

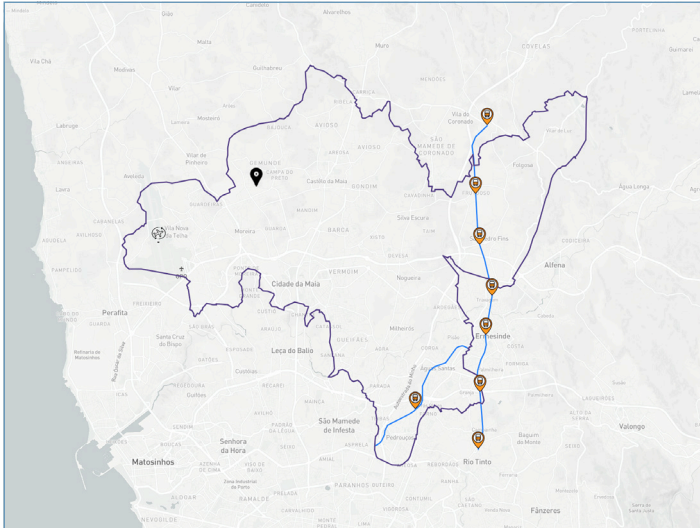
# FLEXIBILITY

## USE CASE IN MAIA

OMEGA-X is developing an **Energy Data Space** that enables multiple actors sharing data and services while ensuring privacy, security and sovereignty. The project sets up 4 use case families, with in total 9 pilots, that showcase the value of having a common energy data space for problems identified by energy stakeholders: **renewables, local energy communities, electromobility and flexibility**.

The flexibility use case will be demonstrated in one pilot, in the Portuguese municipality of Maia, whose infrastructure is being used as sources of flexibility for the electric grid and whose data is being used to deliver advanced data-driven flexibility services. Flexibility is the ability of a power system, to adapt its consumption or production to fluctuating electricity demand, whether expected or unexpected.

Flexibility benefits from data spaces by requiring **high-level of data/information integration** among stakeholders, which will be highly accelerated through a common ecosystem easing the burden of many managerial, bureaucratic, and technological aspects of the data exchange. Examples of exchanged data include electrical energy consumption and production of network nodes and environmental data from weather stations. Examples of data turned into information by advanced analytics and predictive services include energy consumption/production profiles and information on how to remotely activate and deactivate consumption and production of specific resources.



## MAIA

Maia, located in the north region of Portugal, is one of the Porto Metropolitan Area municipalities and around 135 thousand inhabitants. Maia plays an important role in the northern region of Portugal, due to its centrality and proximity to Porto, and because of its major transport infrastructures, which includes Porto's international airport, 3 metro lines, 2 railroad lines and the municipality benefits from several road axes of great regional and national importance.

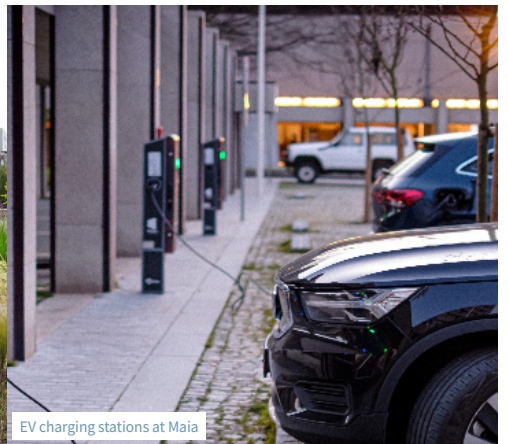
The city counts 14 business and industry districts, 1 science park and over 15.000 companies. It is **one of the most industrialized municipalities of Portugal** and an important **transportation hub**. The productive structure of the city is divided into 74% services, 25% industry and less than 1% agriculture. Maia began seriously paving the way to be a sustainable city in 2012. First by tackling energy issues and in 2014 by creating the Sustainable Energy Action Plan addressing among others the Renewable Energy Storage penetration, energy efficiency, CO<sub>2</sub> emissions, mobility (including soft mobility, promotion of public transport and e-mobility, and citizen's), and citizen's engagement.



Aerial view of Maia city



Green Roof Maia Forum



EV charging stations at Maia

## THE CHALLENGE

OMEGA-X develops accessible business analytics and services using existing data to support the clean energy transition and enhance value creation. Providing energy data via a data space, can enable stakeholders, such as municipalities, to create new business cases extracting economic and social value from it.

The flexibility use case in Maia aims to demonstrate the performance upgrade that can be achieved with a flexibility identification and provision at local or municipality levels when service providers have access to extended data sets from multiple sources. The goals of implementing this use case are:

- 1. An optimization of the energy use** in the infrastructures owned by Maia municipality by:
  - Exploiting the deployment of flexible electric energy production and loads.
  - Developing tools/business analytics routines that allow to balance energy demand and production within infrastructures.
- 2. Flexibility** in municipal operations:
  - Equip the municipality to operate its energy resources in a flexible way, providing support to the Distribution System Operators (DSO) via bilateral contracts.
  - Identify available flexibility, monitor grid conditions in real-time, and recognize grid reinforcement needs based on upcoming distributed energy resources (DER) and loads.
- 3. Real-time flexibility** for future markets:
  - Detect the real-time flexibility capacity that can be offered in potential multi-player flexibility markets.
  - Use business analytics to gauge the flexibility at network nodes, paving the way for future energy market scenarios.

