MUSE GRIDS

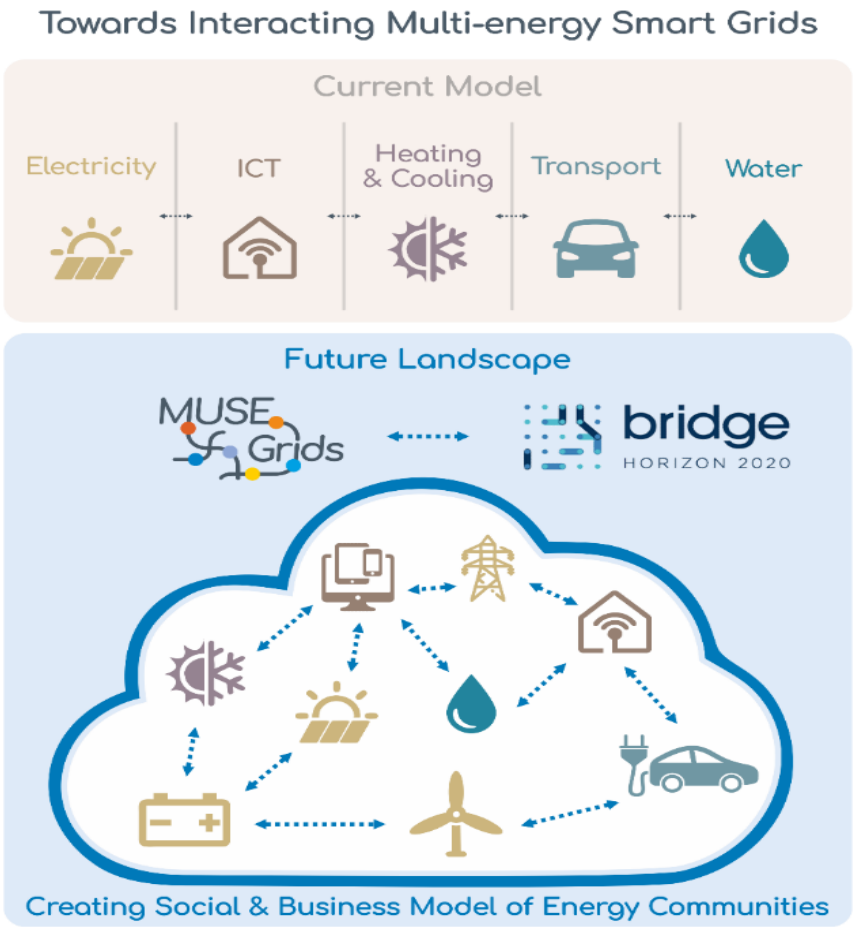
*MULTI UTILITIES SMART ENERGY GRIDS*

# Multi Utilities Smart Energy Grids

*Start Date: 01 November 2018*
*End Date: 31 October 2022*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824441.


# Our Vision




Demonstrate in two **INSPIRING DEMOSITES** a set of both technological and non-technological solutions towards local energy independency via the promotion of **SMART ENERGY SYSTEM**

