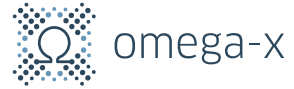


Local Energy Communities



USE CASE IN

- GRANOLLERS (VALLES ORIENTAL), SPAIN
- OSIMO, ITALY
- BELGRADE (R&D CAMPUS), SERBIA
- ÉVORA (VALVERDE), PORTUGAL
- ZARAGOZA, SPAIN

OMEGA-X AND LOCAL ENERGY COMMUNITIES (LECS)

OMEGA-X has a vision of creating an interoperable sovereign federated multi-vector Energy Data Space based on open standards to facilitate different actors and stakeholders in the energy value chain to exchange data and create value. The project set up 4 use case families, with in total 9 pilots, that showcases the value of having a common energy data space for problems identified by energy stakeholders: renewables, local energy communities, electromobility and flexibility.

The Local Energy Communities (LECs) use case family encompasses a variety of pilots, including Vallès Oriental in Granollers (Spain), Osimo (Italy), the R&D Campus in Belgrade (Serbia), Valverde in Evora (Portugal), and Zaragoza Inclusive Solar Community (Spain).

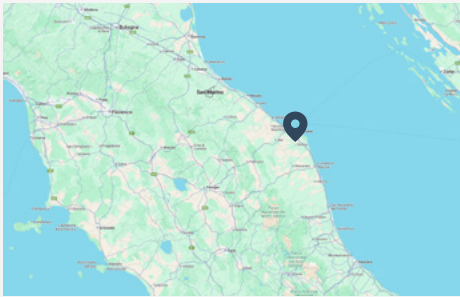
OMEGA-X has been developing, implementing and validating different innovative data-driven

services that leverage data from different energy community actors in order to address different challenges and opportunities in the energy sector, such as increasing the share of renewable energy sources, enhancing the flexibility of the grid, empowering local energy communities, and integrating different energy sectors, exploiting its full value for the benefit of the community and the whole energy value chain. The main goal is to provide these communities with the tools to manage their energy needs efficiently, demonstrating how collaboration among multiple stakeholders and the adoption of innovative technologies can contribute to reducing environmental impact and promoting sustainable development, while addressing the unique context and challenges each pilot faces.



CONTEXT AND CHALLENGES FOR EACH PILOT

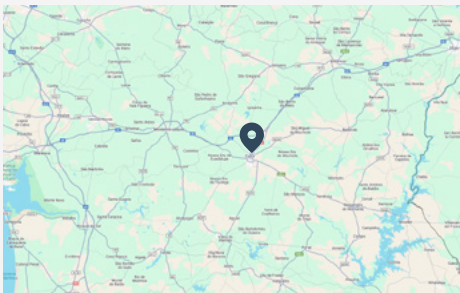
Osimo Energy Community



The Osimo Energy Community, under the guidance of the local utility Astea, aims to optimize intervention, management, and consumption of different public services like water, energy and the electrical grid. The pilot is located in a multi-energy municipal minigrad with a high share of distributed energy resources (DER) and has a combined heat and power (CHP) plant connected to a dis-

trict heating network serving about 1.250 final users, a small portion, a water district network serving about 1.300 final users (with smart water meters) and electric vehicles (EV) charging stations; a smart building (Astea's headquarter); battery energy storage system connected to a low voltage (LV) branch of the distribution grid, and 20 final users. This pilot site's core focus is implementing a comprehensive set of data services that leverage the concept of the Local Energy Community (LEC) to optimize energy consumption and dispersion across thermal, water, and electrical domains with the aim of reducing environmental impact, promoting decarbonization, and improving maintenance interventions. The main challenges for this pilot site are related to the interoperability of the smart meter data management system with OMEGA-X services and the smart meter coverage.

