Enershare

The Energy Data Space for Europe

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

enershare.eu

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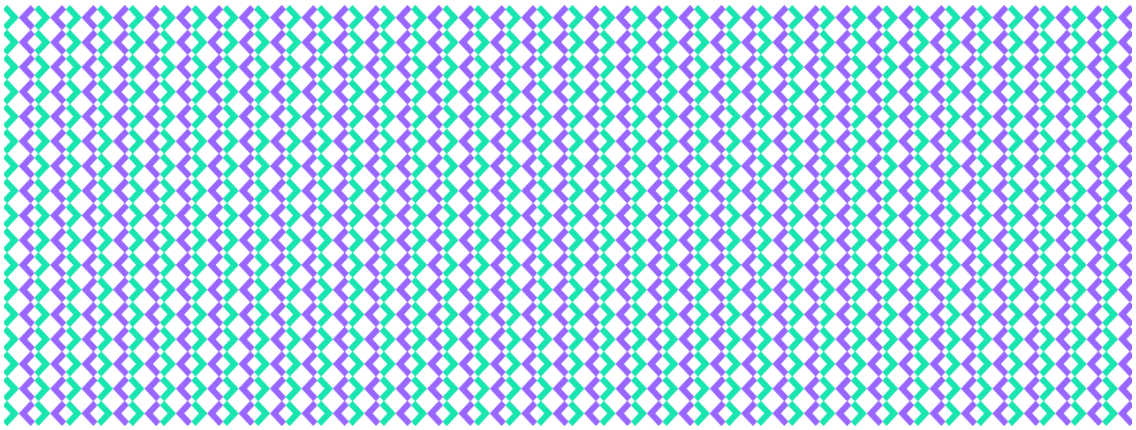
D10.1 Report on the synergies with the relevant projects and initiatives (1st version)



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List of Acronyms

BUC	Business Use Cases
CEC	Citizen Energy Communities
CSA	Coordination and Support Action
CIM	Common Information Model
DERA	Data Exchange Reference Architecture
DSaaS	DataSpace as a Service
DSO	Distribution System Operator
DT	Digital Twin
EC	European Commission
EDDIE	European Distributed Data Infrastructure for Energy
EU	European Union
HEMRM	Harmonised Electricity Market Role Model
KoM	Knowledge operation Management
LEC	Local Energy Communities
MDS	Mobility Data Space
NILM	Non-Intrusive Load Monitoring
P2G	Power to Gas
RBAC	Role-Based access control
REC	Renewable Energy Communities
RPF	Reverse Power Flow

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SUC	System Use Cases
TSO	Transmission System Operator
WP	Work Package
FAIR	Findable Accessible Interoperable and Reusable

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Executive summary

This document is relating the work and engagement on the ENERSHARE project Work Package (WP) number 10. The EU funded several projects on the same ENERSHARE call and initiatives related to Data Spaces. These Data Spaces are linked and inspired by international initiatives such as GAIA-X or IDSA. These sister' projects and sister' data spaces will create innovative business models and technical means accordingly to their specific objectives.

The EU is expecting that ENERSHARE brings a continuous experiences' exchange through several workshops, both in presence and online in order to share common obstacles and solutions found on the projects' development. These interactions could be managed with both energy sector or other sectors dataspaces for which possible synergies have to be identified and linked to the energy data sector (for example, to optimize the electricity consumption based on cost or carbon footprint). GAIA-X and International Data Spaces Association (IDSA) in particular around the Energy Data Space, finds a particular resonance within ENERSHARE.

The present document is the first version from three on a work closed by end of June 2023. It presents the parent and sisters projects objectives and principles to consider studying for dataspaces interoperability for ENERSHARE.

As far as the sister' projects have been financed on the same timeline than ENERSHARE (05/2022 to 04/2025), this first ENERSHARE outcomes are strongly linked to sister' projects production and first tangible results. Nevertheless, we have seen that all projects are trying to avoid to reinvent the wheel as they are inspiring from previous projects and architecture such as IDSA and Gaia-X. Gaia-X and IDSA share certain common objectives and principles regarding data sovereignty and secure exchanges, but they are also large differences between the two initiatives.

Gaia-X is a primarily European initiative, governed by an European association since 2019, with the aim of creating a decentralized data infrastructure for Europe, aiming to promote European digital sovereignty. IDSA is an international initiative not limited to the EU governed by a German association as part of the German government's industrial program (Industry 4.0).

Both projects have different technological approach, the Gaia-X focuses on the development of cloud computing-based data infrastructure, emphasizing aspects such as interoperability, data portability and trust. IDSA also emphasizes interoperability and trust but takes a more specific approach focused on creating a decentralized data ecosystem based on concepts such as secure data spaces and data connectors. Gaia-X may use some part of the technical IDSA stacks, but not all the components.

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To our understanding Gaia-X and IDSA convergence (perimeters) is ongoing and a must have. But these convergence results, especially dataspace technical overlaps, are yet unknown. All the sister' projects are mostly reusing these Gaia-X and IDSA technical definitions to build their Data Spaces.

The Dataspace interoperability level within the same project domain, such as the energy for ENERSHARE, is highly strategic. The project int:net starts to work on an assessment methodology and maturity model and their results will be presented in Q1 2024 as a first dataspace stage to discuss about interoperability.

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1 Introduction

About the project

The ENERSHARE project is aiming at developing, deploying and validating the first-of-its-kind Reference Implementation of the European Common Energy Data Space along a variety of different cross-domain pilots to facilitate, speed up and enable the transition towards the smarter, sectors-integrated, decarbonized and participatory energy system of the future.

ENERSHARE project is fully autonomous in its deliveries. Nevertheless, the EU funded several projects of this call and initiatives related to Data Spaces. A continuous experiences' exchange is expected from the EU to be implemented through several workshops, both in presence and online in order to share common obstacles and solutions found on the projects' development. GAIA-X and IDSA, in particular around the Energy Data Space, finds a particular resonance within ENERSHARE and vis et versa.

The main goal on this work package is to create a stable communication among the most relevant actors who are running these relevant EU-funded projects and initiatives all over the EU. Through the project channel, the stakeholders must interchange the requirements for the semantic interoperability among the EU-funded projects named sister projects. Another goal of the work package is to gain knowledge of the state of the art of the components used by the relevant projects and then catch the developed architectures regarding the interoperability of data spaces.

The major outcomes that are expecting to be achieved are divided and organized in 3 tasks:

- Task 10.1 Interoperability and synchronization with the other projects of this call and initiatives, led by TECNALIA.
- Task 10.2 Alignment and synchronization with GAIA-X, led by ENGIE.
- Task 10.3 Interoperability with BRIDGE cross-sector energy centred architecture, led by ENGINEERING.

About this document

The objective of this document is to describe the main objective of the projects, report new projects of interest, as well as their level of maturity and readiness. The document intent to clarify the possible interactions between ENERSHARE dataspace and other dataspaces projects supported by the European Commission like GAIA-X. These interactions could be managed with

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both energy sector or other sectors dataspaces for which possible synergies may have been identified linked to energy sector data (for example, to optimize the electricity consumption based on cost or carbon footprint).

Table 1 – Projects list

	Project Name	URL
01	BRIDGE	http://H2020-bridge.eu
02	GAIA-X	https://gaia-x.eu/
03	DATA CELLAR	https://datacellarproject.eu/
04	OMEGA-X	https://omega-x.eu/
05	EDDIE	https://eddie.energy/
06	Data Spaces Cluster	https://dssc.eu/
07	Int:net	https://intnet.eu
08	SYNERGIES	https://synergies-project.eu/
09	IDSA	https://internationaldataspaces.org/
10	EDHISI	https://www.teralab-datascience.fr/
11	FIWARE	https://www.fiware.org/foundation/
12	BDVA	https://www.bdva.eu/

Intended audience

The intended audience for this deliverable is all partners of the consortium. As the second audience, it might be of interest for any stakeholders that wants to have a high level understanding of the project sisters' (EDDIE, OMEGA-X, int:net, etc.) and key worldwide organizations such as Gaia-X and IDSA.

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Reading recommendation

This document is divided into 3 core chapters and surrounded by an introduction and a conclusion. Each core chapter is dedicated to a task. Chapter 3 provides an overview of the concept of Interoperability and synchronization with the other projects of this call and initiatives. Chapter 4 presents the Alignment and synchronization with GAIA-X and then chapter 5 is discussing about the Interoperability with BRIDGE cross-sector energy centred architecture.

2 Interoperability and synchronization with the other projects of this call and initiatives

2.1 Introduction

One of the objectives of this Work Package (WP) is the establishment of relationships with other EU-funded projects of the same call as ENERSHARE (OMEGA-X, SYNERGIES, DATA CELLAR, EDDIE), so called "sister projects" because they have similar timelines and share some concerns, in particular potential use cases in the energy domain. Besides, the relationships with other initiatives related to Data Spaces (GAIA-X, FIWARE, BDVA, IDSA) must also be established. Finally, this is the channel for interchanging the requirements for the semantic interoperability among the projects.

2.2. Sister Projects

As mentioned before, there are 4 projects with similar timelines as ENERSHARE, including also potential use cases in the energy domain. In the following table, main objectives of each project are indicated:

Table 2 – System projects main objectives

Project	Objective
OMEGA-X	The aim of OMEGA-X is to implement a data space (based on European common standards), including federated infrastructure,

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	data marketplace and service marketplace, involving data sharing between different stakeholders and demonstrating its value for real and concrete Energy use cases and needs, while guaranteeing scalability and interoperability with other data space initiatives, not just for energy but also cross-sector.
DATA CELLAR	DATA CELLAR aims to create a public energy dataspace that will support the creation, development, and management of Local Energy Communities (LEC) in EU. Such dataspace will be easy to be populated (also via an innovative rewarded private metering approach) and easy to interact with, also guaranteeing a smooth integration with other EU energy dataspaces and providing to LEC stakeholders services and tools for developing their activities
SYNERGIES	SYNERGIES introduces a reference Energy Data Space Implementation that will attempt to unleash the data-driven innovation and sharing potential across the energy data value chain by leveraging on data and intelligence coming from diverse energy actors (prioritizing on consumers and introducing them as data owners/ providers) and coupled sectors (buildings, mobility) and effectively making them reachable and widely accessible
EDDIE	EDDIE creates a de-centralised, distributed, open-source Data Space, aligned with directions of the work on the Implementing Acts on Interoperability and other European activities. This European Distributed Data Infrastructure for Energy (EDDIE) lowers data integration costs drastically because the resulting EDDIE Framework lets energy service companies work and compete in a common European market. EDDIE's vision is to make it cheap and easy for smart, data-based energy-related services to operate on a common European Energy Data Space

More detailed information of each project is indicated in Annex. This information corresponds to the **int:net** Data Space Cluster Meeting held on 30th September 2022.

Some synergies are arising while the projects are going on. For example, semantic Vocabulary Hub that is being developed in ENERSHARE is expected to be used in OMEGA-X. At the same time, the Identity Manager developed in OMEGA-X is expected to be implemented in ENERSHARE.

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2.3 Interoperability Community: int:net

The Interoperability Network for the Energy Transition (**int:net**) is a project with the objective of establishing an open, cross-domain community bringing together all stakeholders relevant for the European energy sector to jointly work on developing, testing, and deploying interoperable energy services. The community will be formally established to exist beyond project lifetime. With a comprehensive, Findable Accessible Interoperable and Reusable (FAIR) knowledge platform and a series of attractive events it guides those who deal with the heterogeneous interoperability landscape of energy services.

Being a Coordination and Support Action (CSA), this project has also the commitment of facilitating discussions to reach interoperability between the sister projects, both from technical as use case levels.

The following events have been carried out with this purpose:

- **Data Spaces Cluster** meetings:
  - 30/09/2022. Presentation of the sister projects: ENERSHARE, OMEGA-X, DATA CELLAR, SYNERGIES, EDDIE. The presentations of this meeting are available in Annex.
  - 02/05/2023. Brussels/remote. Global cluster presentation
- Internal **int:net** workshops meetings:
  - 25/01/2023. Targets. Review of project Use Cases.
  - 08/03/2023. Mural page interoperability definition and Presentation of "int:net interoperability survey" by Antonio Kung (TRIALOG).
  - 22/06/2023. Frankfurt/remote. Objective: Data Modelling, Data Spaces, Communication Protocols, Digital Twins.

An important milestone is foreseen: the analysis of the reference architectures of the sister projects. Probably, this activity will be done within the Energy Interoperability Task Force (presented in next part)

2.4 IDSA: Energy interoperability task force

A task force for working on energy interoperability has been created, being led by IDSA. The main goals of this task force are the following:

- Definition of an interoperability framework for the Energy domain.
- Implementation of defined interoperability framework in (specific) use cases.
- Document the framework and implementation.

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- Establish communication channels with standardisation committees and bring our contributions.

The following meeting/events have been held:

- 07/03/2023. Knowledge operation Management (KoM) Energy interoperability. Definition of what is interoperability.
- 28/03/2023. Towards the Energy interoperability framework paper. Representatives in ENERSHARE: Sonia Jiménez (IDSA); Antonio Kung (TRIALOG), Sonia Bilbao, Adelaida Lejarazu (TECNALIA), Eric Lambert (EDF).
- 21/04/2023. Working groups have been established:
    - Standards&Papers;
    - Technical interoperability;
    - Semantic interoperability and use cases.

ENERSHARE is represented in Standards&Papers by Eric Lambert (EDF) and Antonio Kung (TRIALOG), Semantic and Technical Interoperability by Sonia Bilbao (TECNALIA) and coordinated by Sonia Jiménez (IDSA).

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3 Alignment and synchronization with GAIA-X

3.1 Perspectives of federated use cases between ENERSHARE and GAIA-X Energy data spaces

In a first step, we will recheck the ENERSHARE use cases and compare them with the use cases listed in the GAIA-X Energy dataspace as defined in the Lighthouse project dedicated to Energy sector: OMEGA-X. We will check also potential cross sector synergies by checking use cases available in non-energy related dataspaces in GAIA-X.

Based on these lists, we will propose potential use cases for federated dataspaces and explain the kind of synergies identified.

Federated dataspaces use cases will be described using IEC 62559 (1):

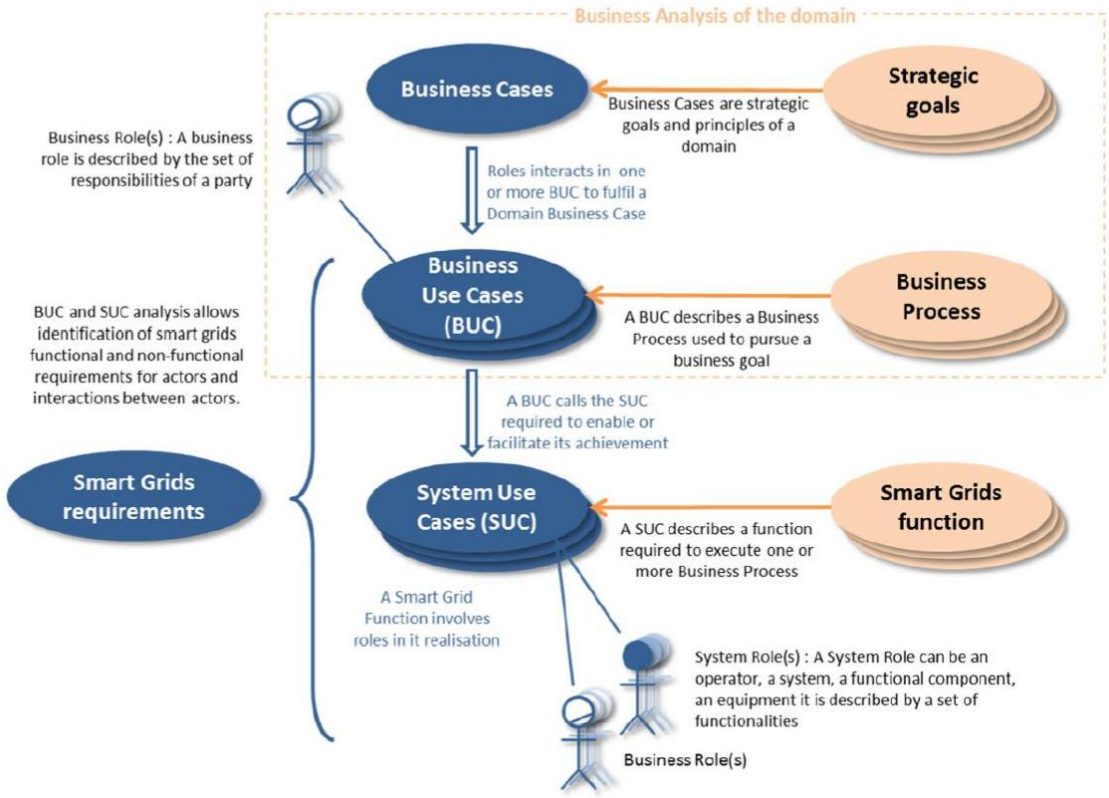

Figure 1 – IEC 62559 Use Case Methodology (source IEC 62559)

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3.1.1 Reminder of ENERSHARE use cases

The ENERSHARE use cases are defined more in details in the task T9.1 with D9.1 Pilots' preparation, measurement, and verification plan. The 1st list describes 7 pilots (12 with sub use cases):

Table 3 – Primary ENERSHARE use cases

Use case	Main goals for Business Use Cases BUC)	Example of data managed for System Use Cases SUC)	Comments
P1-ES: Wind farm integrated predictive maintenance and supply chain optimization	Design and development of an offshore wind digital platform	General operational data Generator data Converter data Hydraulic pitch system data Gearbox data	Target also the enrichment of the IDSA architecture's components (edge) and business models definition for data monetization
P2-PT-A: Leveraging on consumer-level load data to improve TSO's operational and planning procedures	Assess the value of behind-the-meter (consumer-level) load data to the Transmission System Operators (TSOs) in improving operational and planning procedures	Consumer Metering Data Substation level load data Consumer gas consumption data Aggregated consumer level information and profiles Utility level data (energy cost, electricity tariffs, market data) Energy Management System (EMS) residential systems data	To improve net-load forecasting at the substation level, based on aggregated and individual consumer-level data, exploring federated learning, and the typology/amount of load and generation (RES) at the end-consumer side. Including definition of REC/CEC business models, considering consumption and generation profiles, energy prices and flexibility models for smart appliances
P2-PT-B: Instantiation of energy communities and digital simulation of business models	Explore the combinatorial value of data owned by different data owners (i.e., its cross-silo value) for optimal design of REC and/or CEC		
P2-PT-C: Detect irregularities in energy consumption in households with seniors living alone.	Explore the concept of an assisted living digital service offer where the health status of a senior living alone		
P2-PT-D: Suggest maintenance of appliances based on NILM data	Use NILM data to detect appliance retrofit opportunities in private rental sector and social housing		
P3-SI: Optimal multi-energy vector planning - electricity vs heat	In the context of district heating and the use of technologies such as heat pumps and seasonal thermal storage, define potential savings by providing flexibility to the electric system	Solar rooftop potential Heat use of buildings Potential district heating systems Potential DH system with a combination of photovoltaics and a water-to-water heat pump Weather data Weather data - forecast AMI Data (end-user data) AMI Data (secondary substation data) AMI Data (Import from TSO)	Linked to photovoltaic, biomass, hydropower, and geothermal sources, and fine-grained profiling and segmentation of users or management systems
P4-GR: Digital Twin for optimal data-driven Power-to-Gas optimal planning	Optimal data-driven Power-to-Gas (P2G) planning based on scenarios for hydrogen production and storage from RES under different energy demand profiles	Historical Data of Natural Gas Quality Historical Data of Gross Calorific Value and Wobbe-index (Kulata (BG) /	Combined optimization platform, TwinP2G, coupling the electricity transmission system with natural gas demands, leveraging a DT architecture involving P2G

