demonstrated to be a suitable software tool for the remote brainstorming, and the use of the post-it method has allowed to compare different points of view in the definition of the overall purpose. The inputs of partners have been elaborated and refined for obtaining the following points which synthesize the offer: providing a platform for open access data; offering a solution which could increase and improve the RES use, creating benefits for the consumers as well as for the system operators (TSO/DSO); exploiting the data for offering services in energy and non-energy sectors such as e-mobility, environmental and financial services.

Thanks to the use of the Value Proposition Canvas and the identification of the different roles involved in the sectors touched by the project, it has also been possible to define the customers profile together with their gains and pains that could be created and relieved by the ENERSHARE

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solution. The treatise considers an approach based on the “sharing economy” principles which seem to be intrinsically included in the project concept.

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