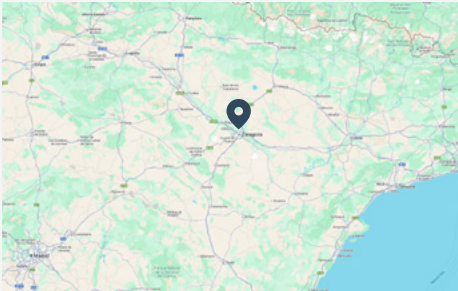
Évora Energy Community



The Évora Energy Community, facilitated by EDP and coordinated by the parish, aims to foster the participation of citizens and local entities in the energy transition, promoting the generation and consumption of renewable energy, the adoption of energy efficiency measures, and the engagement in demand response pro-

grams. The energy community provides data of 10 members (installations) of the LEC with PV panels installed on member's roof (minimum 1.5 kWp per installation) and 2nd life-based batteries with 4.0/4.4kW/kWh, property of LEC members. The pilot focus is implementing a set of data services to enable the creation of a local energy market, where prosumers can sell their excess energy to other consumers, and where flexible loads can provide ancillary services to the grid operator. The main challenges for this pilot site are the engagement and motivation of the users the coordination and collaboration among different stakeholders and service providers, and the social and behavioural aspects of the LEC members.

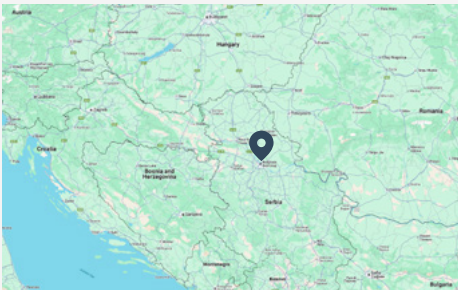
Zaragoza Energy Community



The Zaragoza Energy Community, led by EDP Solar Espana, intends not only to share energy produced by solar panels with several neighbours in the same neighbourhood, but also

to do so in an inclusive way, granting access to solar energy to vulnerable families as well. Two solidarity neighbourhoods are being created in Zaragoza that is positively impacting 200 families and businesses, including 20 vulnerable families with 120 photovoltaic (PV) panels (450Wp per solar neighbourhood) on a pavilion rooftop. The production of solar energy for self-consumption enables customers to reduce their energy dependency and, consequently, their energy bills. Similar to the Évora pilot, the main challenges for this pilot site are mainly related to the engagement of the users and coordination of actions between the different stakeholders.

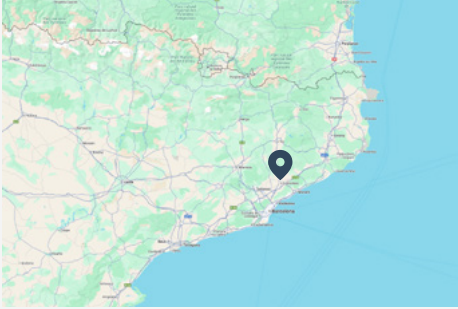
Belgrade Campus Energy Community



The Belgrade Campus Energy Community, supported by the University of Belgrade, aims to enhance the energy efficiency and sustainability of the university campus, by formalizing energy community and replacing current lump-sum based split of energy bill (proportional to occupied area) with a fair, energy performance based, split of costs and leveraging innovative business models for remuneration benefits from common energy production assets. The R&D campus consists of several buildings. The common energy supply infrastructure comprises a

thermal plant running on fuel oil (mazut) and a local photovoltaic (PV) power plant (50kWp). The campus is also connected to the public power grid via low-voltage power station (0.4kV/220V). The overall supervision and control of energy flows is based on the deployed SCADA system (View4, IMP's proprietary solution) which communicates with several remote terminal units (pAtlas RTUs) and PLCs (ATLAS MAX). The campus energy community can be further extended and integrate buildings. The main challenges for this pilot site are related to the identification and processing of data needed for preparing the energy transition scenarios, the interoperability of PUPIN SCADA data and OMEGA-X services and the legal aspects related to formalizing the energy community and compliance with national regulations.