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		Sidirokastron (GR)+Nea Mesimvria) Operator's Estimations of N.G. Off-takes compared to Actual Off-takes Validated Daily Natural Gas Deliveries / Off-takes Hourly Natural Gas Deliveries / Off-takes Historical Data of Natural Gas Pressure in Entry Points	technologies and Regenerative Hydrogen Fuel Cells (RHFC).
P5-IT-A: Cross-sector Flexibility Services for aggregators and DSO	Take advantage of the sources of flexibility offered by cross-sector to reduce the flow of RPF into the power distribution grid and reduce the impact on distribution grid	Historical Data of PV plants Historical Data of loads Historical Data of charging stations Historical Data of Electric vehicles Real-time Data of PV plants Real-time Data of controllable loads Historical data of water pumps Real-time Data of charging stations Real-time Data of Electric vehicles Historical data of power consumption Real time data of power consumption	Include load forecast for household and primary substation and PV feed-in estimation, flexibility estimation for each household, reduction of reverse power flow / Optimisation of the grid and maximisation of self-consumption.
P5-IT-B: Services for e-mobility Charging Point Operators (CPO), EVs drivers and DSO	Cooperation mechanism between Distribution System Operator (DSOs), CPOs and Electric Vehicle (EV) users, to reduce the power grid upgrade magnitude by coordinating the electric vehicles charging		To be able to provide a dynamic charging price based on real-time/forecasted DSO needs, and to offer an advantageous charging price in congested areas to attract EV users, increase CPO revenue, and help DSO to manage the grid congestion level.
(P5-IT-C): Flexibility provision for electricity grid with water pumps and predictive maintenance of the pumps	Increase efficiency in grid operation by tapping the flexibility potential of water pumps, reduce cost of water system operations through water demand forecasting and electricity consumption in lower price periods		Based on forecasting water demand variations using the real time data and historical data available
P6-FI: Data-driven eco-system of green production, flexible consumption, and storage capacity	Data-driven support tool for planning an energy eco-system, and data-driven algorithms for managing the controllable devices of the consumer, such as EV chargers and heat pumps	Historical data of EV chargers Historical data of heat pumps consumption Historical data of temperature Historical data of weather Historical data of market prices Power curve data of wind and solar assets	Using measurements from devices, weather data, and market data
P7-LV: Cross-value chain services for energy-data driven green financing	Cross-sectoral integration of data on financial performance of energy efficiency projects	Weather data Project information: technology installed) (Solar PV installation) Electricity consumption / production (Solar PV installation) Project information: Building energy efficiency data before the renovation / implemented activities / after the renovation	Strengthen debt and equity financing of energy efficiency investments, providing investors and project developers some key performance indicators of future projects

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The detailed description based on IEC 62559 is not used at this step, then we will refine and update the dataspaces use cases in next version of this document.

3.1.2 Inventory of GAIA-X dataspaces use cases with possible synergies

We compare the use cases identified by other GAIA-X Lighthouse projects in order to identify possible cross sector data spaces synergies. We would check especially the opportunities of data exchanges in sectors like transport including EV mobility, manufacturing and smart cities or smart building management.

GAIA-X has selected a set of "Lighthouse" projects and each of them has defined a set of business use cases:

- OMEGA-X is the only GAIA-X Lighthouse project dedicated to energy sector.
- Other Lighthouse projects did not specifically list business use cases with OMEGA-X but we may identify opportunities especially in energy consumption optimization for Business to Business (B2B) or Business to Customers (B2C) consumers and/or with grid balance optimization.

The main (2) identified initially by GAIA-X are per sub domains of activities:

- Use Cases Renewables:
  - Wind and solar asset description model.
  - Works risk prevention.
  - Common taxonomy definition – IEC standards.
- Use Cases Nuclear:
  - Day-to-day collaboration capabilities within Gifen.
  - Nuclear – industry observatory: capabilities mapping & related data analytic services.
  - Nuclear – ESPN Digital Platform for the nuclear sector.
  - Nuclear – eWork Platform.
- Use Cases low-carbon hydrogen:
  - H_2 – Import/export international routes setting up.
  - H_2 – Station networks information sharing.
  - H_2 – Mobility asset monitoring.
- Use Cases downstream, energy renovation and electric vehicles:
  - Energy renovation: map building potential for renovation.
  - Local communities of energy setting up and decentralization.
  - Electric vehicles – Energy Roaming.
  - Electric vehicles - New services.

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  - Stadtwerke/Local Open Data for Business Models in the Energy Industry.
  - Infrastructure data for new business models.
- Use Cases energy networks:
  - Networks – Long term scenarios
  - Networks – EV – CPO and DSO Investment and Planning.
  - Networks – OrtoPhotos.
- Use Cases Compliance and standards:
  - Green certifications.
  - Existing standards integration to GAIA-X.
  - Trusted HUB.

Anyway, during OMEGA-X project, it was planned to recheck more in detail each of these use cases in order to select, merge or redefine the best opportunities for the project.

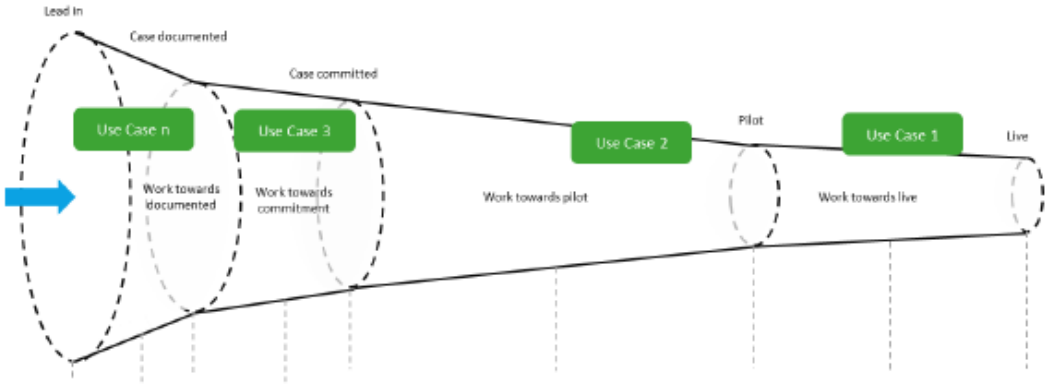

Figure 2 – Omega-X use case scenarios within the data space

Based on last 2023 meeting done with EDF, the 2 main use cases under detailed analysis would be:

- Use Cases downstream, with GIREVE about electric vehicles charging stations grid management with possible energy grid optimization:
  - Local communities of energy setting up and decentralization.
  - Electric vehicles – Energy Roaming.
  - Electric vehicles - New services.
  - Stadtwerke/Local Open Data for Business Models in the Energy Industry.
  - Infrastructure data for new business models.
- Use Cases Renewables with EDF ENR about windfarms optimization:
  - Wind and solar asset description model.
  - Works risk prevention.
  - Common taxonomy definition – IEC standards.

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A more detailed comparison between ENERSHARE and OMEGA-X use cases in terms of business actors, involved systems (either new ones or already existing ones), exchanged data and data models would be done in the version 2 (v2) of the document, for example, for Local Energy Communities or Flexibility management in energy grid.

In parallel to OMEGA-X initiatives, we do not identify at this step other energy related dataspaces in GAIA-X. Anyway, GAIA-X has defined Lighthouse projects for other sectors that may have possible synergies with ENERSHARE initiatives.

To remind the official list of GAIA-X Lighthouse projects available in April 2023 includes: AgDatahub, Catena-X (Automotive Supplychain), Elinor-X (Urban data cooperative), Eona-X (Mobility transport & tourism), EuPro Gigant (Industry 4.0), Mobility Dataspace, SCSN (Electronics), GAIA-X4 Future Mobility, Structura-X (IT).

STRUCTURA-X is a sector agnostic GAIA-X project supporting the implementation and operation of GAIA-X dataspaces platforms in technical sovereign environment.

ENGIE is also participating to EDHISI project led by Cleyrop, 3D Outscale and IMT Terralab in France in order to define a sector agnostic dataspace platform compatible with GAIA-X standard and certified by ANSSI regarding SecNumCloud, the French security and sovereignty standard. EDHISI will develop some connectors including IDS standard ones in order to simplify the use of GAIA-X standard by small and medium businesses: through a simple connector to EDHISI (following IDS, GAIA-X or other standard), they will be able to both use EDHISI platform for their own data visualization and analysis including with Machine Learning models and easily publish it in GAIA-X dataspaces catalogues for data visualization or analysis by other GAIA-X participants.

At this step the main links identified with other sectors GAIA-X dataspaces for cross sectors synergies with ENERSHARE are mostly about EV in mobility management and optimization. For example:

- EONA-X: multi-modal dataspace in order to be able to plan and manage travels with multiple transport solutions combining for example taxi (EV), airplane, train, car renting (EV) for one travel. By aggregating data for multiple travels, especially about usage of electrical vehicles linked to EV (rent or taxi), you can collect data about EV charging needs per area.
- Gaia-X 4 Future Mobility (https://mobility-dataspace.eu/): the Mobility Data Space (MDS) is a data marketplace where equal partners from the mobility sector can exchange data. The data provider always remains the owner of the data and can decide independently if and with which member to start exchanging data. The aim is to create a cross-company data economy for the realization and further development of innovative, environmentally friendly and user-friendly mobility concepts. Like EONA-X, the data about electrical vehicle use and needs for charging (future or in charge) could be used to optimize the energy

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production, transport, and storage ecosystems. Some of the use cases and data catalogues available could be linked to ENERSHARE use cases, like:

- Forecast data for renewable energies for electro mobility optimization (PV, wind for Germany in temporal and spatial resolution, by a Research institute).
- Geographical information on charging points worldwide (Card service provider).
- State of charge and remaining range of a specific electric vehicle with personalized consent (German car manufacturer).
- Display of electricity consumption in a geographical area or measurement of charging potential in that area (German car manufacturer).
- Charging status, Remaining electric range in km, Size of the high-voltage battery, Display of charging time, Calculated remaining charging time of the high-voltage battery, Maximum and real energy content of the high-voltage, Forecast of remaining charging time (German car manufacturer).

Some other dataspaces may have midterm possibilities to check after development or additional investigation. For example:

- AgDatahub which is connecting farmers for their agricultural production and supply chain may also provide additional information about their needs in electricity or even electrical (ex. With solar panels) or biogas production.
- Catena-X or EuPro Gigant dataspaces which intend to manage supply chain data in automotive or manufacturing sectors in general can also provide some data about electricity needs linked to the production chains.
- Elinor-X as smart city data cooperative could provide data about energy needs, consumption, or local/individual production (solar panels).
- Mobility Data Space could provide data about traffic and vehicles (EV).

Figure 3 shows an example of EuPro Gigant future use cases with energy data management (https://euprogigant.com/en/use-cases/) :

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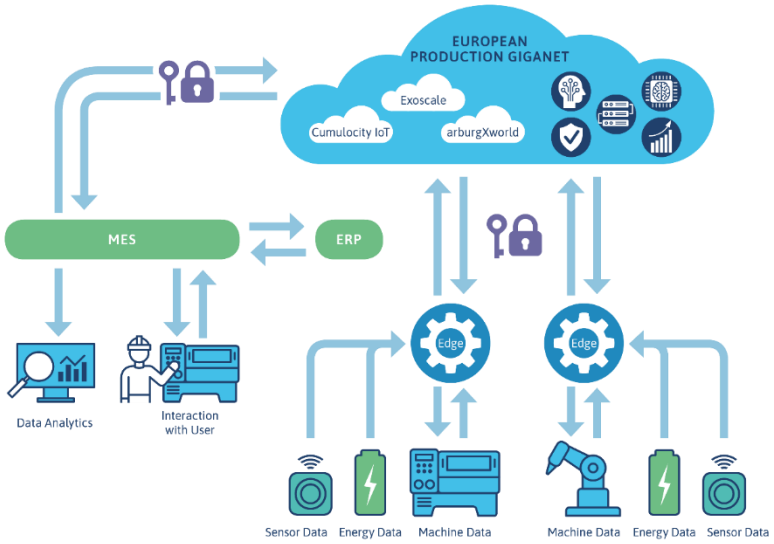

Figure 3 – EuPro Gigant example

EuProGigant stands for "European Production Giganet for calamity-avoiding self-orchestration of value chain and learning ecosystems," a binational research project focused on the smart and sovereign utilization of data within the European manufacturing industry. Led by the TU Wien and TU Darmstadt, a consortium of Austrian and German partners is undertaking this initiative with the aim of establishing a digitally interconnected production ecosystem across multiple locations. Serving as a flagship endeavor for the Gaia-X initiative—an effort to construct an open, European data infrastructure—EuProGigant is advancing the creation of a resilient, data-driven, and sustainable industry in Europe.

Within this ecosystem, comprising data and infrastructure components, we demonstrate practical methods for generating added value for customers and manufacturing firms through the intelligent and sovereign utilization of data. This endeavor bolsters European industry while also contributing to the sustainable development goals of Europe.

3.1.3 Use cases synergies propositions

Based on the use cases comparison between ENERSHARE and GAIA-X dataspaces, we will list the possible federation with related ecosystems based on data, services and business models linked to. We will also check possible synergies based on technology and building blocks sharing with GAIA-X standards and developments including with specific GAIA-X technological projects like STRUCTURA-X and EDHISI.

At this step of ENERSHARE, OMEGA-X and other GAIA-X other sectors dataspaces, we consider that main synergies could be linked to electro mobility with grid management, renewable energy production optimization and technical building blocks.

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Main principles proposed for a 1st set of synergies are about:

- Electro mobility with grid management optimization synergy would be based on data exchanges between ENERSHARE and OMEGA-X or EONA-X / Gaia-X 4 Future Mobility about the needs of electricity charging for EV and the impacts on electrical grid management (load plan) allowing to optimize the use of renewable production or low carbon energy storage system or production.
- Renewable energy production optimization synergy would be based on data exchanges between ENERSHARE and OMEGA-X for maintenance and production optimization.
- Even if ENERSHARE and GAIA-X are based on common standards as IDS, FIWARE or DSBA standard, the way to implement and manage these standards could vary and generate questions for federation and future exchanges of data or services. Synergies could be defined at both the functional levels for data description or governance level for identification of participants, and trust or security levels to manage for data exchanges or services to avoid double definitions and complex integration in the future.

The details of this 1st set of synergies (v1) would be studied in the next chapters.

If needed a v2 of the synergies would be defined in 2024, based on the results of the analysis of the synergies v1 and the progress of both ENERSHARE, OMEGA-X and other GAIA-X projects progress. Also new initiatives to federate dataspaces with close services could be defined such as ManufacturingX in order to unify building blocks used by different supply chain initiatives (ex. Catena-X with other GAIA-X projects

Figure 4 – The 7 key points from Manufacturing-X

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Manufacturing-X initiative seems close to INT:NET initiative described in section 2.3 or Energy interoperability task force described in section 2.4.

Cross sector sharing at least for building federated dataspaces principles and building blocks could be check during the v2 of ENERSHARE synergies. Same for opportunities that could exist for exchanging data and use cases between INT:NET and Manufacturing-X for example to share carbon footprint of electricity used in manufacturing processes (Manufacturing-X would support Carbon data exchanges across the manufacturing supply chain) or naturally regarding the energy consumption prediction based on manufacturing planning.

Based on the synergies set v1 and in order to prepare a v2, as defined in ENERSHARE WP10.2 description an Excel tool would be put in place to monitor the progress of each initiative and relationships between.

The Excel tool will be built on the data and service descriptions published by the dataspaces use cases, as defined in IDS architecture and dataspaces connector principles.

3.2 Selection and analysis of data spaces synergies

3.2.1 Proposition of federation between data spaces

At this step we will focus on the “Electro mobility with grid management optimization” federated use case in order to describe the possible synergies between ENERSHARE and GAIA-X on a detailed example. IEC 62559 model could be used to compare use cases and identify opportunities for synergies.

After a 1st example of synergies description, we will extend the approach to describe more globally other possible synergies (in v1 set identified and later in the additional synergies to define in v2).

3.2.2 Proposition of common building blocks for federated data spaces

We wish to compare on several functional and technical axes the possible differences in particular between ENERSHARE and OMEGA-X or other GAIA-X data spaces implementing common standards suchas as FIWARE and IDSA.

Please note that the European project Int:net is key within our different studies to illustrate the structure or applicability of the technical solutions used by pilots. The Interoperability Maturity Model (IMM), could give a comparison structure to illustrate the differences between pilots and actors that are participating within a pilot.

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For this analysis, we will use part of the studies done in EDHISI project to clarify the GAIA-X choices to implement IDS standard for dataspaces. Then we will check the same criteria for ENERSHARE implementation of its building blocks. Then we will produce a gap analysis to use in the section 3.3 chapter to specify the federation of dataspaces between GAIA-X and ENERSHARE for any kind of use cases.

EDHISI proposition is to build a kind of DataSpace as a Service (DSaaS) solution, supporting both legacy technologies (ex. Databases legacy connectors or existing data exchange protocols), IDSA standard implementation through simple connectors (one to one exchanges, for example) and GAIA-X standards. One of the targets is to simplify the adoption of GAIA-X standard with a ready to use SaaS compatible with the highest GAIA-X trust level compatible with the "SecNumCloud" certification managed by French cyber security authority (ANSSI).

A 1st pilot of EDHISI would be built in 2023, starting to implement IDS standards before to move to GAIA-X ones. For this EDHISI would produce a gap analysis between IDS standards and GAIA-X implementation choices.

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Table 4 – IDSA vs Gaia-X services component view

IDSA (centralized view)	Gaia-X (decentralized view)
Identity Access Manager: - Certificats (PKI / X509) - DAPS (oAuth) - ParIS	Identity Access Manager: - SSI/DID - VC/VP (Token based)
Meta Data Broker Vocabulary Provider	Federated Catalogue Data Exchange Service
Clearing House Contract Negociation	Data Soverignty Services Logging Contracting Service
App Store	Parts of services composition

If possible, we may share and reuse the works done by EDHISI to accelerate the gap analysis and federation specification between IDSA standards implemented in ENERSHARE and GAIA-X standards.