**MUSE Grids aims to be a lighthouse/ inspiration project for EU.**

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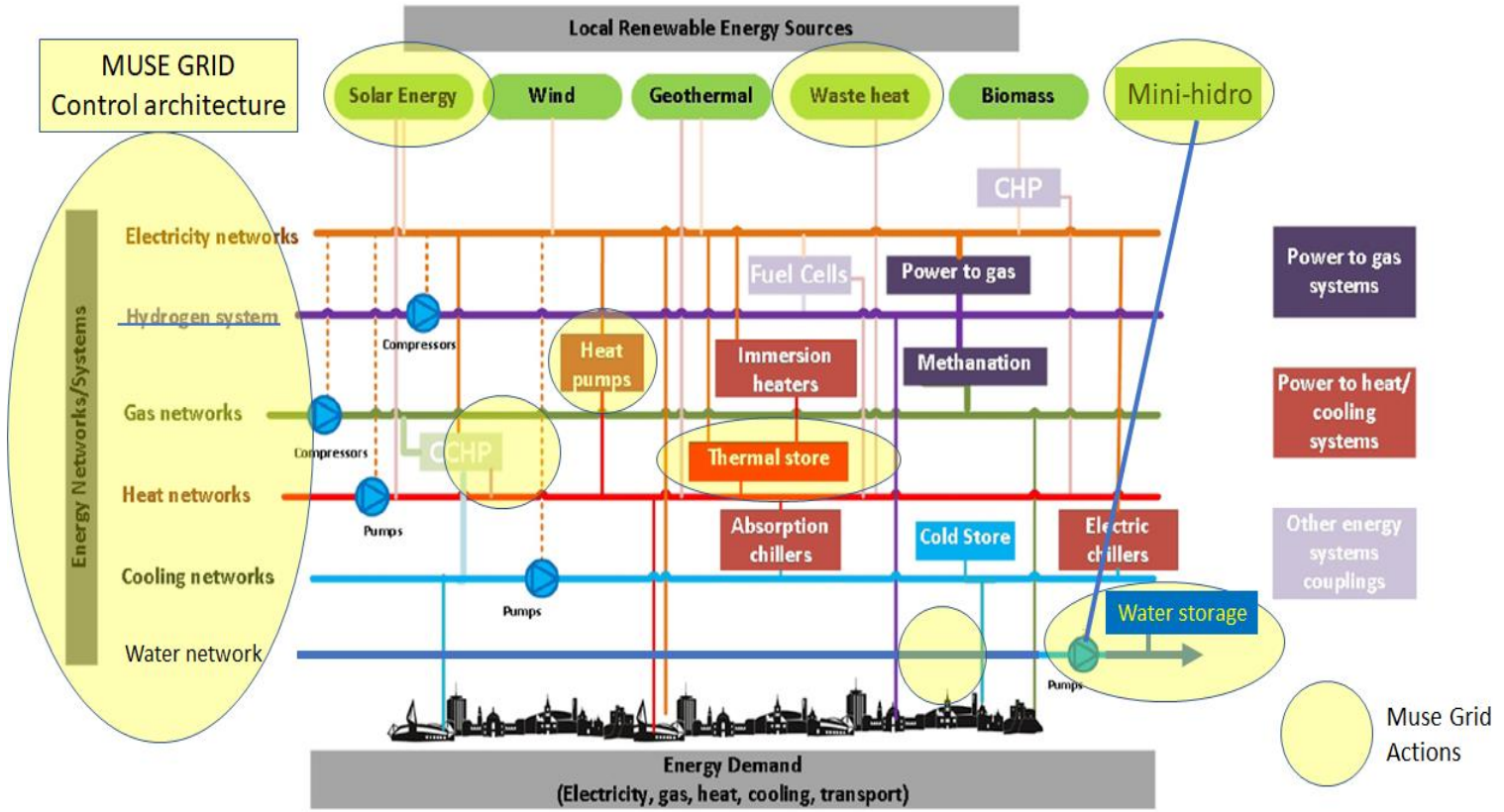
# Our Vision




*A **Smart Energy System** is defined as an approach in which smart electricity, thermal, water, gas grids etc. are combined with storage technologies and coordinated to identify synergies between them in order to achieve an optimal solution for each individual sector as well as for the overall energy system."*

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# MUSE Grids Key Challenges

**Some of the key challenges of exploiting the synergies between energy supply networks include:**

- The complicated interactions and interdependencies between energy supply networks have not been clearly understood. Design and operation planning of energy supply needs these issues, to which there are no commercial tools available
- No standard available for grids coupling technologies: network interfaces have relevant different characteristics.
- The fragmented institutional and market structures of different energy systems is often a barrier to realise the benefits of synergies between energy networks.
- Integration of multiple energy supply networks would result in a more complex energy system to manage and operate.
- Grids coupling technologies and solutions have been generally considered in the context of objectives and constraints at the distribution level, not necessarily reflecting on the impact on the design and operation of energy systems at the national level.