Granollers Energy Community



The Vallès Oriental LEC pilot, hosted by ESTABANELL in their Granollers premises, is a testbed promoted by ESTABANELL's utility company acting as a LEC Operator. Within this community there is a PV plant for self-consumption, a demo battery bank, controllable HVAC (heating, ventilation and air-conditioning) and EV charging points, which even include a bi-

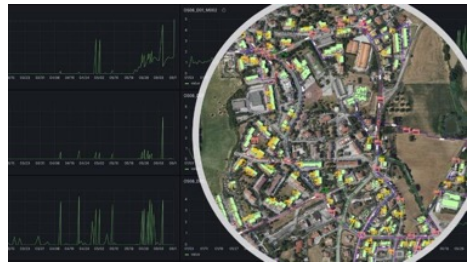
directional charger able to feed the grid with power from the EV. Altogether, the PV installation, which has an installed power of 37kWp, and the battery, which has a capacity of 210 kWh, would be able to almost satisfy the energy needs of the entire office building, excluding the EV chargers. The main data for the LEC use case includes both generation and consumption data, allowing for the implementation of multiple services regarding demand response, load shifting, increased self-consumption and plenty of cutting edge technologies. Examples of registered parameters are: hourly active and reactive power from smart meters, grid meters, and PV on rooftops, power, energy and charging time on the EV chargers, detected frauds, asset costs and age, and GIS (geographic information system) data of the DSO (Distribution System Operators) grid.

MAIN GOALS FOR THE OMEGA-X ENERGY COMMUNITIES

The main goal for the pilot sites is to demonstrate the feasibility and benefits of different data-driven services for LECs.

Osimo Energy Community

In Osimo the focus lies on the optimization of water and energy resources, the reduction of losses and inefficiencies, and the improvement of maintenance and operation through the implementation of comprehensive data services to reduce environmental impact, promote decarbonization.



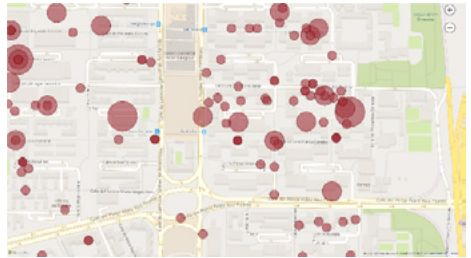
Valverde Energy Community

The focal point of this LEC are on the creation of a local energy market, the integration of distributed energy resources, and the provision of flexibility services to the grid operator. The pilot site will also showcase how participation and empowerment of citizens and local entities can foster the energy transition and create new opportunities for the LEC members.



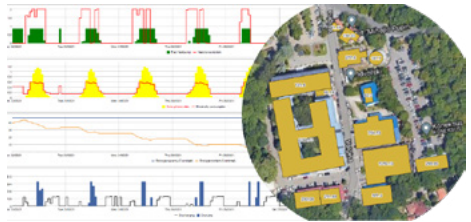
Zaragoza Energy Community

The provision of feedback and incentives to the users, and the integration of renewable energy sources and electric vehicles are the key elements of this LEC. The pilot site will demonstrate the benefits in reducing electricity costs among the LEC members, improving the lives of families, including 20 vulnerable families.



Belgrade Campus Energy Community

In Belgrade, the focus goes to on facilitating the digitalization of the PUPIN campus that will serve as a showcase for flexibility for satisfying the specific energy demand with multiple alternatives (electricity from grid and PV, heat from thermal plant, electric boiler or airconditioning), which can be dynamically switched considering available, locally produced, energy and varying import and export energy prices.



Granollers Energy Community

The LEC in Granollers aims at testing several cutting-edge technologies and services while reducing the environmental footprint of the company and the energy costs of the main office building. It is a heavily sensorized environment where multiple data vectors are collected, turning it into an ideal technology testbed with the ability to easily add new hardware. This LEC is being used for different innovative projects and tests as pilot site and ESTABANELL integrates learnings, when possible, into new services for their clients and improves the efficiency of its operations.