The gap analysis could also be based on DSBA guide for building a dataspace (GAIA-X or others) and on GAIA-X available documentation.

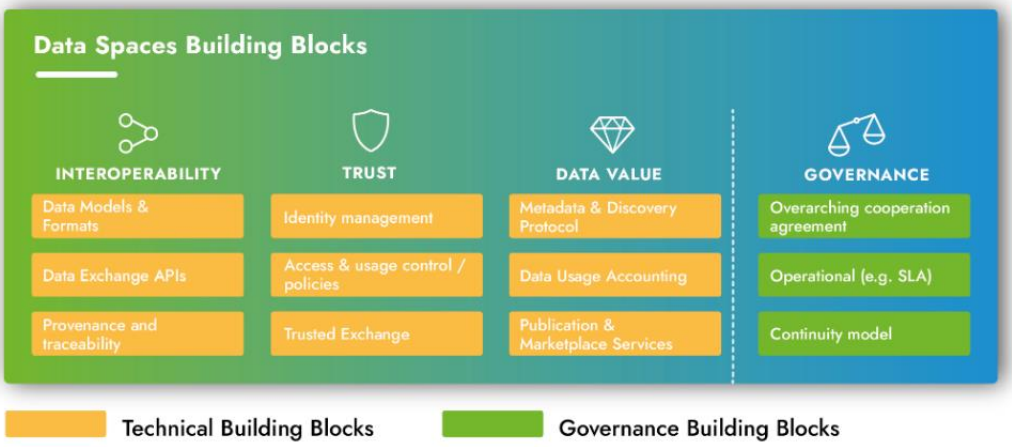

Figure 5 – DSBA Data Spaces Buildings Blocks

For more detailed analysis of the technical building blocks, the DSBA is providing a framework to check for dataspaces interoperability.

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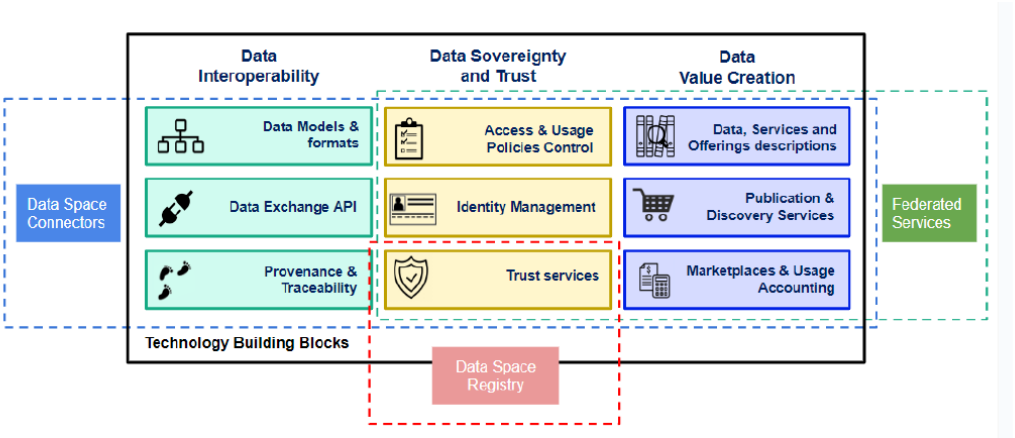

Figure 6 – DSBA interoperability framework

Dataspace federation registry requires to implement these kind of models: centralized, federated, decentralized. This is not clear yet how several models may be used or may collaborate in the same time by one actor and platform.

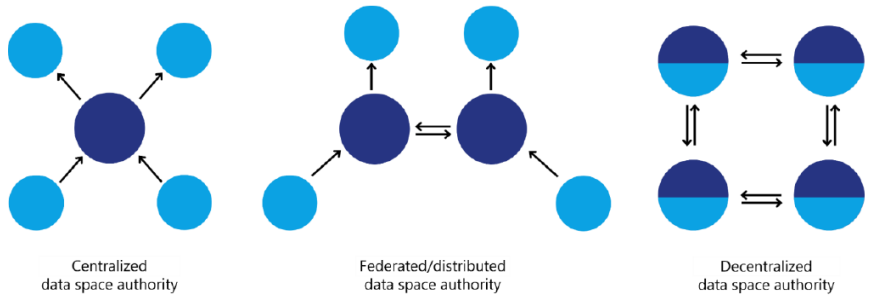

Figure 7 – Gaia-X architecture options (from IDS-RAM)

In a 1st step, we suggest to study and then choose the simplest federated model based on a close cooperation between ENERSHARE and GAIA-X actors (OMEGA-X dataspace in v1 mainly).

4 Specification for federated ENERSHARE – GAIA-X use cases

It already exists several tools to defining the dataspace federation, the DSBA as well as Int:net should be studied as they are used by IDSA and Gaia-X associations to create energy dataspaces.

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The IEC 62559-2 standards must be used to structure the Energy Dataspace comparisons within Gaia-X. We will focus first on general specification for the v2 of the document. Depending on the use cases and the complexity of the federation, we will refine these specifications or even make some test of interoperability if possible for the conclusion of the project (mid 2025) Ecosystem and business use cases principles for dataspaces federation.

Further details will be reported in the second version of the document, such as the ttechnological principles and system use cases for dataspaces federation.

5 Interoperability with BRIDGE, cross-sector energy centered architecture

ENERSHARE's focus is on the development of the Energy Domain data space, open to interact and interoperate with cross-sector Data Spaces and relevant architectures. In this regard ENERSHARE has contributed on the BRIDGE Data Management Working Group, by proposing new elements to be adhered in the BRIDGE Data Exchange Reference Architecture (DERA) adopting data space requirements. This has led to BRIDGE DERA v3.0. Currently, ENERSHARE considers this reference architecture to provide an innovative and cross-interoperable software architecture following, also, the logical processes inspired by other relevant projects.

As it is documented in D2.3 (See section 3.2) BRIDGE DERA 3.0 forms the basis for the Data Space Reference Architecture as ENESHARES's reference architecture is split into the orthogonal concerns of energy and data space domain architectures.

6 BRIDGE

BRIDGE is an initiative of the European Commission where 64 Horizon 2020 projects, in the context of Smart Grids, Energy Storage, Islands, and Digitalization, are involved to pool field experience, feedback, and lessons learned, to create a structured view of cross-cutting issues that are encountered in the demonstration projects to help overcome the barriers to effective innovation. In that sense, BRIDGE aims at providing coordinated and coherent

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recommendations to strengthen the messages and maximize their impacts towards policy makers.

The BRIDGE initiative fosters continuous knowledge sharing amongst projects with the aim to deliver, in a single voice, conclusions, and recommendations about the exploitation of results from the different projects through four different Working Groups representing the main areas of interest:

- Data management
- Business models
- Regulations
- Consumer and Citizen engagement.

The BRIDGE Data Exchange Reference Architecture (BRIDGE DERA) is part of the Data Management Working group's work. It is based on SGAM and was created through the evaluation of surveys taken by a variety of projects and initiatives, including sector-specific ones such as INTERRFACE or EEBUS, as well as cross-sector ones such as InterConnect and OpenDEI.

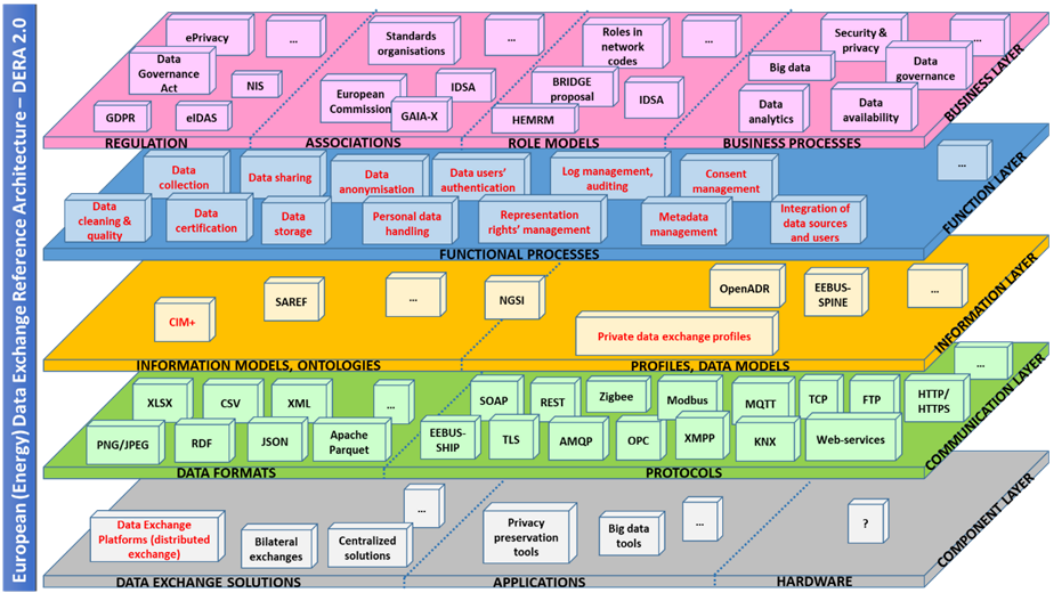

Figure 8 - The BRIDGE **(3)**

As shown in Figure 8, the interoperability layers of DERA 2.0 are based on SGAM and split into sub-layers. The topmost "Business Layer" is split into:

- **Regulation** sub-layer, containing sector-specific and cross-sector EU regulations.
- **Associations** sub-layer, containing entities such as the European Commission or GAIA-X.

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- **Role Models** sub-layer, which consists of different models defining Roles for an architecture. For example, the Harmonised Electricity Market Role Model (HEMRM) which defines different "data roles" such as Data Provider, Consent Administrator, etc.
- **Business Processes** sub-layer with common generic processes, specific to the electricity sector as well as cross-sector.

The "Function Layer" contains functions and services derived from the analysed initiatives' use cases. This includes sector-specific processes such as grid monitoring and operation, as well as cross-sector functionalities such as data collection and consent management.

Below it, the "Information Layer" is again divided into sub-layers:

- **Information Models and Ontologies** sub-layer with common generic models such as Common Information Model (CIM).
- **Profiles and Data Models** sub-layer with more specific profiles.

The "Communication Layer" refers to necessary tools for data interoperability between components depending on specific use cases and functionalities. It consists of:

- **Data Formats** sub-layer, which is generally not sector-specific and contains generic formats such as XML and CSV
- **Protocols** sub-layer, which contains generic as well as sector-specific protocols.

Finally, the "Component Layer", which describes the physical distribution of system components and is split into three sub-layers:

- **Data Exchange Solutions** sub-layer focusing on distributed data exchange and the need for interoperability between platforms.
- **Applications** sub-layer containing electricity-specific components such as SCADA and EMS, while for cross-sector aspects the focus lies on data management (e.g., privacy preserving or big data tools).
- **Hardware** sub-layer, which is extremely use-case-specific.

As mentioned, the BRIDGE Data Exchange Reference Architecture covers aspects that are specific to the electricity domain, as well as addressing cross-sector concepts. In its context, Data Space Connectors play a role mostly on the Data Exchange Solutions sub-layer, though of course data formats and models as well as protocols from the above layers are relevant in this context as well. Meanwhile, semantic Interoperability is not addressed explicitly, although it is very relevant to some of the projects surveyed during the reference architecture's creation (see InterConnect in particular). In addition to covering contents of the issues they face in lower layers, other Data Space initiatives such as GAIA-X and IDSA are explicitly mentioned on the

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business layer, e.g., the IDSA Role model is to be found on the corresponding sub-layer in Figure 8.

BRIDGE is a cross-project initiative attempting to find and create synergies and common solutions among EU projects on these topics. As DERA is an abstract reference architecture, direct practical implementation is not within its scope, however in working together with research projects, many of them refer to the BRIDGE DERA when creating their own architectures and in turn designing systems for their use cases.

7 ENERSHARE Data Space Reference Architecture

A first version of a Data Space Reference Architecture based on BRIDGE DERA 3.0, and the ENERSHARE D2.1 (Use cases' descriptions and list of minimum Data Space building blocks required for pilots) building blocks, which are in turn based on OpenDEI might look like as depicted in Figure 9.

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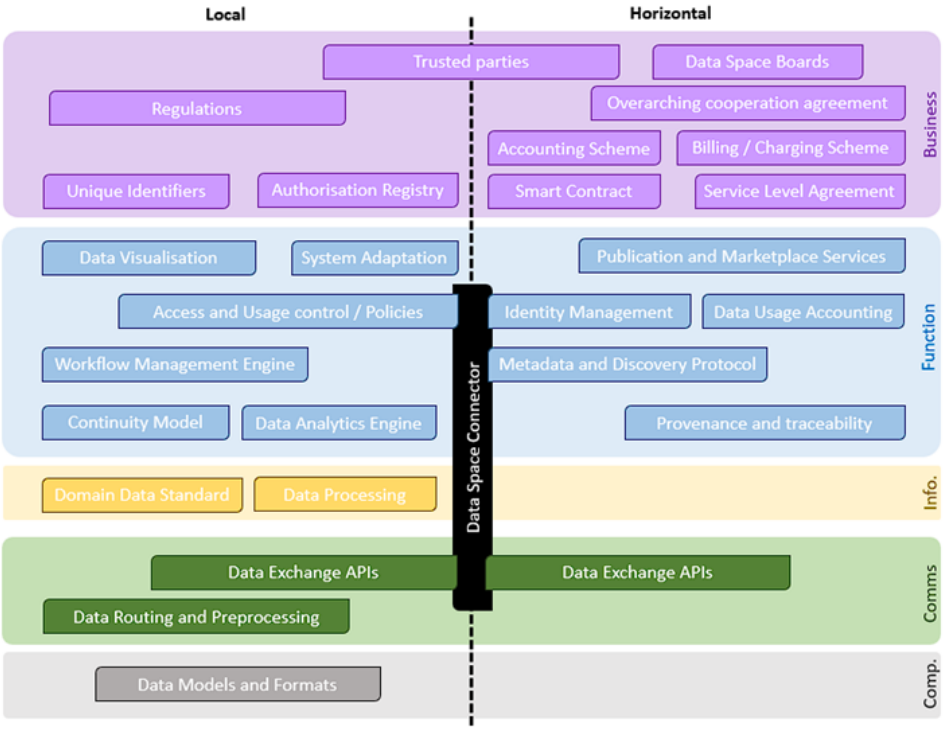

Figure 9 – Data Space Reference Architecture first draft based on BRIDGE DERA 3.0 and D2.1 building blocks

8 Reflection of ENERSHARE on other relevant projects

Table 5 – RA of Related Projects BD4NRG and PlatONE

RA Criterion	BD4NRG	PlatONE	INTERRFACE	OneNet
Area of Application	Grid operation, distributed energy resources, building energy efficiency	Grid distribution network operation and market	Procurement of flexibility and grid related service assuming TSO/DSO coordination	TSO-DSO-Customer cooperation at any level

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RA Perspectives	Logical, development, process, physical	SGAM	**BRIDGE** TSO/DSO Coordination report, BRIDGE reference architecture version 1&2, Active System Management report, SGAM-based representation & logical architectural view	**BRIDGE DERA** + IDSA RAM + FIWARE Smart Energy Architecture
Data Space Basis	Loosely based on IDSA-RAM	No	No explicit use of data space basis. Intra-energy standard services for flexibility procurement steps (biding, activation, settlement) could be only used as relevant input for ENERSHARE	IDSA RAM 3.0 + FIWARE NGSI-LD
Energy UC Model	**Bridge DERA 2.0**	IEC 62259- **Bridge** UC repository	IEC62559	IEC 62259- **Bridge** UC repository
Interoperability Features	Vocabulary hub	Open and Standard protocols for interoperability mechanisms (MQTT, Open APIs, Kafka)	Standard IEC CIM profiles (ESMP 62325, CGMES) Common open APIs has been utilized for each process. ECCo SP option has been also tested for specific data exchanges with the Transparency Platform,	Decentralised OneNet Data Space Connector + service catalogue with more than 60 services in the vocabulary
Privacy & Security Features	End-to-end encryption, data certification, role-based access to data	Blockchain-based certification and authentication. Security protocols mechanisms applied at any level	Data protection by design and by default (DPbDD) (also known as Privacy by Design) in the architectural design of the	IDSA based authentication and authorization mechanism + Usage Control application

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			INTERRFACE system. Privacy Protection Framework: This component provides the mechanisms and the techniques in order to ensure the data privacy in the project. PPF features an authorisation mechanism in which, based on the user consent and other hierarchical procedures, access to the data is granted. In this project, this mechanism will be the Role-Based access control (RBAC).	
Scalability Features	-	-	Roadmap of scalability and replicability has been reported here	Decentralised architecture – Plug-and-play solution – Low hardware requirements
Innovation	Extension of **BRIDGE** with marketplace, data sovereignty, trust, governance aspects to **BRIDGE**	Open-source modular framework for DSO-centric architecture	Proposed a multi-actor data exchange platform as a data governance middleware connecting (SOs, FSPs, MOs, Settlement Responsible Party) tool	Fully decentralized architecture following data space guidelines and ready-to-go solution which enable end-to-end data exchange in a secure and trust way.

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9 Conclusions

In this first version of the deliverable for ENERSHARE WP10, we have defined the basis of the interoperability study by clarifying the different uses cases that could interoperate in the energy area in a first step and the main projects that could produce standards to use for data exchange and data spaces interoperability in energy or other related sectors.

We will propose a high level specification of the interoperability in the next version of the deliverable D10.2. Depending on the achievements of ENERSHARE and the other sister projects, we will define some detailed specifications for development or test of the interoperability in the final version of the document to close the study into the D10.3.

The next version will give a more detailed comparison between ENERSHARE and OMEGA-X use cases in terms of business actors, involved systems (either new ones or already existing ones), exchanged data and data models, for example for Local Energy Communities or Flexibility management in energy grid.

The next version would also include the feedback from standardization works, managed in European Commission projects, including from Task 11.4 - Contribution to standards - of ENERSHARE.