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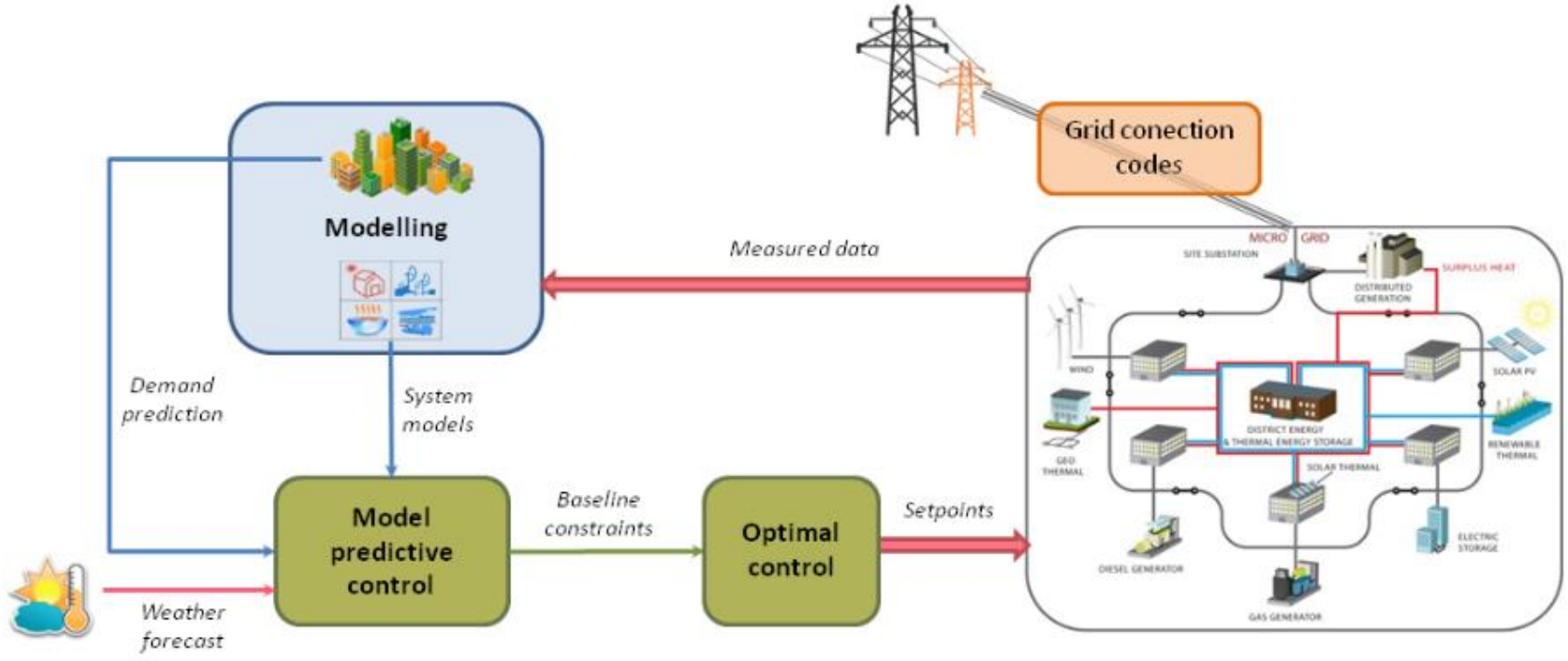
# MUSE Grids Research Pillars