PROVIDED SERVICES

OMEGA-X delivers a range of services tailored to the needs of each LEC, with a clear mapping of the benefits and impact linked to the OMEGA-X Data Space. This approach ensures that con-

sumers, prosumers, and data owners within the LECs can actively participate and benefit from the energy data space.

Service name	Service provider	Pilot
Thermal losses detection and benchmarking	REVOLT	Osimo
Water losses detection and benchmarking	REVOLT	Osimo
Electricity saving simulation	REVOLT	Osimo
Local Energy Communities Designer	REVOLT	Osimo, Valverde, Zaragoza
Gamification for electrical energy savings	REVOLT	Osimo, Valverde, Zaragoza
Electrical Losses Detection and Benchmarking at LEC level	UPC	Granollers, Valverde, Zaragoza
Detect and correct measurement errors	UPC	Granollers, Valverde, Zaragoza, Belgrade
Reinforcement plan of Local Energy Communities for future renewable integration	UPC	Granollers, Valverde, Zaragoza
Optimizing sharing coefficients in collective self-consumption	TECNALIA	Valverde, Zaragoza
Optimizing self-consumption of renewable energy at LEC level	TECNALIA	Granollers
Planning Services	TECNALIA	Belgrade

IMPACT

Overall, the OMEGA-X Data Space demonstrates that collaborative environments where data is shared among trusted partners could improve the quality

of services needed for accurate forecasting, optimal setting of assets, maintenance and operation as well as engagement.

Osimo Energy Community

For the Osimo pilot site the main benefits and impact are related to the **optimization of water and energy resource usage**, leading to both environmental and economic benefits, including an expected 2% and 5% reduction in thermal and water losses, respectively. Data can

provide decision support for the transition to renewable energy by guiding strategic choices related to expanding renewable energy sources, implementing storage solutions, and developing effective energy management strategies.

Evora and Zaragoza Energy Community

The main benefits and impact for these pilot sites are related to the **improvement of user engagement and awareness**, thanks to the gamification and social network features that motivate and reward users for their energy-sav-

ing actions. A contribution to the transition towards a more sustainable and resilient energy system, thanks to the demonstration and validation of innovative solutions and business models for LECs.

Belgrade Campus Energy Community

The impact for this LEC lies in the field of the **decision-making support** on the transitions of the Institute Mihajlo Pupin complex into a positive energy district and the valuable information for elaboration of optimum energy management strategies, particularly regarding the extension of the PV plant and use of storage solutions. Moreover, OMEGA-X solutions advance the ex-

isting software infrastructure with interoperable services and components that will maximise the use of renewable energy produced to cover the building's consumption. This will increase the share of renewable sources of energy usage and reduce the energy import from the grid bringing both environmental (reduction of CO² emissions) and economic benefits (energy bill reduction).

Granollers Energy Community




The cutting-edge technologies tested on this community allow ESTABANELL to improve both its performance as a DSO and its catalogue of products and services as a retail company. Applying the learnings of the LEC into new products and services has a positive effect on ESTABANELL's clients, **indirectly through an improved grid performance or directly through new com-**

mercialized services. Additionally, the entire city of Granollers benefits from a lighthouse energy community project, which should serve as an example to foster the creation of new communities within the city, hence reducing the footprint of the entire town.

INVOLVED PARTNERS/ROLE

The success of OMEGA-X is a collaborative effort, involving partners who play various roles, from LEC members to service providers. Each stakeholder contributes to the creation of a robust and dynamic energy ecosystem.

LEC MEMBERS

			Consumers, prosumers, data owners
			Data Providers
			Service providers

THE CONSORTIUM



Keep up with omega-x.eu

 @Omega_X_EU

 Omega X

 @OMEGA_X@mastodon.social



This project has received funding from the European Union's Horizon Europe Framework Programme under Grant Agreement No. 101069287