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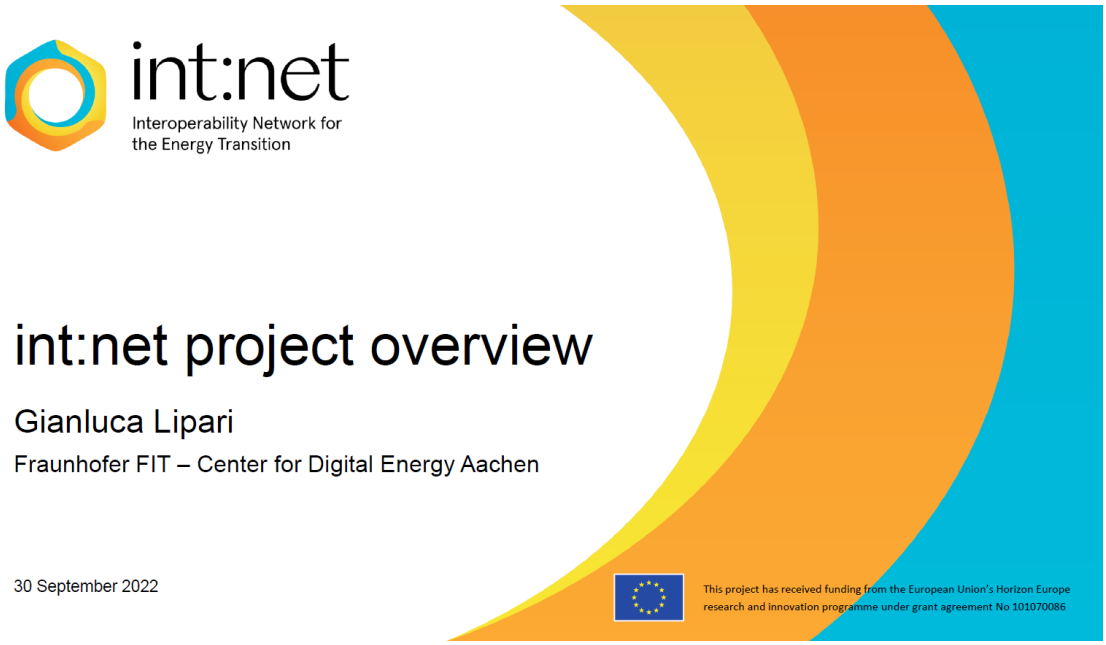
Annex

10 A1. Int:net



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int:net project overview

Interoperability Network for the Energy Transition

- **Horizon Europe call HORIZON-CL5-2021-D3-01**
  - Duration: 36 months
  - Runtime: 01.05.2022 – 30.04.2025
  - Consortium: 12 Partners
    1 Associated Partner
    7 Countries
  - Budget: 5 M€

int:net

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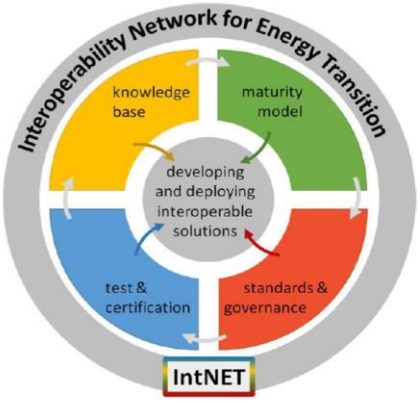
int:net project overview

Project objectives

- **The project aims at:**
  - Consolidating a common knowledge base for interoperability activities on energy services in Europe
  - Developing a comprehensive and accepted Interoperability Maturity Model (IMM)
  - Deploying a framework for interoperability testing in a network of interoperability testing facilities
  - Fostering a community network for a European interoperability ecosystem



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int:net project overview

Interoperability knowledge base on energy services in Europe

- Increase interoperability of energy services, data and platforms at the function and business layers via a knowledge base of
  - interoperability initiatives
  - best practices
  - use cases.
- Making knowledge publicly available
  - understanding of the state-of-the-art, at European level, of interoperability of energy services
  - create a destination for the results of the project to be stored
  - dissemination and outreach activities
- Standardised way of documenting the knowledge base, following the FAIR principles, that guarantees European-wide impact long beyond the project period

int:net

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int:net project overview

Interoperability Maturity Model (IMM)

- Ensure the continuity of the ongoing interoperability of energy services activities
  - Developing an interoperability assessment methodology
  - Related Interoperability Maturity Model (IMM)
- The IMM will allow the assessment of the level of maturity in organisations and will support developing actions to reach higher levels of interoperability maturity.
- int:net will foster the adoption of the proposed IMM and its reference implementation through the int:net community.

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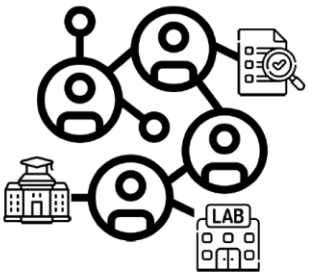
int:net project overview

Network of interoperability testing facilities

- Create and support a common framework for testing interoperability across running projects by
  - harmonising interoperability testing procedures
  - creating a self-sustained and formally institutionalised distributed "network" of interoperability testing labs
  - Identifying real-life use cases where interoperability testing is required
- Create a European interoperability ecosystem where all stakeholders can participate and actively support the project's activities.
  - int:net considers existing initiatives like living labs and digital innovation hubs
  - including testing for interoperability (IOP)



int:net

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int:net project overview

Community network for a European interoperability ecosystem

- Ensure horizontal coordination and support, sustainable up-take of the energy services related to interoperability, data spaces and digital twins by
  - actively involving legal and regulatory framework setters in cross-domain modelling and interoperability testing exercises (e.g., connectathons),
  - cross-fertilisation process for existing regional testing infrastructures
  - being part of initiatives external to the project like Gaia-X or OPEN DEI
- At the end of the project, the int:net community forming the European interoperability ecosystems needs to be self-maintained in the long term with a community platform and formal institution, possibly an association.

Engage Stakeholders

Disseminate Results

Create a Community

int:net

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int:net project overview

Relationship with other interoperability initiatives

int:net will monitor and reach out to other interoperability initiatives ongoing in Europe, including European projects, standardization bodies, innovation activities.

int:net consortium partners are already active participating in activities such:

- Bridge WGs
- ISO/IEC technical committees
- ETIP SNET
- ISGAN
- IEEE
- DERLab
- ETSI
- CEN/CNELEC (JTC21: AI act)
- ERA-Net "CETP"
- AIOTI
- IEC
- CIGRE
- ETSI
- CENELEC CGSG
- INTERCONNECT (H2020)
- OneNet (H2020)
- OPEN-DEI
- Joint Research Center Interoperability Lab

int:net

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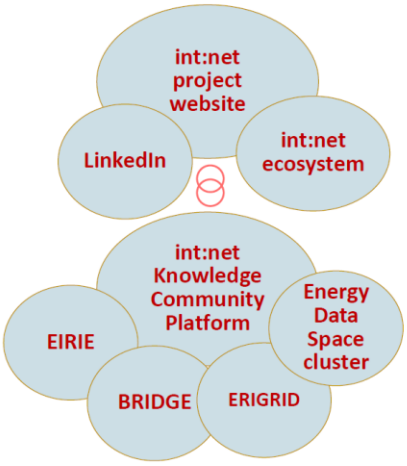
int:net project overview

Infrastructure for the interoperability ecosystem

- int:net final goal is to establish formal, self-operated Interoperability Network for the Energy Transition
- Its main pillars are:
  - int:net knowledge base repository, collecting activities on interoperability at national and international level, linked to BRIDGE and ETIP SNET (EIRIE) and other similar initiatives
  - inventory and network of testing facilities, implementing the int:net IMM and certification model
- Supporting means and measures:
  - cross-domain modelling and interoperability testing exercises (e.g., connectathons, workshops, design thinking, etc)
  - quality seal for interoperable smart grid and energy products and services ("int:net approved")
  - FAIR principles for research data management (e.g., datasets released as Linked Open Data)



int:net

int:net cluster projects meeting 30 September 2022 9

Enershare has received funding from European Union's Horizon Europe Research and Innovation programme under the Grant Agreement No 101069831

int:net project overview

Relationship with Energy Data Space projects

- int:net will coordinate joint activities together with the projects funded under the Horizon Europe call HORIZON-CL5-2021-D3-01-01
  - ENERSHARE
  - OMEGA-X
  - DATA CELLAR
  - SYNERGIES
  - EDDIE
- The cluster needs to closely work together to identify gaps in interoperability and standardization related to Energy Data Spaces and create opportunities for joint activities for aligning the efforts and close the identified gaps

int:net int:net cluster projects meeting 30 September 2022 10

int:net
Interoperability Network for the Energy Transition

int:net project

https://intnet-project.eu/

https://www.linkedin.com/company/int-net-project/

info@intnet-project.eu

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101070086

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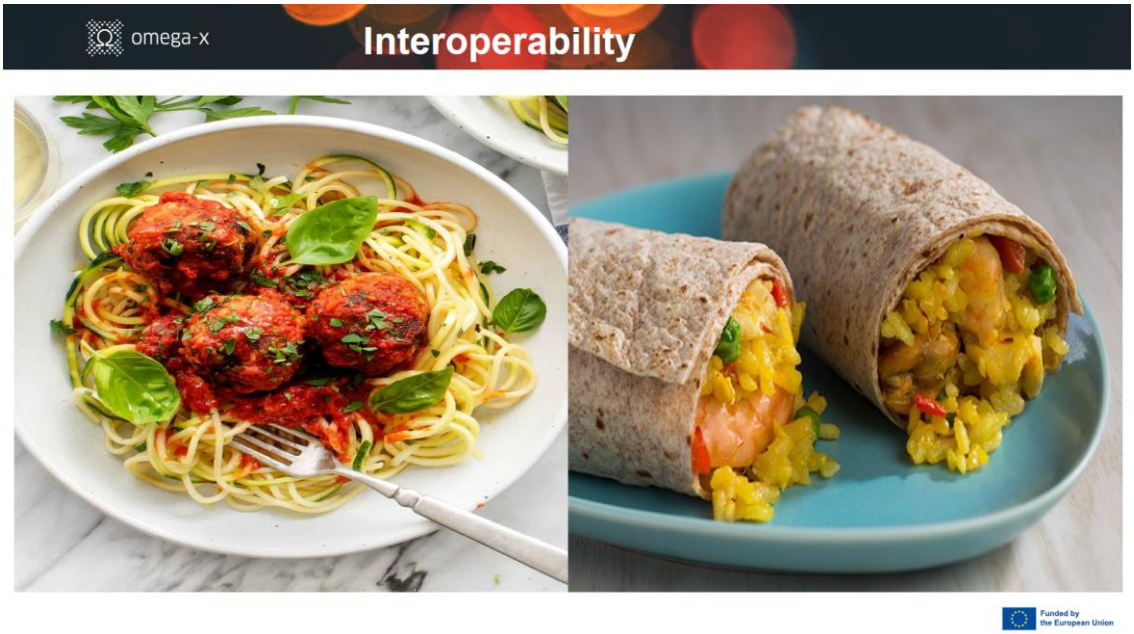
11 A2. Omega-X



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omega-x

Setting the scene

Funded by the European Union

omega-x

European Commission and data

The CE supports the development of **common European data spaces** in **strategic economic sectors** and domains of public interest.
The European data strategy of February 2020 announced the creation of data spaces in 10 strategic fields, such as health, agriculture or **energy**

Common European data spaces bring together relevant data **infrastructures and governance frameworks** in order to facilitate data pooling and sharing

The creation of EU-wide common, interoperable data spaces in strategic sectors will overcome existing legal and technical barriers to data sharing and, as such, unleash the enormous potential of data-driven innovation

Source: EC Digital Strategy

Source: Wikimedia Commons

Funded by the European Union

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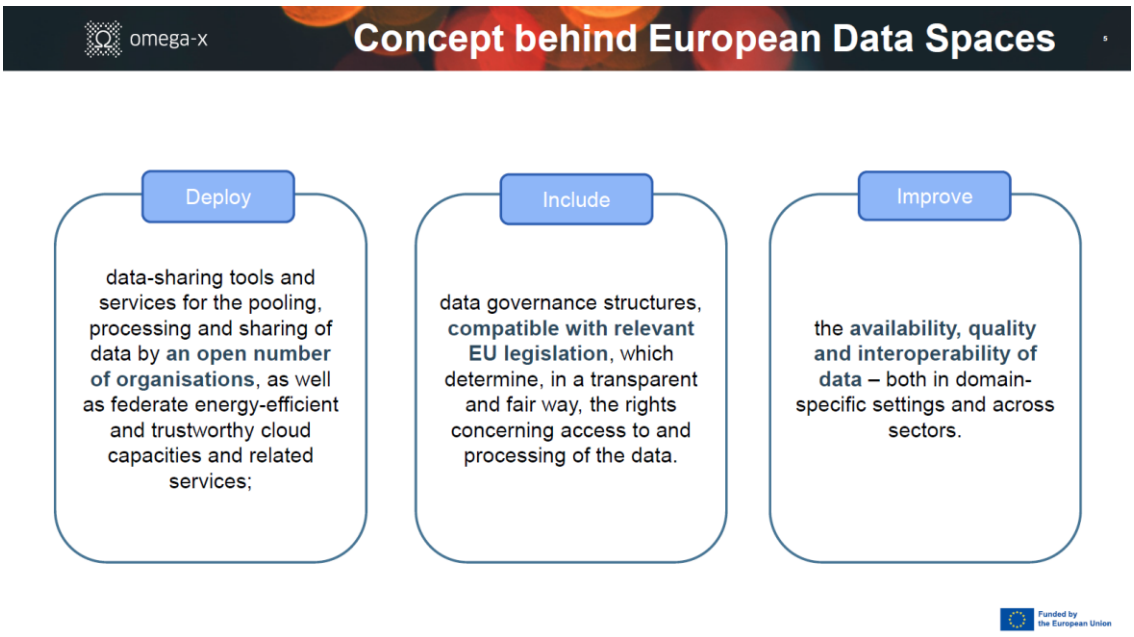

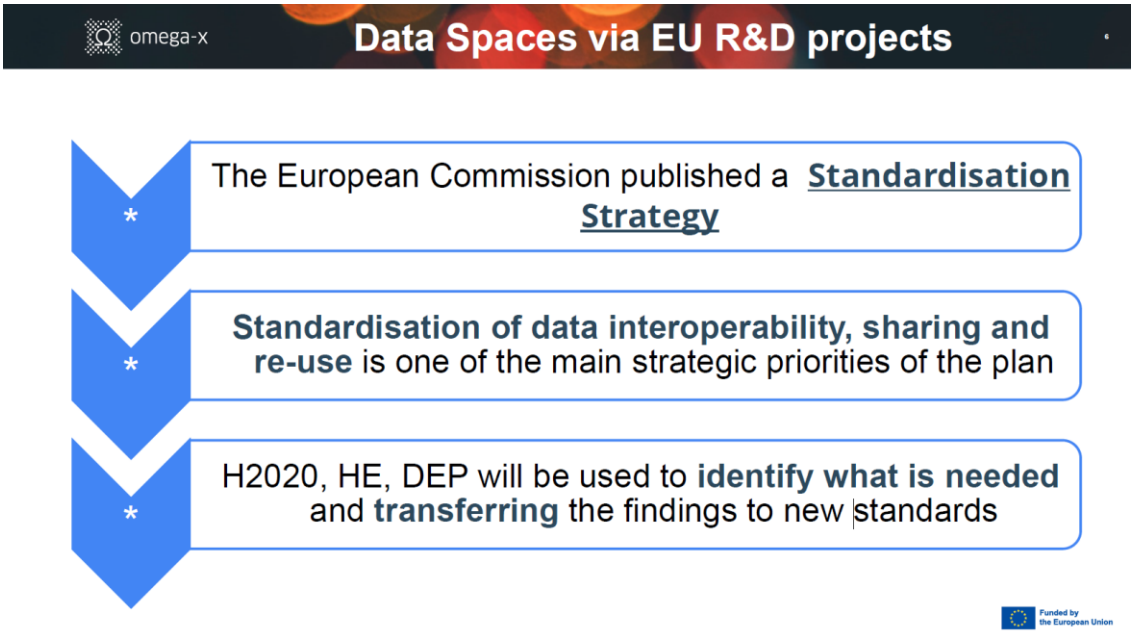

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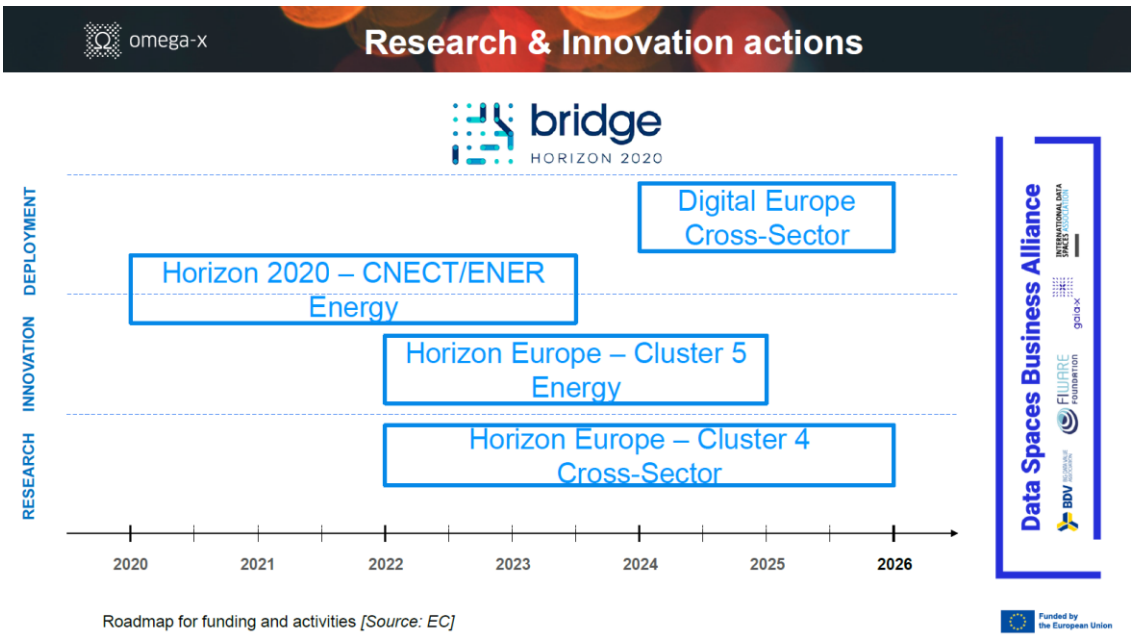