**PILLAR 1:** OPTIMIZE AND AGGREGATE ENERGY GRID MANAGEMENT SYSTEMS IN A MULTI ENERGY DSM (under CAR supervision)

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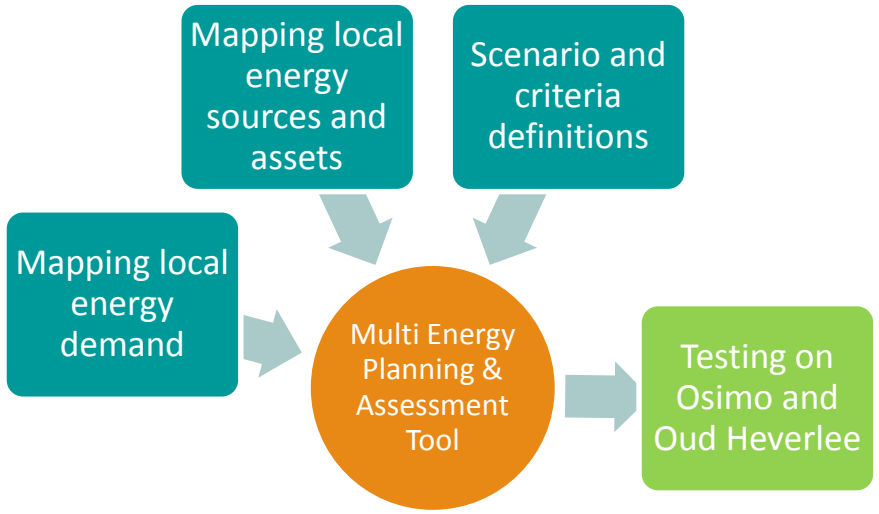
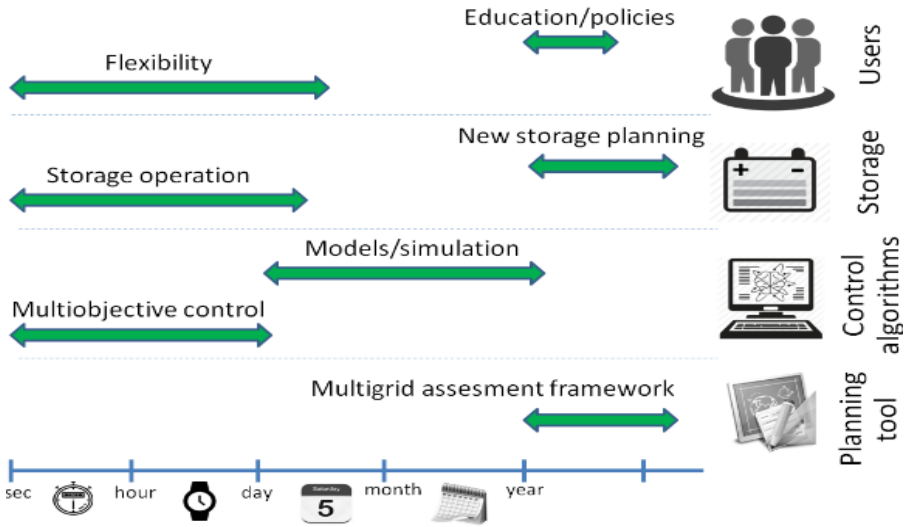
# MUSE Grids Research Pillars

**PILLAR 2:** MULTI ENERGY PLANNING FOR EU CITIES (under AAU supervision)




**MUSE Grids Main Outcomes interconnection**

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# MUSE Grids Research Pillars

**PILLAR 3:** KPI DRIVEN DEMONSTRATION AND REPLICATION (under RINA-C supervision)

OSIMO


OUD HEVERLEE

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# Presentation of the demosite – **OSIMO**

Osimo, with a population of about 35,000, is one of the municipalities managed by Astea Group. Our Utility provides water, gas, electricity and heat services and a relevant contribution to waste management activity.

| PRODUCTION LINE | ROLE | QUANTITY | CLIENTS (n) | LINE (km) |
|---|---|---|---|---|
| WATER | DISTRIBUTION AND SALE | 2,23 Mm3 | 17.300 | 373 |
| WASTE WATER | TRASPORT | | | 176 |
| ELECTRICAL ENERGY | DISTRIBUTION | 152,5 GWh | 18.600 | 228 |
| DISTRICT HEATING | DISTRIBUTION AND SALE | 14 GWh | 1.250 | 23 (double pipe) |
| NATURAL GAS | DISTRIBUTION | 22,0 Mm3 | 13.500 | 234 |