The flexibility use case relies on aggregated data from the OMEGA-X Data Space and the data analytics services developed, focusing both on single-party and multiple-party business cases.

## THE PILOT

The Maia pilot on flexibility services provision focuses on two types of flexibility applications based on data analytics working on top of existing data: **Real-time and Future planning**.

The Maia municipality owns several infrastructures, that can provide data and will be used as sources for data-driven flexibility services in this pilot, such as:

- **Heating, ventilation, and air conditioning (HVAC)** and climatization of public offices and municipality infrastructures
- Electric vehicle charging station and electric vehicle fleet
- Distributed energy power plants (such as rooftop photovoltaic panels) and public lighting infrastructure meteorological data.

Within the pilot, Maia aims at trading and activating the ramp-up and ramp-down (both of capacity and rate) of different infrastructures, considering both flexible load and generation. The municipality focusses on the following key elements:

- Obtaining a **higher degree of interoperability** between data platforms by using multiple energy data sources.
- Working with open standards, data storage, interfaces, protocols, platforms and procedures: **through the Energy Data Space**.
- The **operationality and integration of data from different energy vectors**. Only electric energy (no heat, cooling or gas vectors), although some electric energy is used for heating and cooling.
- The **availability of data from various energy services**.
- New market roles, market participants and energy communities leveraged by the stakeholder's participation – feeding data and using the data – thus enabling the appearance of **innovative business models**. This requires an increased acceptance and participation of consumers on data sharing for energy services.

The solutions and economic models developed during the pilot have a strong focus on demonstrating and exploring the financial and economic viability of the solutions. The financial viability assessment is obtained through the solutions monetization whereas the economic viability assessment is done not only based on the financial

figures, but includes all the externalities (positive and negative) associated with the solutions. A new business model is developed when a company is able to appropriate positive externalities and internalise them.

Deploying a smart set of services and solutions serve as a baseline for the demonstration of how an Energy Data Space can be relevant for all energy actors in concrete case studies. Following this idea, a set of tools, such as Data Analytics Services, are being developed on top of the data gathered and made accessible via the OMEGA-X Marketplace:

- Grid observability & validation platform
- Flexibility platform for Distributed Energy Resources connection, planning
- Energy services for prosumers
- Energy services for flexibility users
- Production models for intermittent Distributed Energy Resources
- Energy Management System optimization






These flexibility services are enhancing the operational integration of data from different energy assets based on the aggregation of multiple distributed infrastructures (public infrastructures such as swimming pools, schools and offices thermal appliances...) operated by a single owner: Maia municipality. In this case, a bilateral business model is expected to be developed to provide economic remuneration for unlocking the flexibility sources.

It will, as well, enable the appearance of innovative business models, triggering economic and social value from it and increasing acceptance and participation of prosumers on data sharing for energy services.

The access for industrial organisations to high quality data sources are being facilitated, enabling them to progress and facilitating their knowledge and development of the right skills needed to extract the full potential from databases. This way the industry is better equipped to use shared data as part of their business.

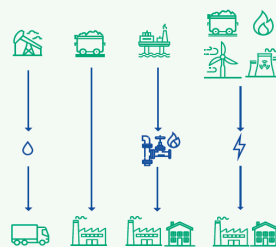
## ROLES AND RESPONSIBILITIES

The following partners are involved in the pilot, including their roles:

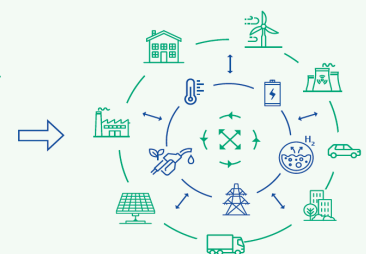
|   |  |
|---|--|
|  | Leader of the use case family Flexibility, energy supplier and facilitator, Distribution System Operator (DSO) part of group EDP |
|  | portfolio manager service provider (PMSP)  |
|  | Distribution System Operator service provider (DSOSP)r   |
|  | prosumer, providing and using data science and data engineering  |
|  | facilitator and data provider  |

In Portugal, as in many countries, municipalities are the owners of the low-voltage grid whose operation is concessioned to a Distribution System Operator. The existing working relationship and the mutual interest in more efficient and flexible services facilitates a more profound collaboration. By managing its own flexibilities, the municipality is **lowering the exploitation costs of public energy assets**, including the grid. Savings that can be used to reinvest in improving the energy efficiency or flexibility, improving the return of investment of public energy assets or even inject other relevant actions. The solutions and work done within OMEGA-X and within this pilot in Maia are replicable for other European cities.

**The energy system today** : linear and wasteful flows of energy, in one direction only



**Future EU integrated energy system** : energy flows between users and producers, reducing wasted resources and money



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