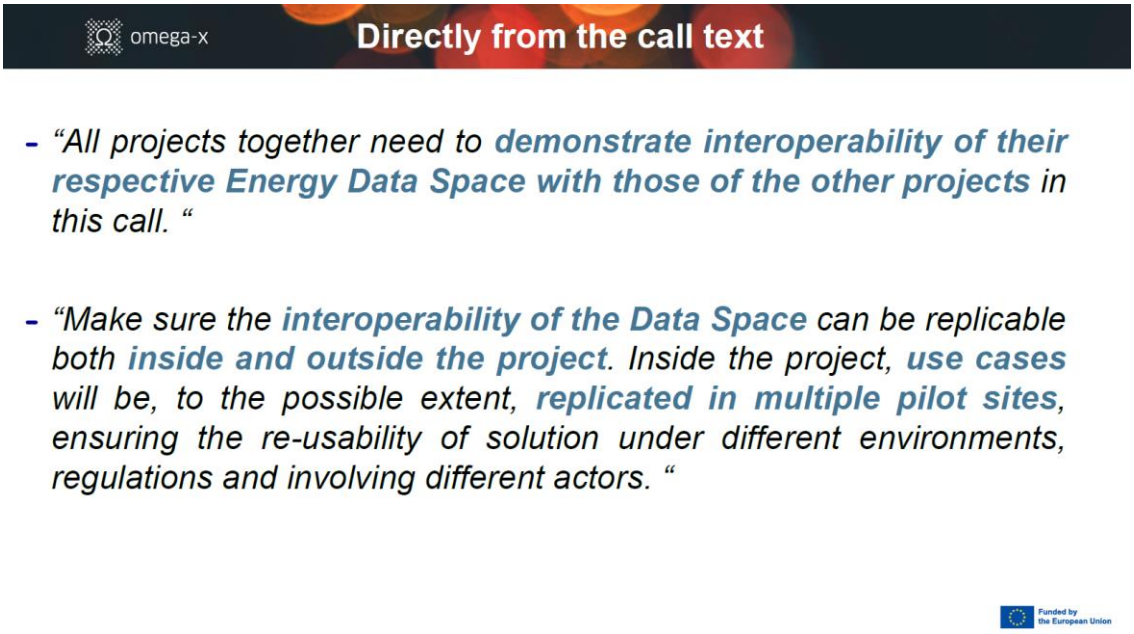

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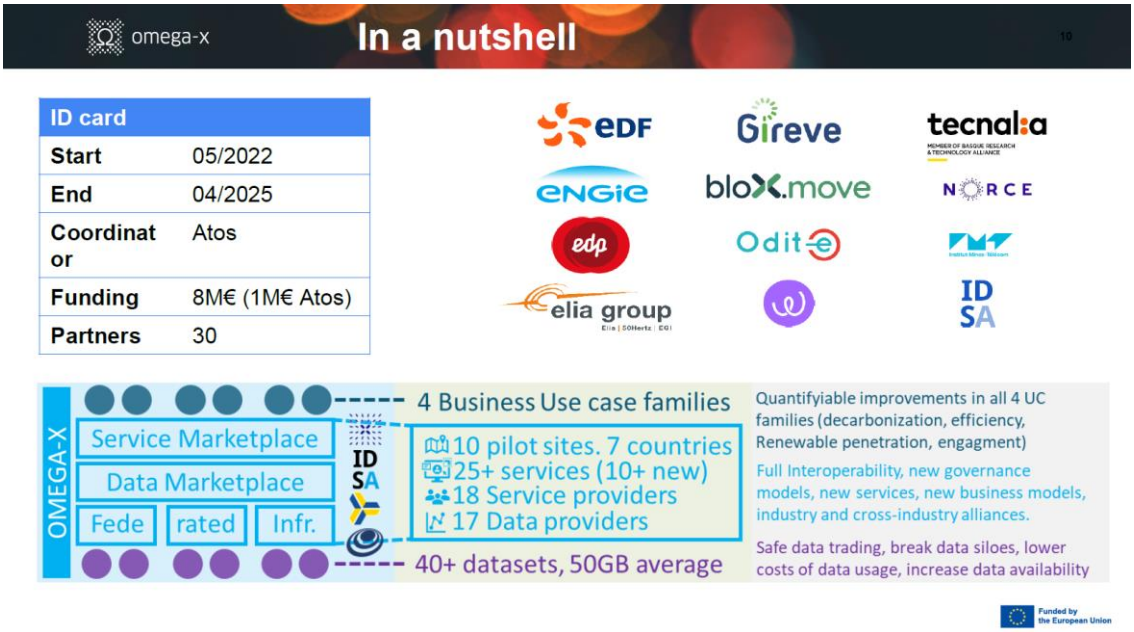

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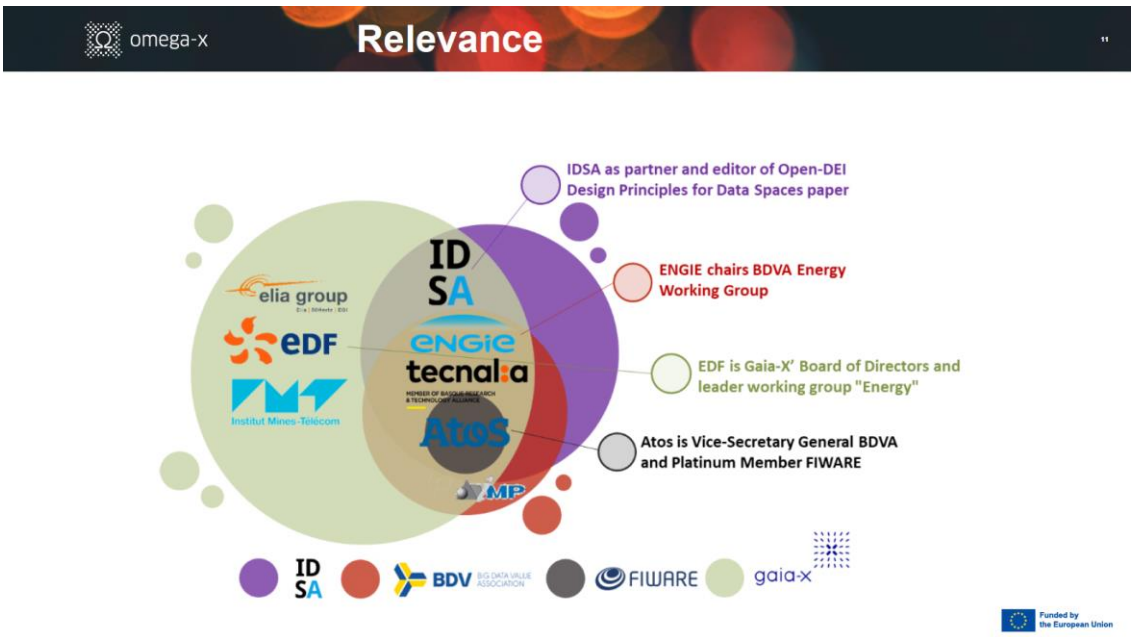

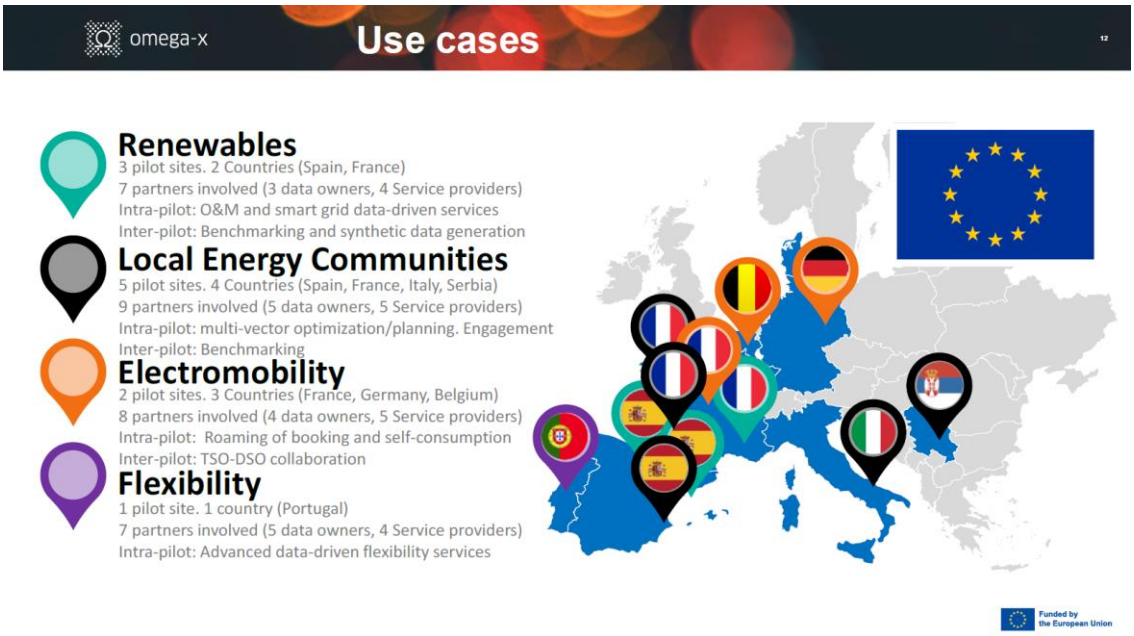

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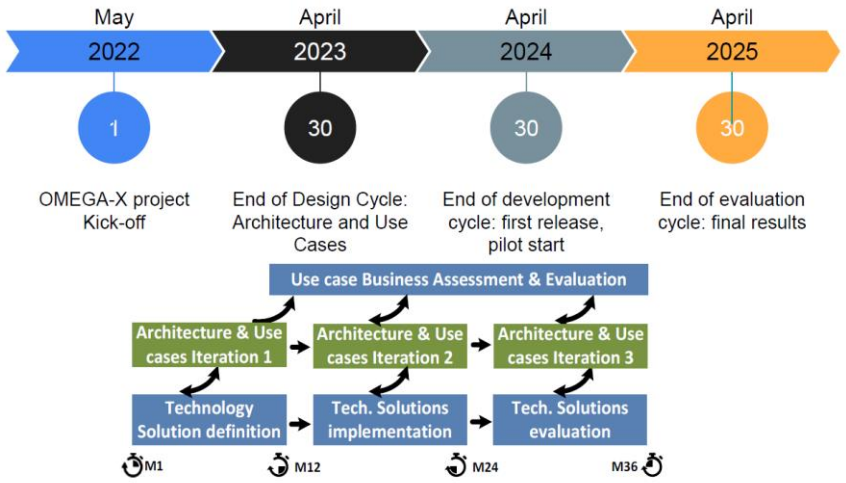
omega-x

OMEGA-X visión for Interoperability

Funded by the European Union

omega-x

Time Plan



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omega-x Cooperation approach

"**Iterative methodology**" which will be an input for the following tasks :

- **Continuous monitoring of data space initiatives at EU level**
  This task will **align with IDSA** and monitor the work as being delivered by **Gaia-X** (related to general architecture and Energy Working Groups) and other data space initiatives coming from the EU, **FIWARE, BDVA/DAIRO, DSBA**. These will provide valuable input to OMEGA-X architecture and use cases.
- **Identification of sister projects complementary use cases**
  This task will exchange the results from OMEGA-X use cases with sister projects on the same call (**ENERSHARE, DATA CELLAR, SYNERGIES**) by using the **IEC 62559-2 use case template**. The focus will be on commonalities, complementarities, and differences between OMEGA-X use cases and sister project's ones.
- **Integration of sister projects functionalities**
- **Alignment with BRIDGE**

→ **Report on Data Space initiatives/projects in EU and BRIDGE alignment** – M12, M24, M36

Funded by the European Union

omega-x Technical/Semantic Interoperability

Vertical Interoperability:

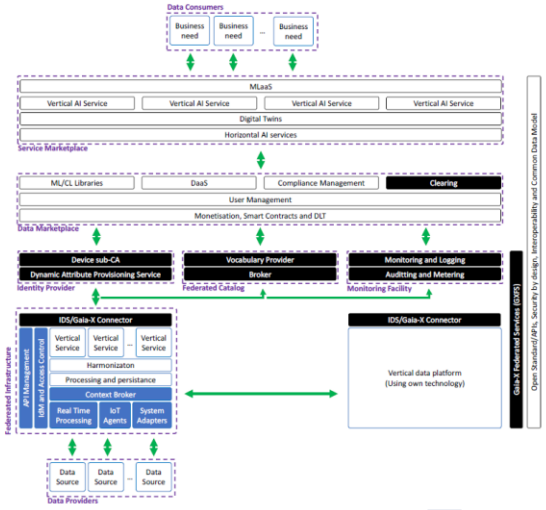
- Open definition of protocols and standards
- Alignemt with IDSA/Gaia-X federation services (GXFS) and roles

Horizontal Interoperability

- Open Source Standardized protocols and APIs
- Information Models based on standards such as IEC CIM, IEC 61850 and IEC COSEM

Use case Interoperability

- Multiple stakeholders (both for data provision and service provision)
- Multiple locations (at least 2 per use case family)
- Interaction with sister projects



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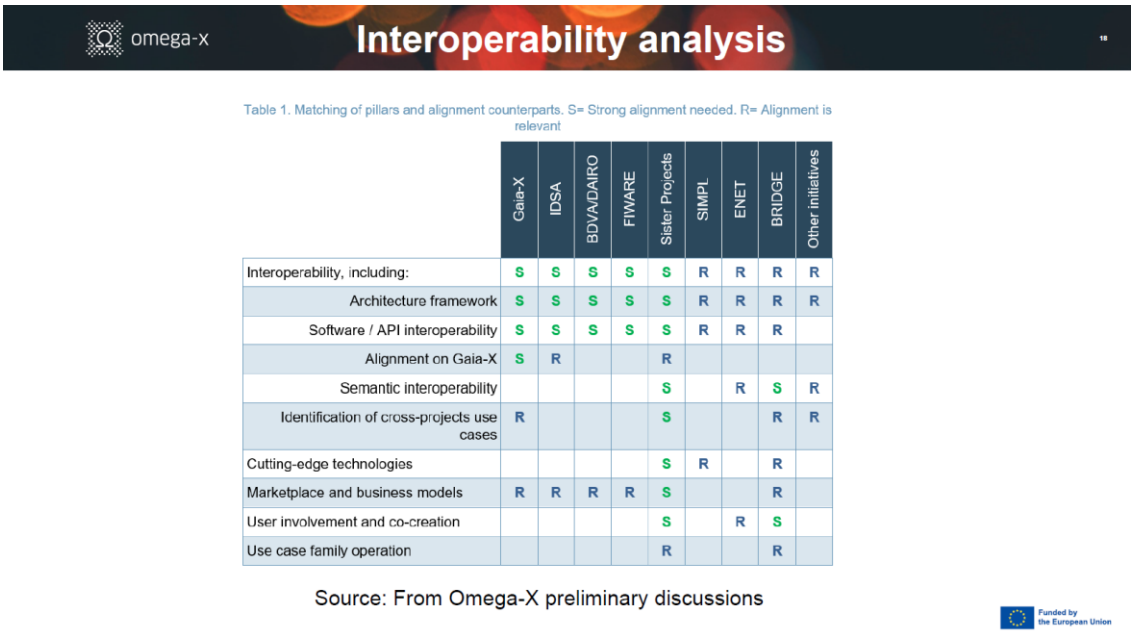

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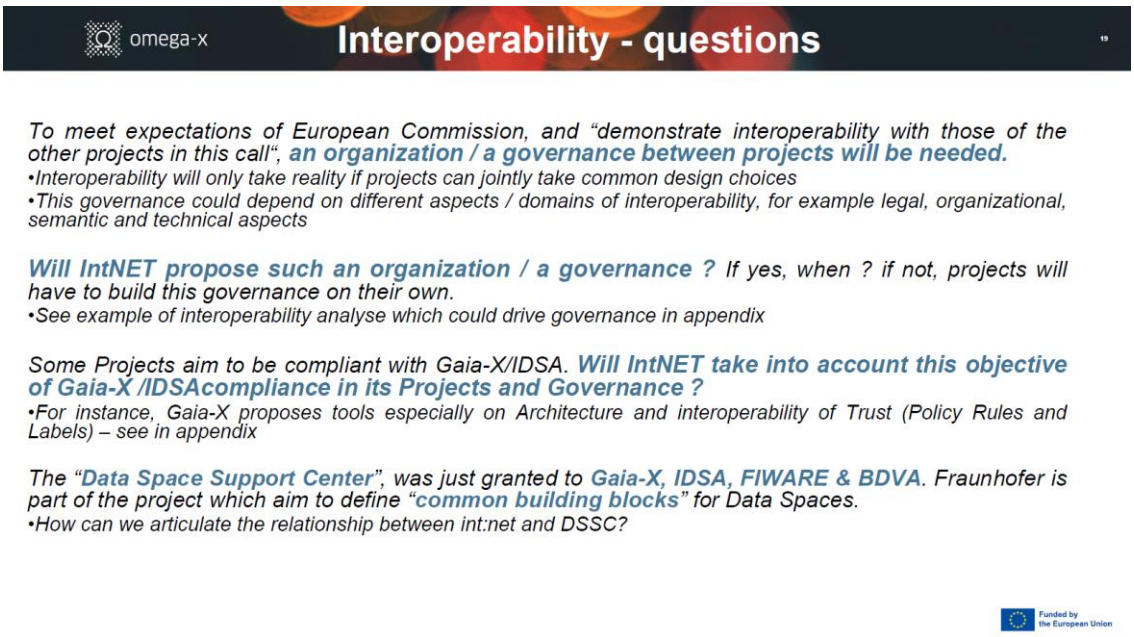