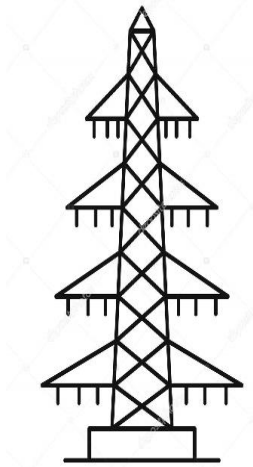
Osimo: weak connection point

Power consumption peak

35 MW

Power production peak due to renewable energy systems

21 MW



800 annual hours during which electricity flow was sent to the national network

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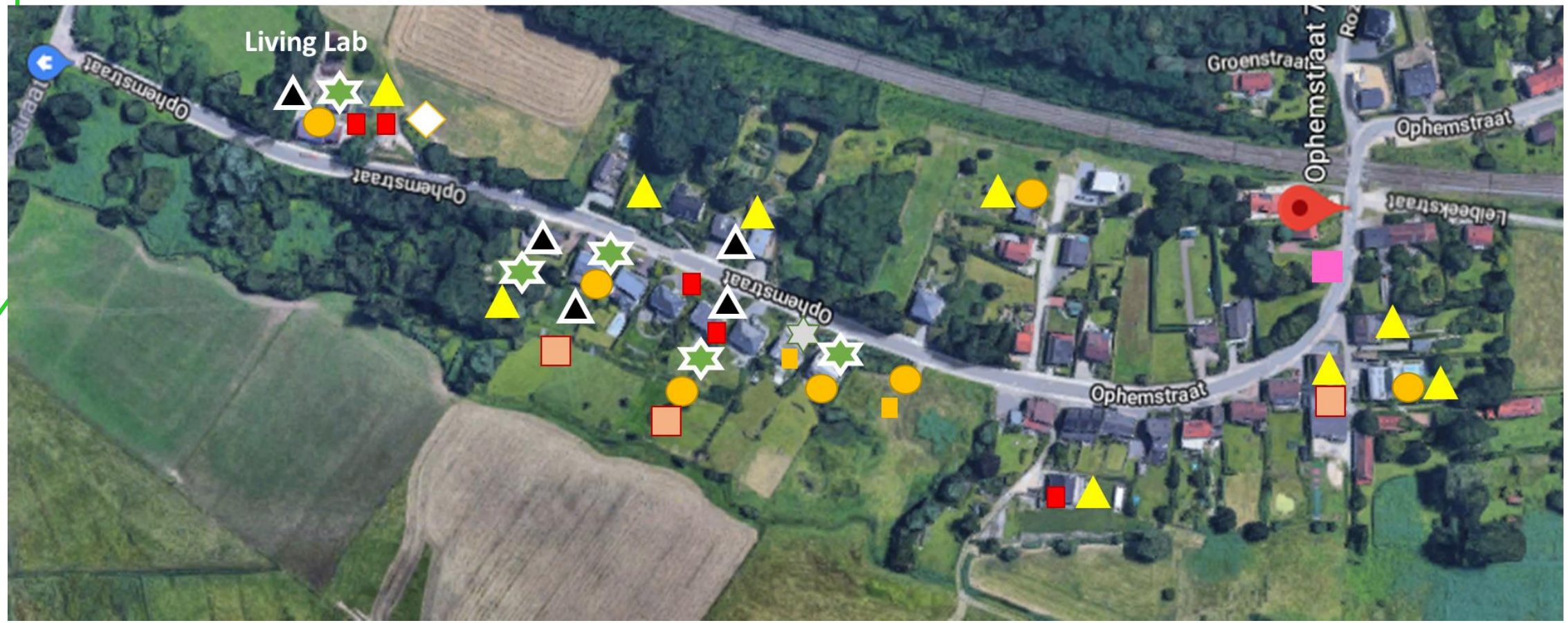
# Presentation of the demosite – **OUD HEVERLEE**

Partial electric heating
Electric car
Small scale battery
Hybrid vehicle
Neighbourhood battery
PV
Heat Pump
Thermal storage
Seasonal thermal storage
Fuel Cell

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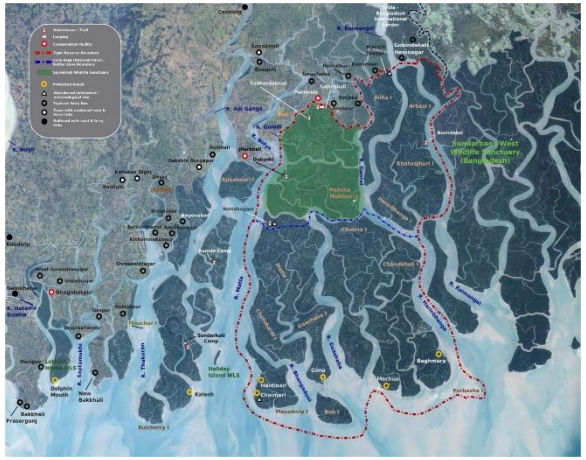
# Presentation of the demosite – **VIRTUAL DEMOSITES**

EILAT

District of Belen, Valladolid

Sundarbans, Bali Island

San Cebriàn de Campos

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# MUSE Grids Research Pillars

**PILLAR 4:** ENGAGEMENT OF END USER IN POLYGENERATIVE ENERGY GRIDS AND CREATION OF ENERGY COMMUNITIES (under TU-E and GDHVI supervision)


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# MUSE Grids Objectives

**MO1:** Demonstrate interaction of energy grids via flexibility assets and innovative DSM – WP1-WP2

**HOW?** Development of MUSE Grids DSM, V2G/V2B algorithms, monitoring data as a data mine for maintenance/fault identification.