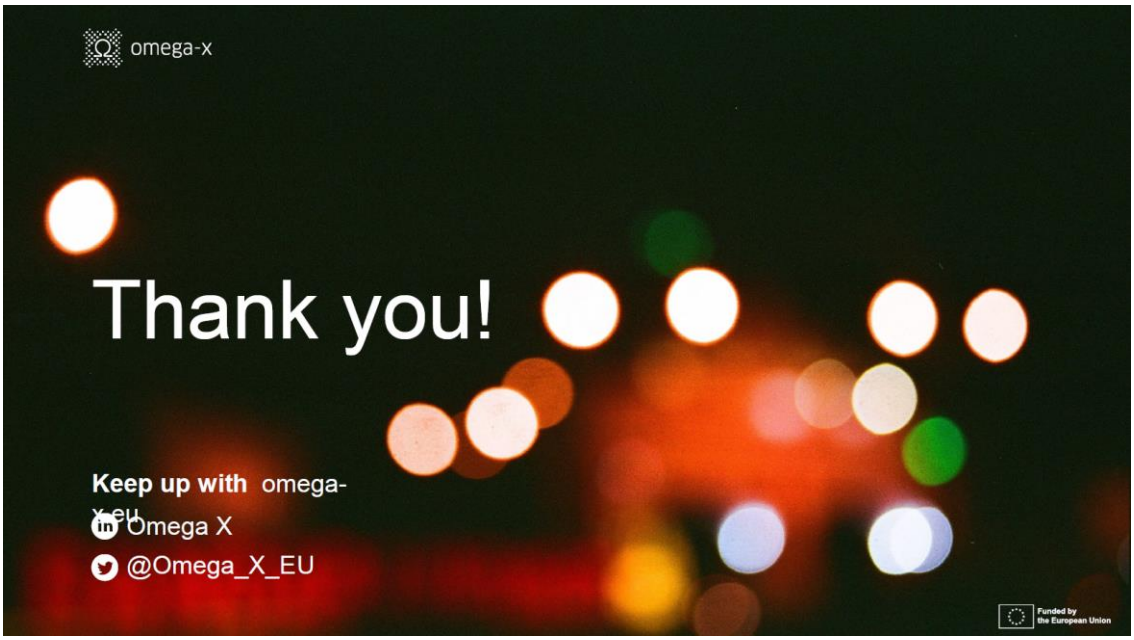

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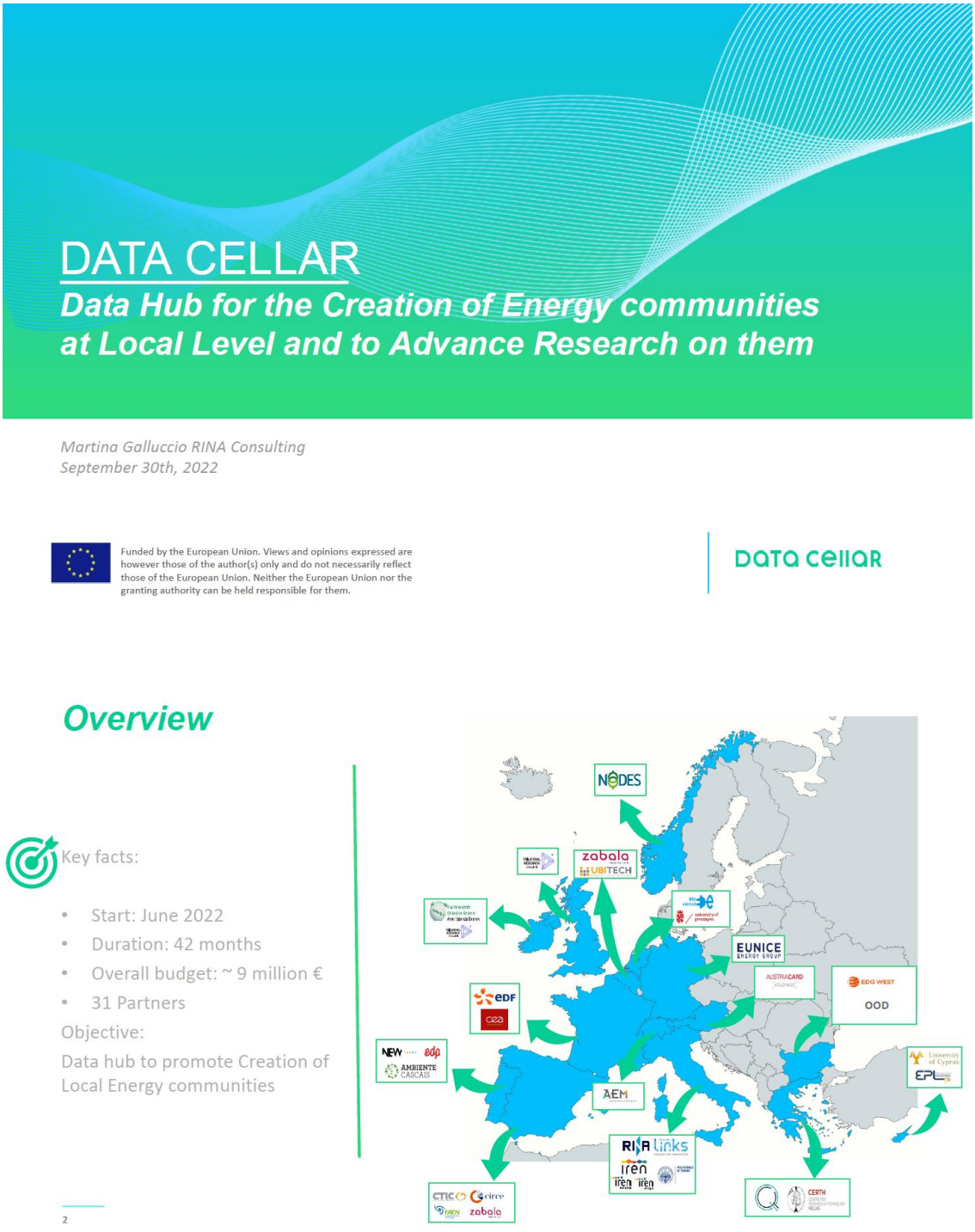
12 A3. Data Cellar



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Data cellar why: Digitalization

In line with European Commision vision of "*a single European data space*" as "*a genuine single market for data, open to data from across the world* ", the actions towards this aim have four pillars:

Data cellar why: Decarbonization

EU has set itself a target to collectively reach a share of at least 27% renewables in final energy consumption by 2030, with half of the electricity coming from RES, while the electricity should be 100% carbon-free by 2050.

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Ambition

Create a public energy data space that will support the creation, development and management of Local Energy Communities (LEC)

Based on an open and interoperable cloud-to-Edge data Exchange architecture & alinged with current and future EU data spaces initiatives

DLT-Driven Marketplace to engage users and extract value of data and pre-trained AI models

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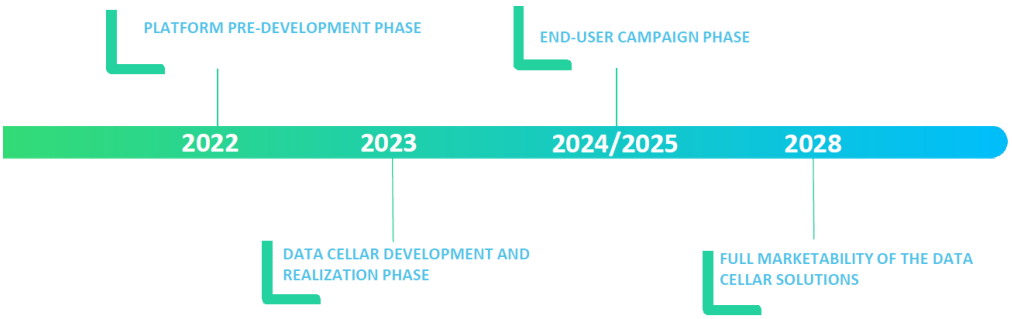
Timeline



Data Cellar Validation Cases

Through the **validation campaign** it will be possible to:

- Populate the data space with former R&D projects and with local VCs identified datasets
- Test DATA CELLAR effectiveness and if generated datasets are relevant for VCs LECs
- Test AI services for the purposes of the VCs responsible partners
- Enhancement of data analytics

.

8

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Data Cellar business cases synthesis

Flexibility markets: the energy community becomes an asset for providing ancillary services together with local providers

- to either estimate the dimension and the location of the grid constraint;
- to provide appropriate flexibility solutions with consideration of asset type, amount of flexibility and OPEX/CAPEX.

The business case is managed by NODES.

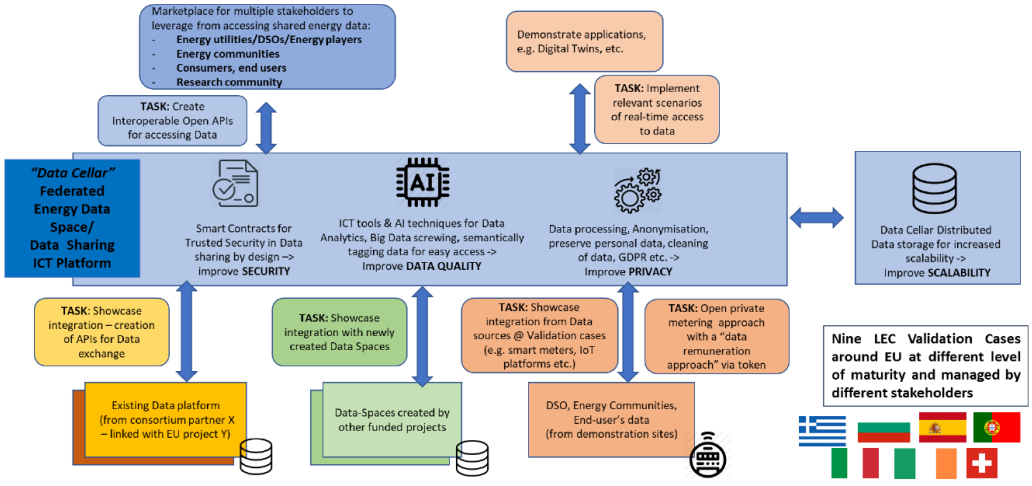
EV public charging points: the data space will be populated with open data on EV charging station that could help new energy communities.

- The open data will allow further research and business development.
- The use case will involve more than 7500 charging points in Dutch, around 8000 users for a size of the area of 5.500 km2, it will provide 5GB yearly at start for a total of 15GB at the end of the project.

The business case is managed by NOORD-HOLLAND.

9

DATA CELLAR Platform



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Main impacts 1/2: Promote EU Energy System Green and Digital Transition

- **High quality data available and accessible** through standardized and interoperable common European data spaces;
- **Lead on the usage of data, data analysis models and energy efficient AI-based solutions for sustainable decision-making**;
- Promote the use of **Digital Twin** and of **AI applications** by encouraging the development, share and use of algorithms for energy efficiency;

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DATA CELLAR

Main impacts 2/2: Promote EU Energy System Green and Digital Transition

- Fully exploit the potential of technology such **as AI and Blockchain**, to support new and on-going energy community to a better management of their energy system;
- Take full advantage of digital technologies to **support smart and sustainable energy systems**.

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DATA CELLAR

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Main impacts: Promote Energy Communities widespread in Europe



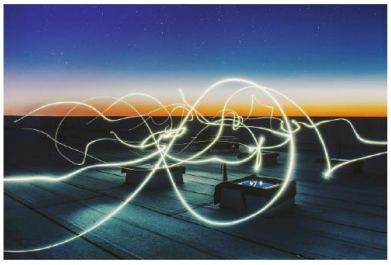
Enhance the creation and management of energy community with the focus to:

- increase self-consumption thanks to the local renewable generation and providing flexibility services
- support in the optimal technology sizing
- support network operators to improve network operation and estimating network status and managing the distributed DSO resources.


DATA CELLAR

Main impacts: Promote Energy Communities widespread in Europe





- Open new opportunities for profitable data-driven business models to support energy market players in speeding up their green transition, having a positive impact on the local economy.

The improved performance of the energy network will attract further investment and the development of industrial initiatives in the area.


DATA CELLAR

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Interaction and exploitation of synergies with relevant EU Initiatives

- **BRIDGE** initiative will allow to share the knowledge generated through the 4 BRIDGE working groups: data management, business models, regulations, and consumer and citizen engagement. (ZABALA)
- **OPEN DEI** collaboration and knowledge focuses on "Platforms and Pilots" to support the implementation of next generation digital platforms in industrial/energy domains thanks to UBE presence.
- **PANTERA** aimed at setting up a European forum composed of Research & Innovation stakeholders active in the fields of smart grids, storage and local energy systems, including policy makers, standardization bodies and experts in both research and academia, representing the EU energy system. This meeting point will allow to share results and strategies fostering the innovation strategies for the sector. (FOSS)
- DATA CELLAR also provided feedback and foster collaboration with **GAIA - X**, where representatives from business, science and politics on an international level are creating a proposal for the next generation of data infrastructure. (EDF, EDP)

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Vision for technical and semantical interoperability

Where we start:

- Collect relevant input in terms of data collected by DATA CELLAR and other relevant Data Sets that could be relevant to DATA CELLAR:
  - Collected by DATACELLAR (Data Model)
  - Relevant to DATACELLAR (other initiatives)
- Compliance with IDSA/GAIA-X
- Mapping of components to the RAM of IDSA/GAIA-X
- Identify required components – not explicitly described in DOA (e.g. Federation services)

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DATA CELLAR

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Vision for technical and semantical interoperability

Traceability:
•Agreed identification taxonomy related to source of data

Searchability:
•Agreed taxonomy facilitating intelligent grouping of data, that can be informative and exhaustive on specific attributes, services, applications etc
•Source related

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Collaboration with other data spaces

- Plan specific collaboration periods according to the timing of other Data Space projects to synchronize on key steps (e.g. use cases and system architecture definition, data model design to align semantic interoperability specs, interoperability testing & verification after implementation, data sharing during the demonstrations activities)
- Common workshop – timeline of sister projects
- Coordinate on SoA analysis and selection of existing data models and ontologies to build upon.
- Align Terminology (DATA SPACE, Use Cases..).
- Validation in other projects (vice-versa).
- Collectively organize regular dissemination events and workshops to maintain the interactions between initiatives/projects.
- Define responsibility also in the long term.

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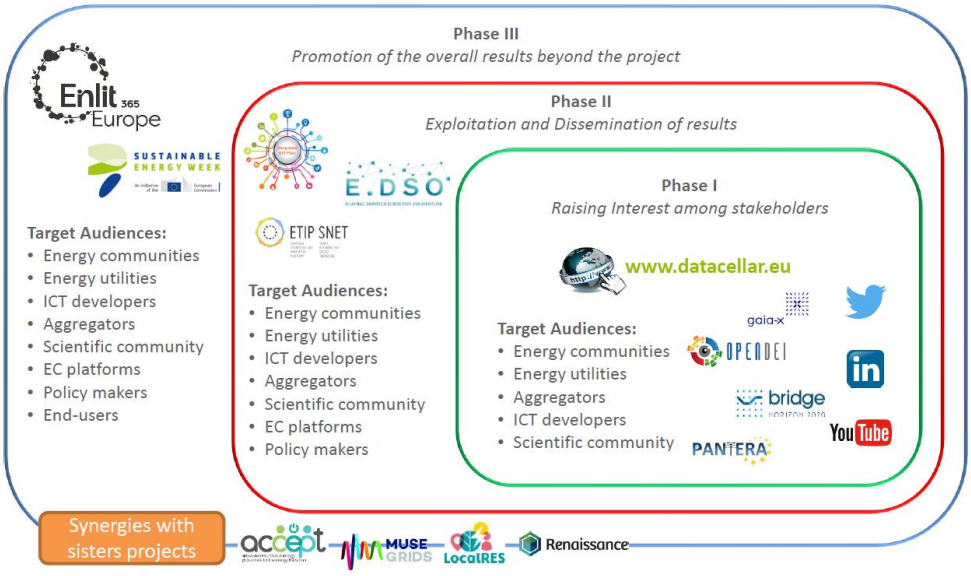

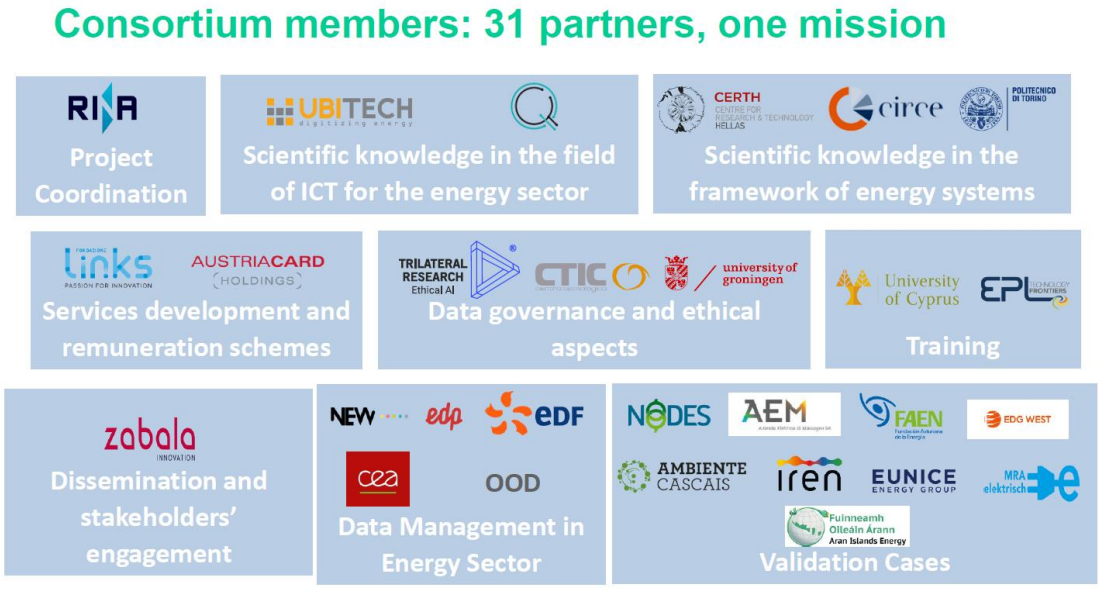

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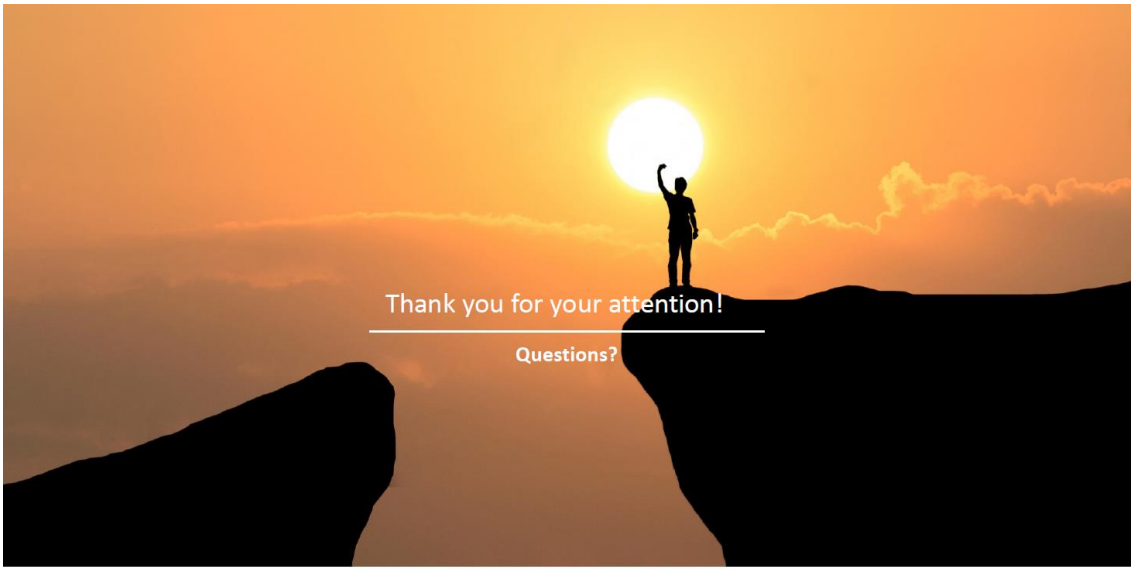

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DATA CELLAR

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13 A4. Synergies

SYNERGIES

Project Overview

30/09/2022
Tasos Tsitsanis
Suite5

This project has received funding from the EU HORIZON Innovation Actions - Sustainable, secure and competitive energy supply CL-5-2021-D3-01
Grant Agreement: 101069839

SYNERGIES

Agenda

- Background and Rationale
- Vision and Architecture
- Key Project Facts
- Considerations for the meeting

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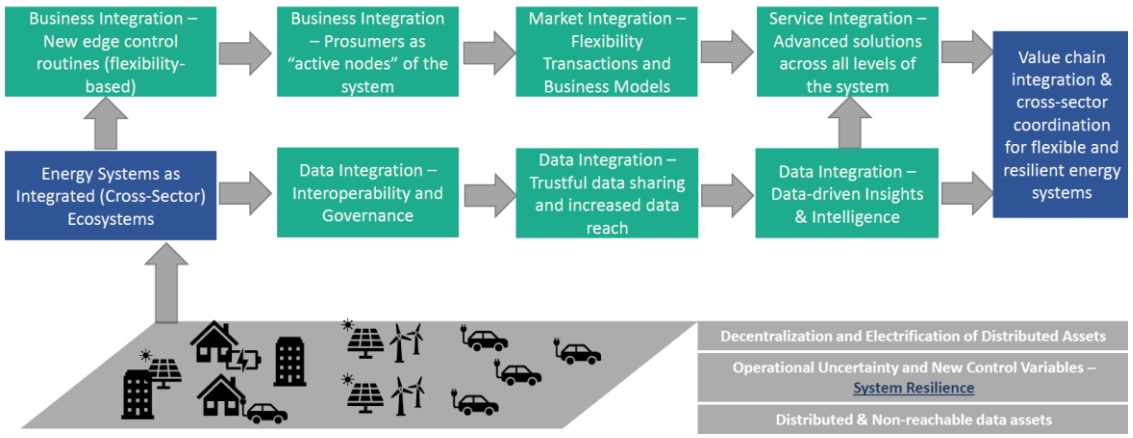
SYNERGIES

Background and Rationale

SYNERGIES

Motivation and Needs



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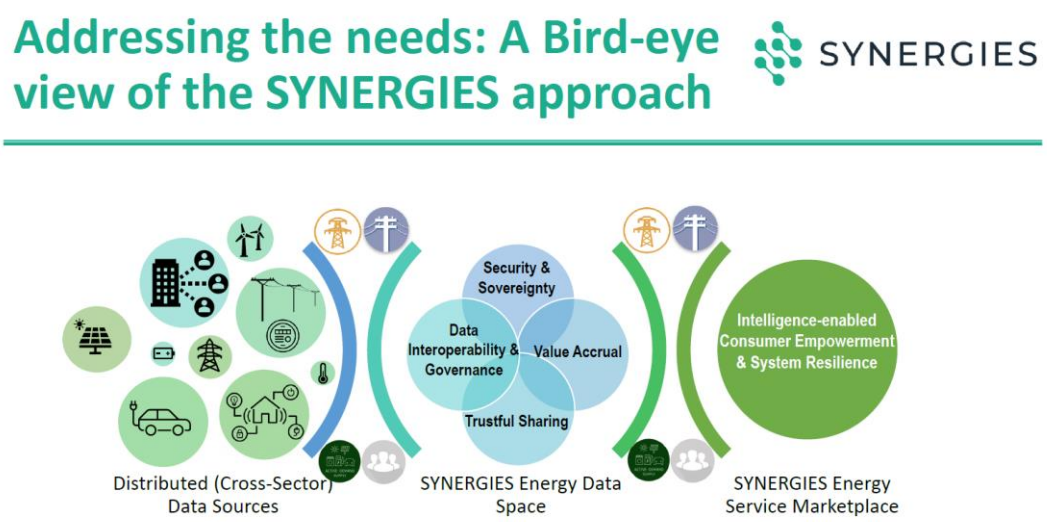

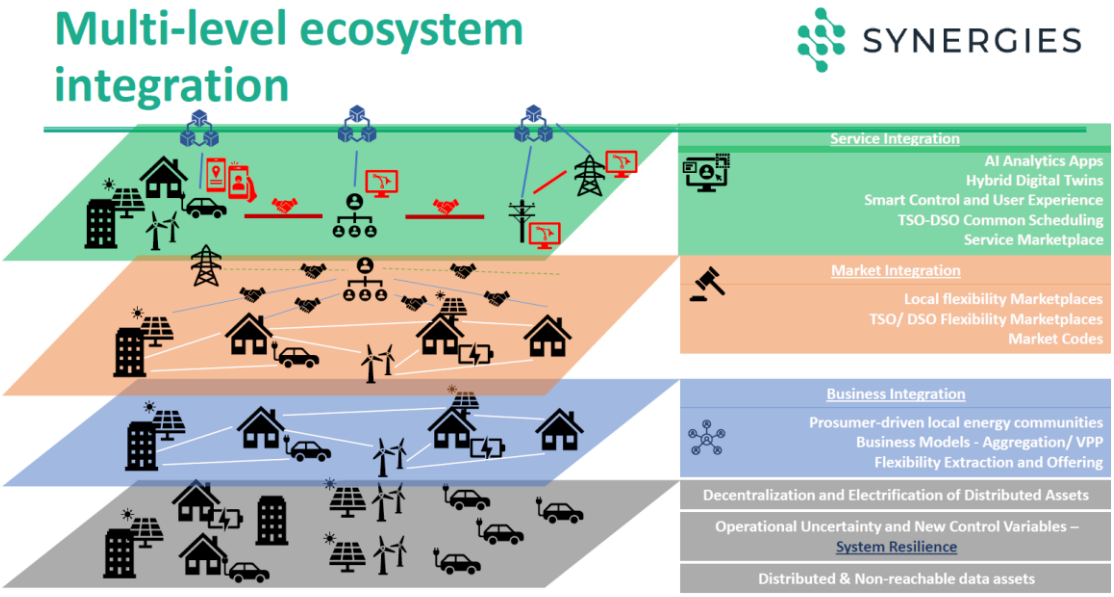

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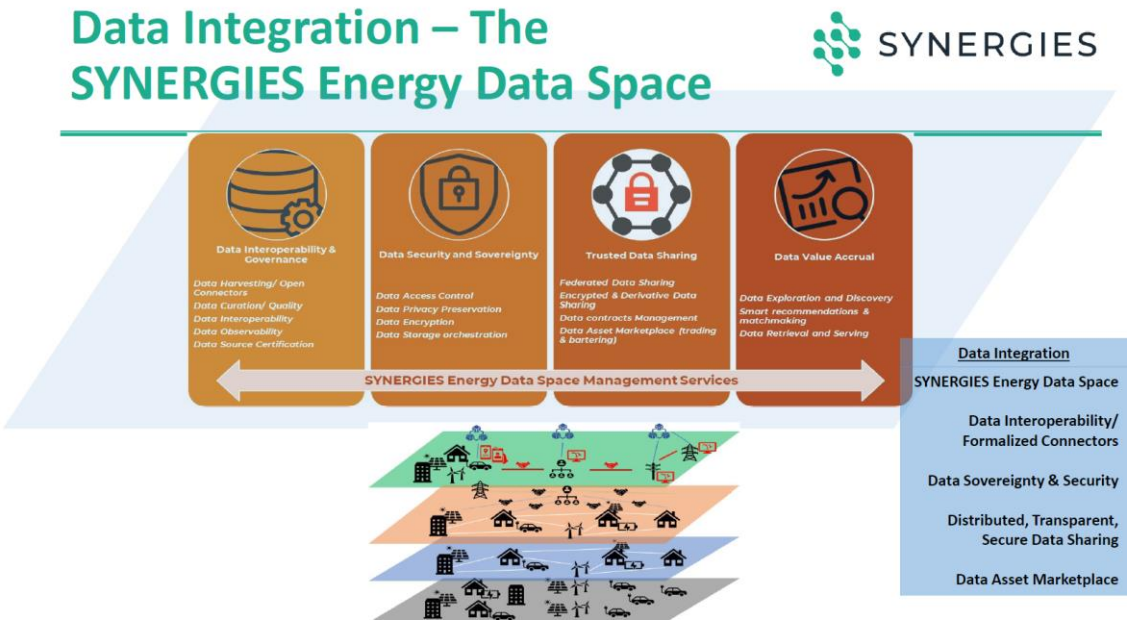

Vision and Architecture

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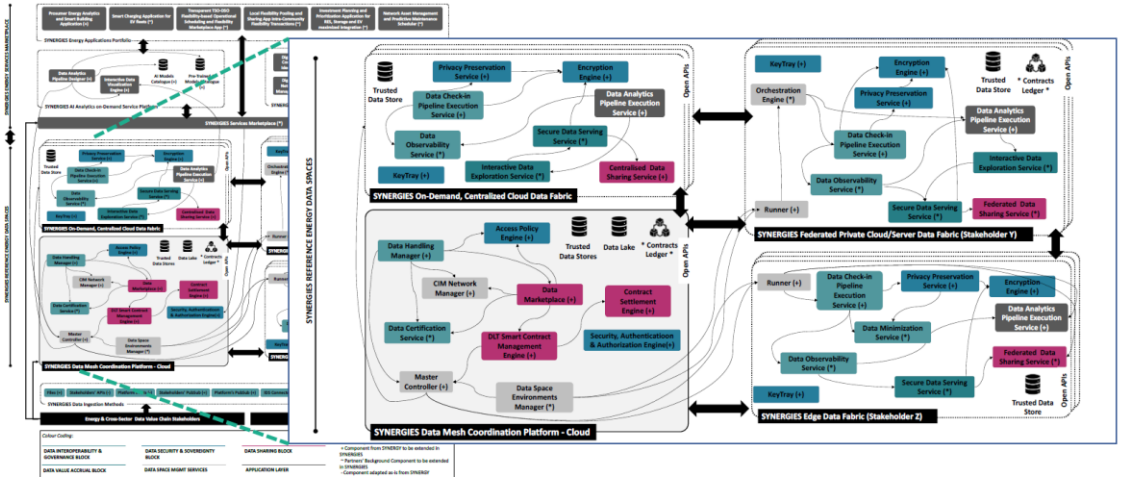
SYNERGIES

Vision (DoA)

SYNERGIES brings forward a **reference Energy Data Space Implementation** that will attempt to **unleash the data-driven innovation and sharing potential** across the **energy data value chain** by leveraging on data and intelligence coming from diverse energy actors (prioritizing on consumers, but also introducing the stakeholders of the whole value chain as **data owners and/ or providers**), as well, from **interrelated and coupled sectors (buildings and mobility)** and effectively making them **reachable and accessible** by all interested actors.

SYNERGIES

Architecture - I



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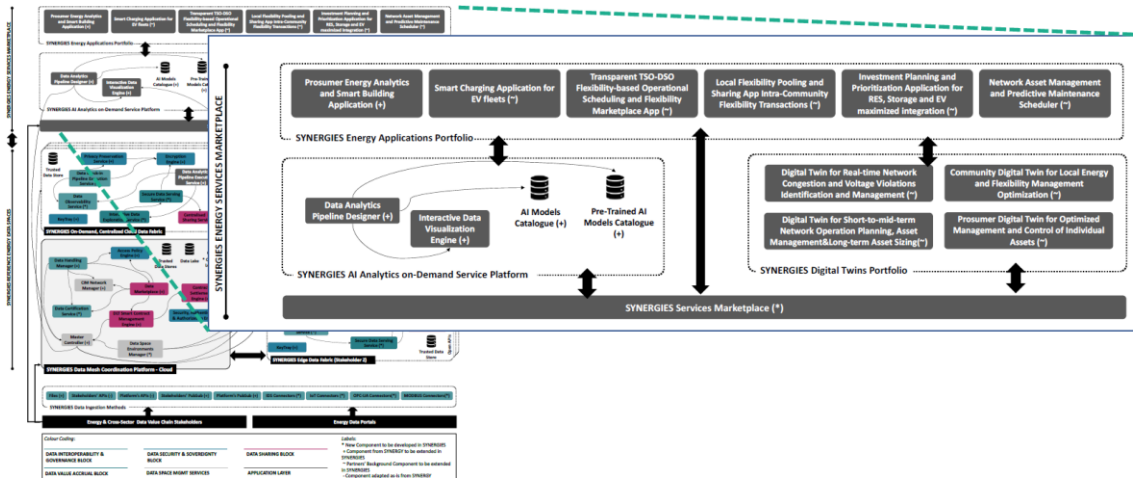
SYNERGIES

Architecture - II



SYNERGIES

Key Project Facts

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SYNERGIES

SYNERGIES at a glance

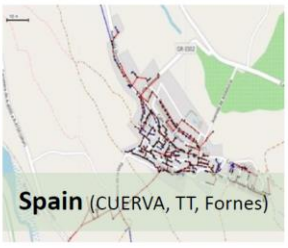
Shaping consumer-inclusive data pathwaYs towards the eNERGy transItion, through a reference Energy data Space implementation

Start Date 01/09/2022	22 Partners
42 Months	10 Countries
Innovation Action	3 Demonstrators

SYNERGIES

Demonstration

3 Demo Sites



Demonstration Case	EL	ES	DK
Proactive Flexibility-Aware Network Management Data sharing between: TSO, DSO, LEC/Aggregator-BSP, Prosumers	✓	✓	✓

The demo case will shift traditional network management approaches, towards strategies that prioritize on distributed flexibility provided by small (but large in number) consumers. Smart metering information and generation data both from DSO/ TSO systems and prosumers will be blended and further analysed towards delivering highly accurate forecasts of demand and generation in different time horizons. Such forecasting models, algorithms and results will be introduced in the associated Digital Twins implementations, togeth[er] [with] network models, to further enhance their prediction capabilities by comb[ining] improve their accuracy in promptly identifying anticipated network events [and] balances) at both sides of the energy network (Transmission and Distributi[on] emerging network needs in terms of flexibility (considering both spatial and temporal parameters of the flexibility needed) to ensure the resilient and stable operation of the networks. Identified flexibility needs will be transposed to relevant flexibility requests that will be made available in the corresponding flexibility marketplace and communicated to aggregators (a role to be assumed by LECs). Subsequently, based on these requests, aggregators will be able to define in detail their VPP strategies (utilizing flexibility offered by prosumers of their portfolio) and post the relevant flexibility bids in the marketplace towards establishing agreements and

8 Demo Cases

Data Type	Data Providers	Format	Volume	Velocity
Energy Data – Buildings/ Consumers (BEMS, Sensors, IoT Devices)	CoEn, BEOF, Fornes, TT	Structured (text, numerical) and Sensory	~250 GB/ month	1s – 1min
Smart Metering Data	HED[NO]	Structured	~0.5 TB/ month	3-15 mins
Power Grid (RTU, SCADA, Imagery, GIS) Data	HED[NO] TEN[O]	and Sensory	~2 TB/ month	1-5 sec, event-based or static
Other DER (Storage, EVs)	CoEn, BEOF, Fornes, TT	Structured (text, numerical)	~10 GB/ month	5sec – 1min
Extra Energy Data (market	HEDNO, IPTO, CUERVA	Structured (text	Over 100	

N Data Assets

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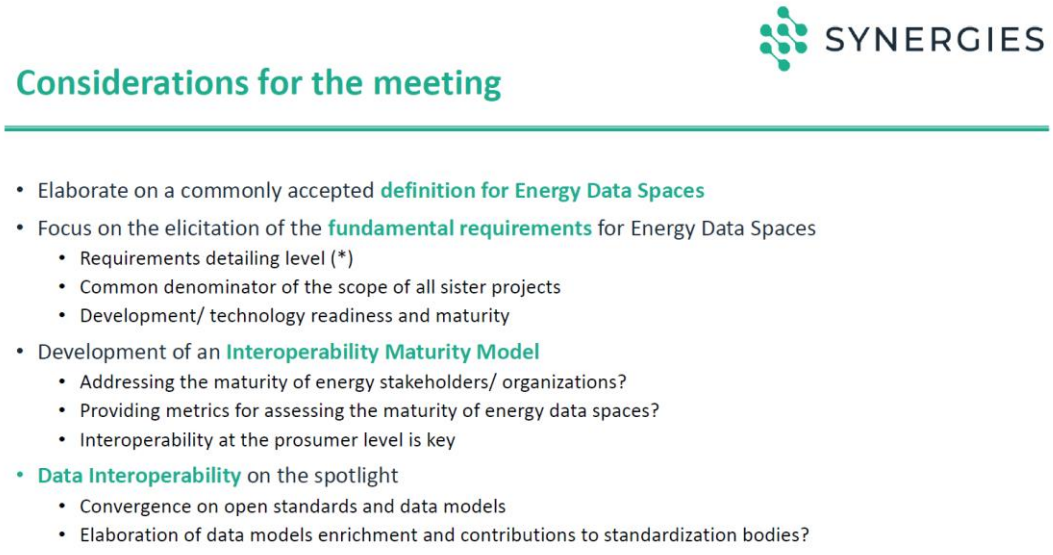
SYNERGIES

Considerations for the meeting



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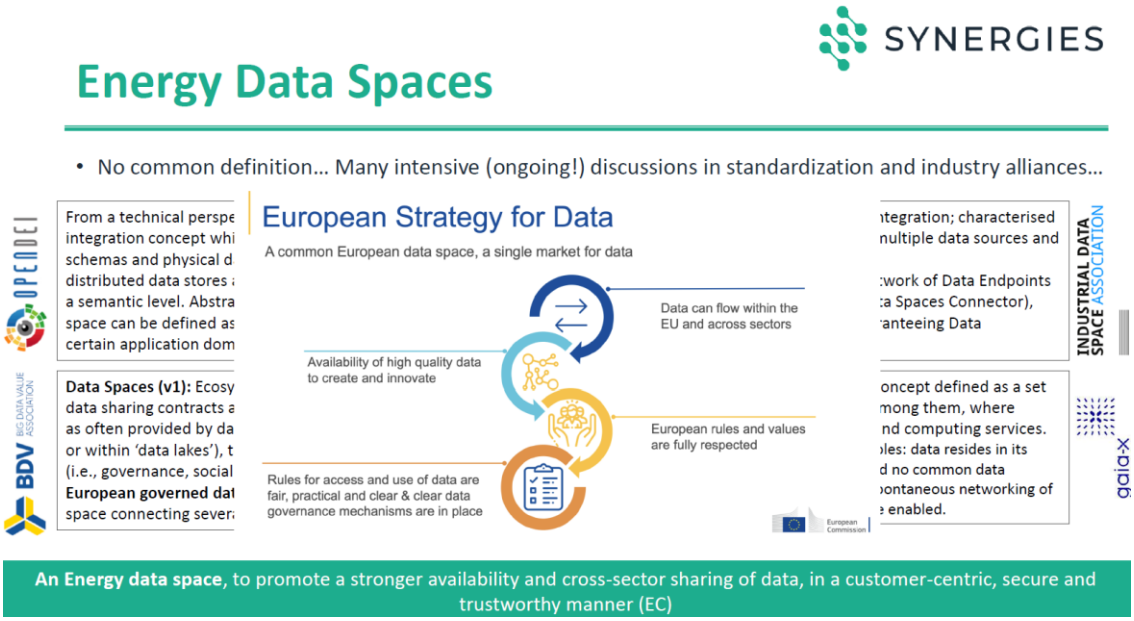