**MO2:** Facilitate the replication of interacting grids in new districts and areas – WP3-WP6-WP7

**HOW?** Development of a first of its kind planning tool, creation of LEC (200 citizens), 5 replication studies.

**MO3:** Demonstration of MUSE GRIDS Innovations in different EU countries and contexts – WP4 - WP5

**HOW?** Demonstration in Oud Heverlee and Osimo

**MO4:** Dissemination and capacity building at EU and Local level – WP7-WP8

**HOW?** Local Engagement of citizens – promotion via BRIDGE and EU initiative – policy paper

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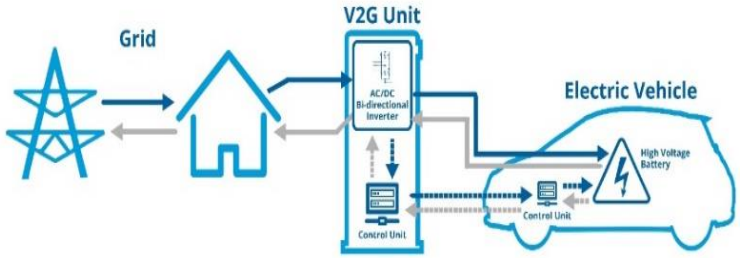
# MUSE Grids Main Technological Assets

## POWER TO HEAT

- Smart Heating
- TES integration at small and large scale

**GALU-GDHVI**




## ELECTRIC VEHICLES

- V2G/V2B algorithms
- Innovative fast charging station

**DUFERCO/SCAME – ENGIE/ABB**

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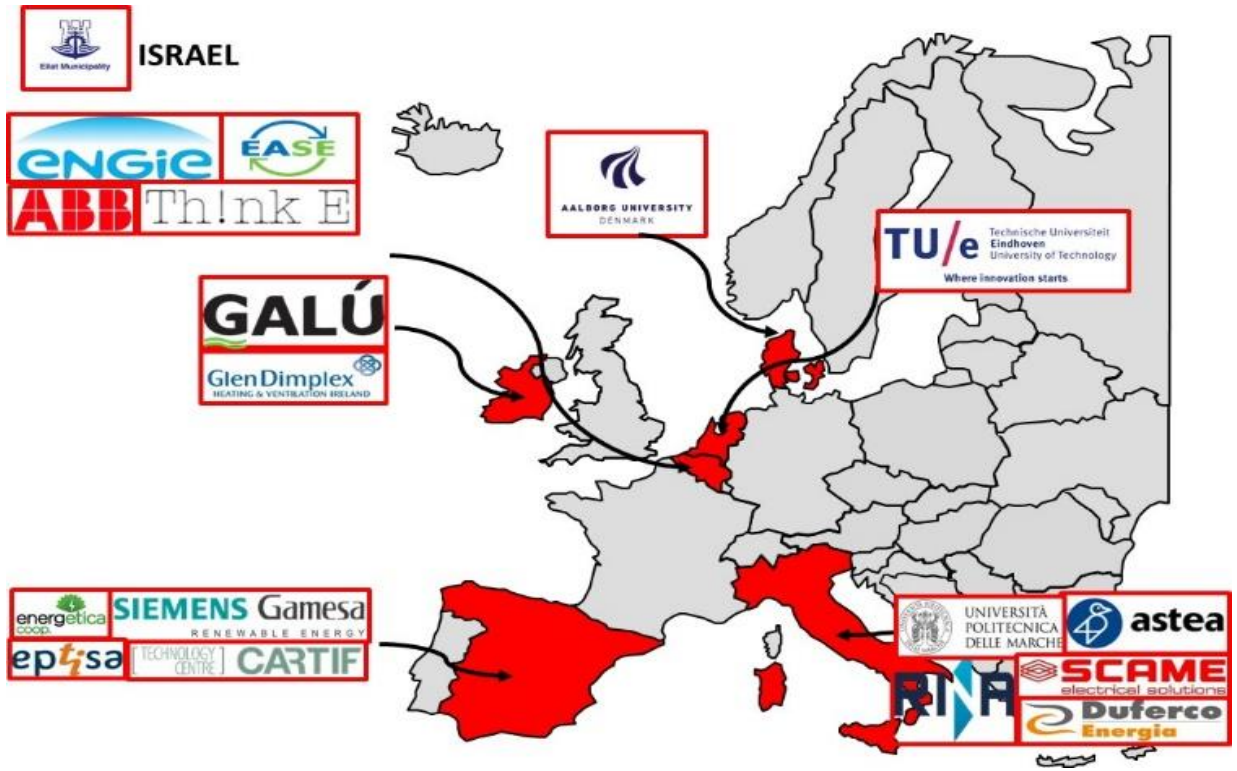
# Project Team