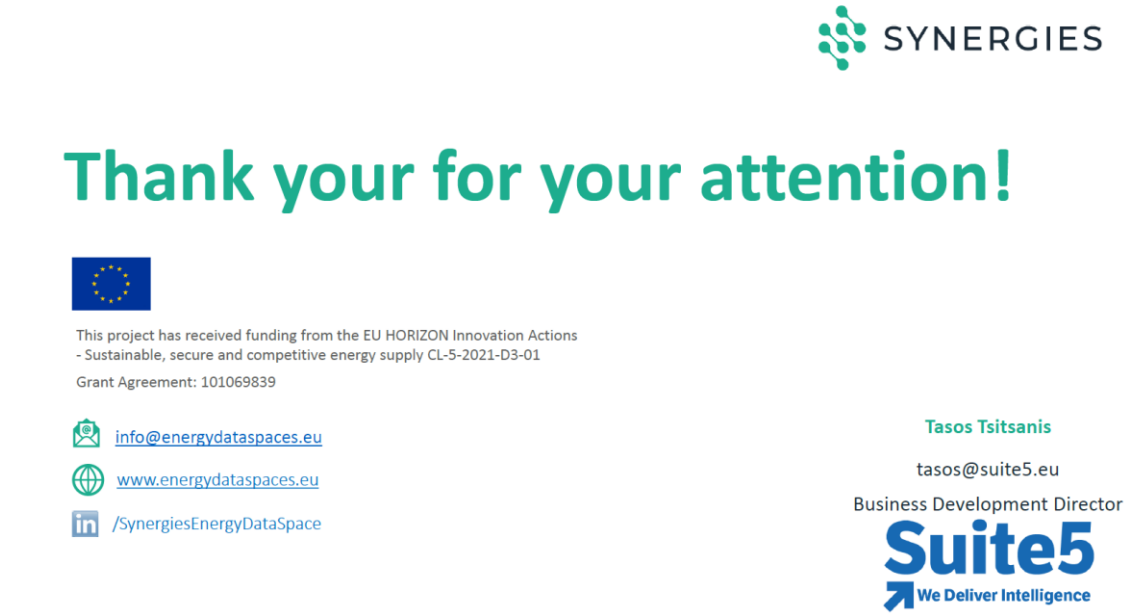

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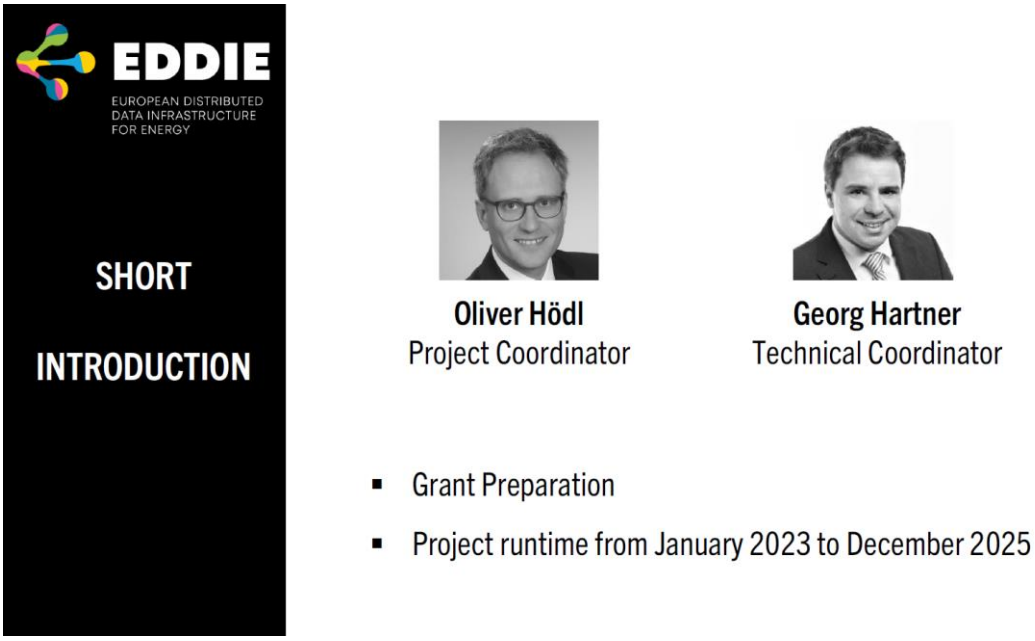
14 A5. Eddie



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CONSORTIUM PARTICIPANTS

1. Austrian Institute of Technology, Center for Digital Safety & Security, Competence Unit Cooperative Digital Technologies, Vienna
2. Copenhagen School of Energy Infrastructure, Department of Economics, Copenhagen Business School, Copenhagen
3. European University Institute, Florence
4. University of Vienna, Faculty of Computer Science, Cooperative Systems Research Group, Vienna
5. University of Applied Sciences Upper Austria – Campus Hagenberg – Research and Development, Hagenberg
6. University of Applied Sciences Upper Austria – Campus Hagenberg – Department of Studies – *Affiliated Entity with FHO (5)*, Hagenberg
7. The Lisbon Council for Economic Competitiveness and Social Renewal asbl, Brussels
8. PONTON GmbH, Hamburg
9. Asociación de Empresas de Energía Eléctrica (aelec), Madrid
10. Plataforma Datadis C.B., Madrid
11. DEDA – Public Gas Distribution Networks – Single Member S.A., Athens
12. EDA Energiewirtschaftlicher Datenaustausch GmbH, Vienna
13. Südtiroler Energieverband, Bozen
14. ÖTZI Strom, *Affiliated Entity with SEV (13)*, Bozen
15. FlexiDAO, Barcelona
16. Digital4Grids, Paris
17. EASEE Gas, Paris
18. Entarc.eu, Waidhofen/Ybbs
19. ETA+ GmbH, Stuttgart

Support:
- S1. Enedis, Paris
- S2. Energinet, Copenhagen

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VIEWS ON ENERGY DATA

"Data is like butter - it makes everything better!"

Problem: If you do fried eggs, you need to put butter underneath – otherwise it burns. We are doing more and more fried eggs. **Energy data use cases are becoming more and more critical!**

"Data is like oil - you can **mine it**, **refine it**, and then **sell it!**"

Problem: This approach has side-effects and is too business centric. As data holders are „mining data", why should they share it to others to simply „refine and sell"?

"Data is like water - it needs to be **fresh**, **clean** and **available to all**"

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Focus

Residential real-time data sharing

which is secure, reliable, trusted and consent-based

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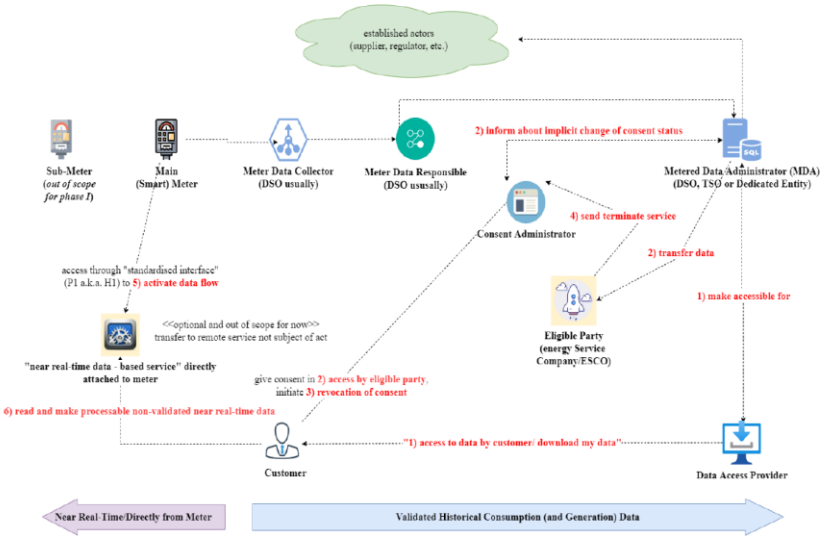
VIEWS ON ENERGY DATA

DATA ACCESS ENABLED BY ARTS 20/23/24 OF 2019/944



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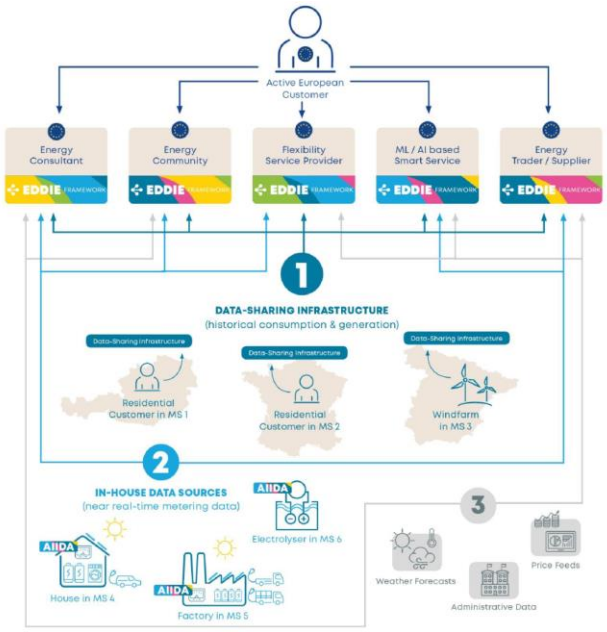

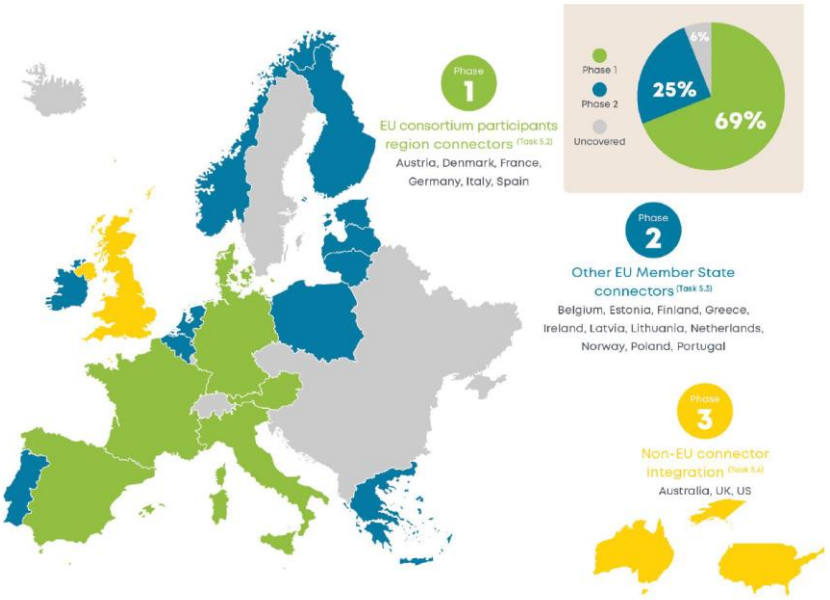

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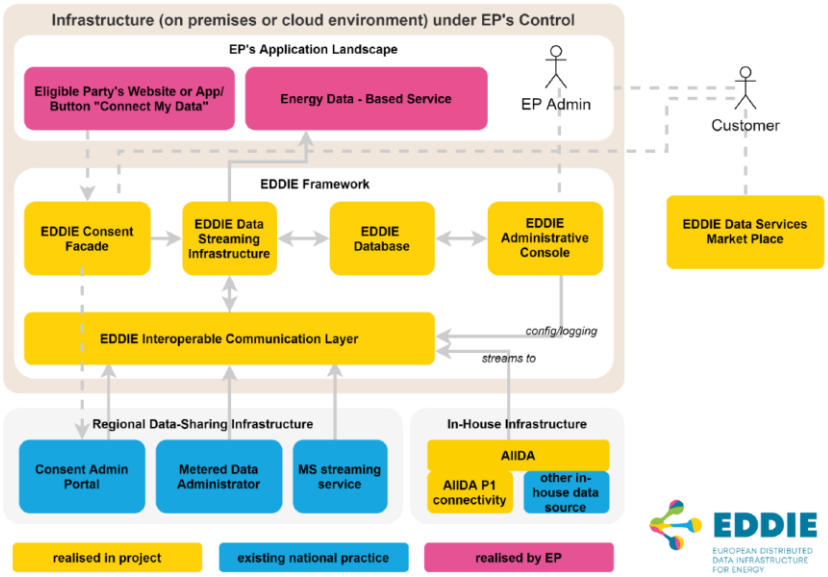
ARCHITECTURAL SCHEMA



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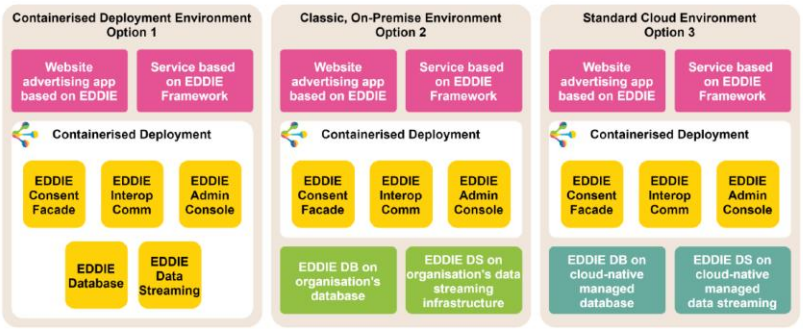
DEPLOYMENT OPTIONS



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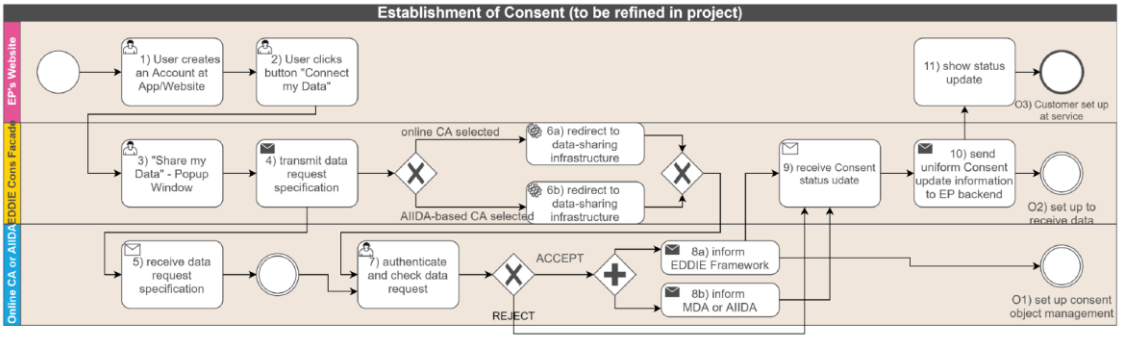
ESTABLISHMENT OF A CONSENT



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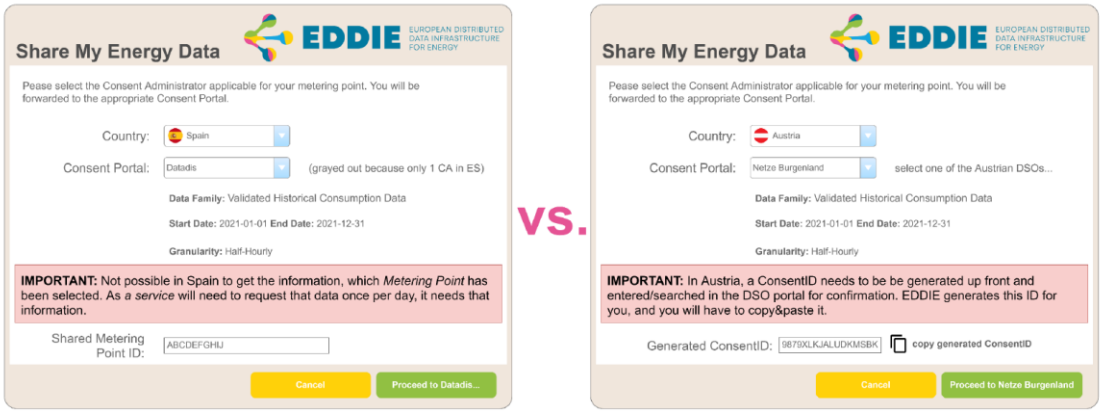
DIFFERENT CONSENT USER/DATA FLOWS IN MSs



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DIFFERENT CONSENT ADMIN PORTALS

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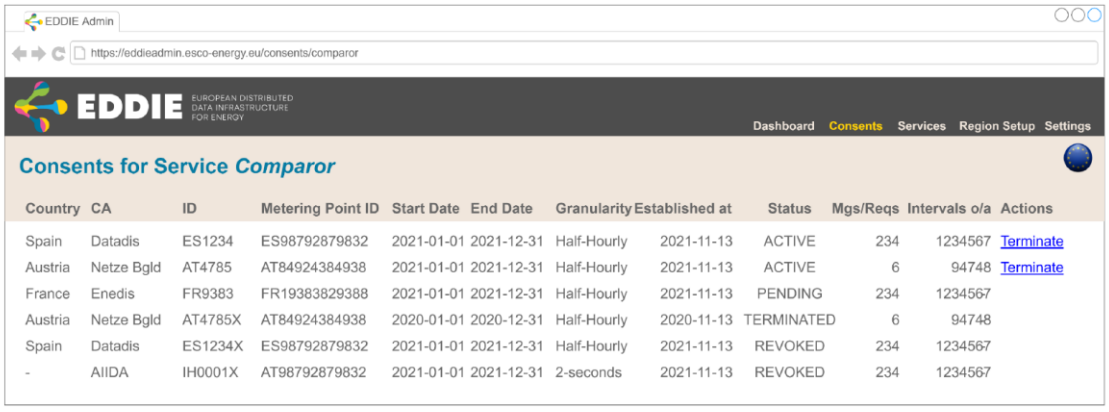
ADMIN CONSOLE – MANAGE CONSENTS



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Spain	Datadis	ES1234	ES98792879832	2021-01-01	2021-12-31	Half-Hourly	2021-11-13	ACTIVE	234	1234567	Terminate
Austria	Netze Bgld	AT4785	AT84924384938	2021-01-01	2021-12-31	Half-Hourly	2021-11-13	ACTIVE	6	94748	Terminate
France	Enedis	FR9383	FR19383829388	2021-01-01	2021-12-31	Half-Hourly	2021-11-13	PENDING	234	1234567	
Austria	Netze Bgld	AT4785X	AT84924384938	2020-01-01	2020-12-31	Half-Hourly	2020-11-13	TERMINATED	6	94748	
Spain	Datadis	ES1234X	ES98792879832	2021-01-01	2021-12-31	Half-Hourly	2021-11-13	REVOKED	234	1234567	
-	AIIDA	IH0001X	AT98792879832	2021-01-01	2021-12-31	2-seconds	2021-11-13	REVOKED	234	1234567	

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COOPERATION

- Work on a broader alignment of IEC-62325 (market), IEC-61970 (grid), IEC-61968 (assets) and Saref4Ener
- Contribute to BRIDGE Data Management WG
- Link with EU DSO and ENTSO-E
- Link with EU Smart Grids Task Force EG1 and other legislative initiatives

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- Act as Data Provider for others:
  "EDDIE makes it as easy to share metering and consumption data as if you would pay online"
- Interest to connect V2G use case with community u.c.
- Drive developments towards Energy Data Space "Retail"
- And all other ideas welcome…

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3. **BRIDGE.** *European (energy) data exchange reference architecture 3.0* . July 2023.

4. **Tolkien, John Ronald Reuel.** *The Lord of Rings.* Crows Nest, New South Wales : George Allen & Unwin, 1954. pp. 1-5.

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