**-An industry driven consortium**
**- 3 demonstration oriented local clusters (Spain, Belgium, Italy) to be properly directed to maximise sharing of best practices**

***CAR-THNK-E-RINA-C***

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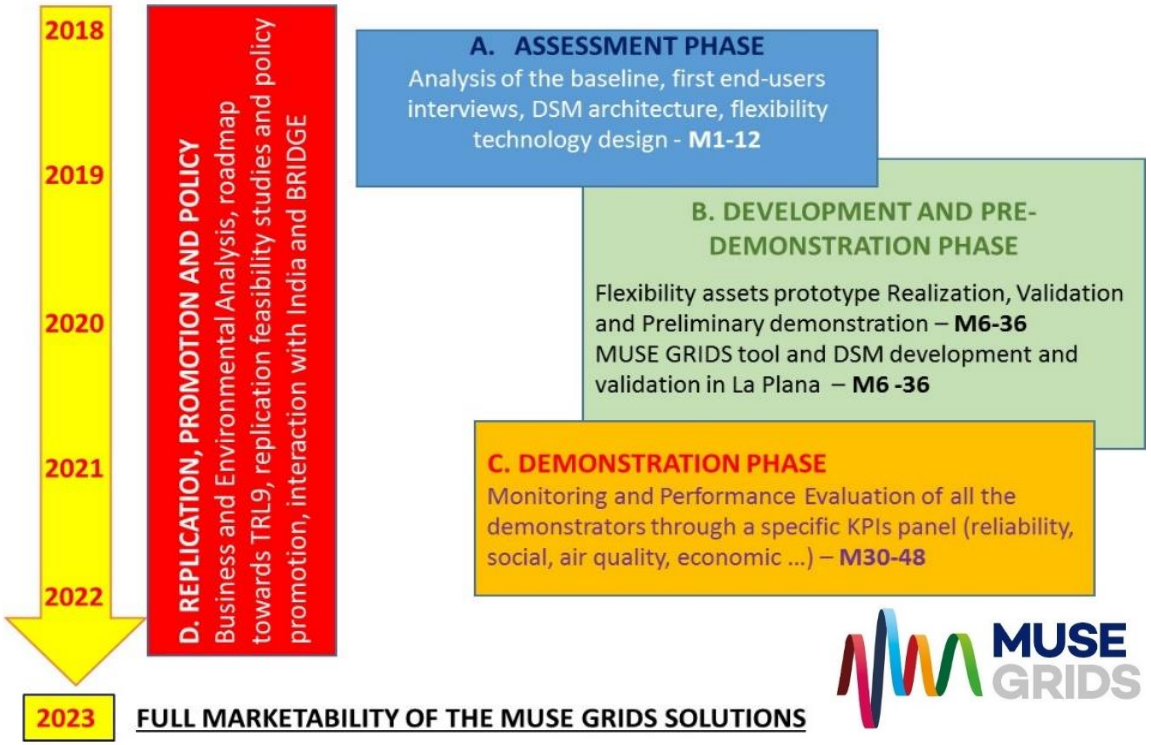
# MUSE Grids Consortium and roles




***A. ASSESSMENT PHASE:*** M1-12 – demo teams first agreement – RTOs set the objectives, industry make them achievable

***B: DEVELOPMENT AND PRE-DEMO PHASE:*** M6-36– All partners committed to pave the ground to future activities at tools, technology and demosites point of view

***C: DEMONSTRATION PHASE:*** M30-48 – OSIMO and OUD HEVERLEE Teams driving

***D. REPLICATION AND PROMOTION PHASE:*** M1-48 – all partners involved under EASE, GDHVI (BRIDGE) and RINA-C leadership

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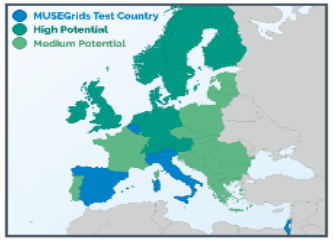
# MUSE Grids: A demonstrative inspiration project

| Key Exploitable Results | TRL |
|---|---|
| Multi Energy DSM | 5 |
| Multi Energy Planning Tool | 5 |
| Electro Thermal Storage | 6 |
| Advanced EV management System (V2H,V2G) | 6 |
| Water Smart Pumping | 6 |
| Power-to-X as flexibility tools for grid stability | 6 |
| Operational Model for LECs | 5 |

| Key Exploitable Results | TRL |
|---|---|
| Multi Energy DSM | 6 |
| Multi Energy Planning Tool | 6 |
| Electro Thermal Storage | 7 |
| Advanced EV management System (V2H,V2G) | 7 |
| Water Smart Pumping | 7 |
| Power-to-X as flexibility tools for grid stability | 7 |
| Operational Model for LECs | 6 |

| Key Exploitable Results | TRL |
|---|---|
| Multi Energy DSM | 7 |
| Multi Energy Planning Tool | 7 |
| Electro Thermal Storage | 8 |
| Advanced EV management System (V2H,V2G) | 7/8 |
| Water Smart Pumping | 7/8 |
| Power-to-X as flexibility tools for grid stability | 7/8 |
| Operational Model for LECs | 7 |

| Key Exploitable Results | TRL |
|---|---|
| Multi Energy DSM | 8 |
| Multi Energy Planning Tool | 9 |
| Electro Thermal Storage | 9 |
| Advanced EV management System (V2H,V2G) | 8/9 |
| Water Smart Pumping | 8/9 |
| Power-to-X as flexibility tools for grid stability | 8/9 |
| Operational Model for LECs | 8 |




PROJECT STARTS — 2019 — TRL 5/6

2020 — TRL 7

2022 — TRL 8

PROJECT ENDS — 2025 — TRL 9

MUSE Grids

**Project Starts**

**Project Drivers**

- Microgrid concept promotion and increased autonomy and reliability
- Reduction of emission & energy bill for end users at local level
- Decarbonisation of the local energy systems
- Creation of energy communities
- Maximisation of local RES self consumption
- Coupling energy grids, storages and their smart management system towards an unique goal
- Use monitored data to facilitate design, control and predictive maintenance of energy grids
- Create Business case for devices that could contribute to avoiding grid investments

**Project Actions**

- Demonstration in weak connected villages (OSIMO) and rural areas (OUD HEVERLEE)
- Replication in rural areas (Spain), in urban districts (Spain), high touristic areas (Israel) and in India
- Truly/active involvement of local energy consumers and producers
- Benckmark of technical solutions and business models

**Non Technological Barriers:**

- Definition of best practices and measures for the integration of the MUSE GRIDS management schemes and technologies at urban level
- Standardization of control and monitoring systems protocol also for smart grids
- Increase social acceptability also via dedicated policies/supporting schemes and the creation of energy communities (MUSE GRIDS Positioning Paper thanks to EASE and BRIDGE collaboration)
- Development of dedicated business models and contractual arrangements
- Different stakeholders to be involved to make energy grids interacting (DHN, Building Owners, Gas grid managers, DSOs etc.)
- Different tariffs for services at LV and MV level

**Further Demonstrations**

- Demonstration of the MUSE GRIDS in larger scale and other contexts (isolated areas, rural areas etc.)
- Application in other countries(Environmental, logistics & energy market scenario)
- Facilitate installation and development of standardized "control package" not to be customized everytime

**Marketing**

- Start to promote the MUSE GRIDS HW&SW technologies among building owners/managers, ESCOs, energy utilities, controller manufacturers etc.
- Selection of the first entry markets: EU countries with presence of gas grids or DHN to make them interacting with electricity grids, high penetration of RES and costs of electricity
- Assessment of the final business model for the commercial exploitation of the MUSE GRIDS solutions technologies (Environmental, Logistics & Energy Market Scenario)

MARKET DRIVERS:

- Reduction of energy bills
- Increasing RES exploitation at local level
- Introduce new flexible actors on the national grids
- Overall Decarbonization of EU Local Energy Systems
- Penetration of Smart Grid and Smart Home systems
- Deferred investments in LV and MV Grids

MAIN APPLICATIONS:

Small Towns | Villages | Urban Districts

## DEMONSTRATION IS THE CORE

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# Thank you for your attention!

## Contacts

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