



**SUSTAINABLE
PLACES 2025**

8-10 October 2025

Milano



Energy Communities WORKSHOP

Building flexible energy communities: Remuneration, aggregation & market interfaces



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Smart Energy Solutions for a Better Tomorrow

INDEPENDENT

INTERPED

E-BUSCO

Building flexible energy communities: Remuneration, aggregation & market interfaces

Day **2** Thurs. 09 Oct. 16:00–17:30 CEST

In-person
Workshop

Projects

- STUNNED ●
- MASTERPIECE ●
- FEDECOM ●
- NEON ●
- ENERGENIUS ●
- INDEPENDENT ●
- InterPED ●
- E-BUSCO ●

Agenda

16:00-16:10 Introduction & Framing

Matteo PORTA (RINA-C)

16.10 STUNNED

Matteo PORTA

16.17 MASTERPIECE

Fayaz Ahmed

16.24 FEDECOM

Zia Lennard

16.31 NEON

Fausto Sainz

16.38 ENERGENIUS

Pablo Barrachina

16.45 INDEPENDENT

Arso Savanovic

16.52 InterPED

Raymond Sterling

16.59 E-BUSCO

Ana García-Garre

17.06-17.40 Open Discussion & Wrap-up

Matteo PORTA (RINA-C)

Each project's overview



01. Project Overview

Introduction of the project

02. Results & Key Findings

Results & Key Findings addressing 3 pillars (see [workshop](#) details)

03. Impact & Next Steps

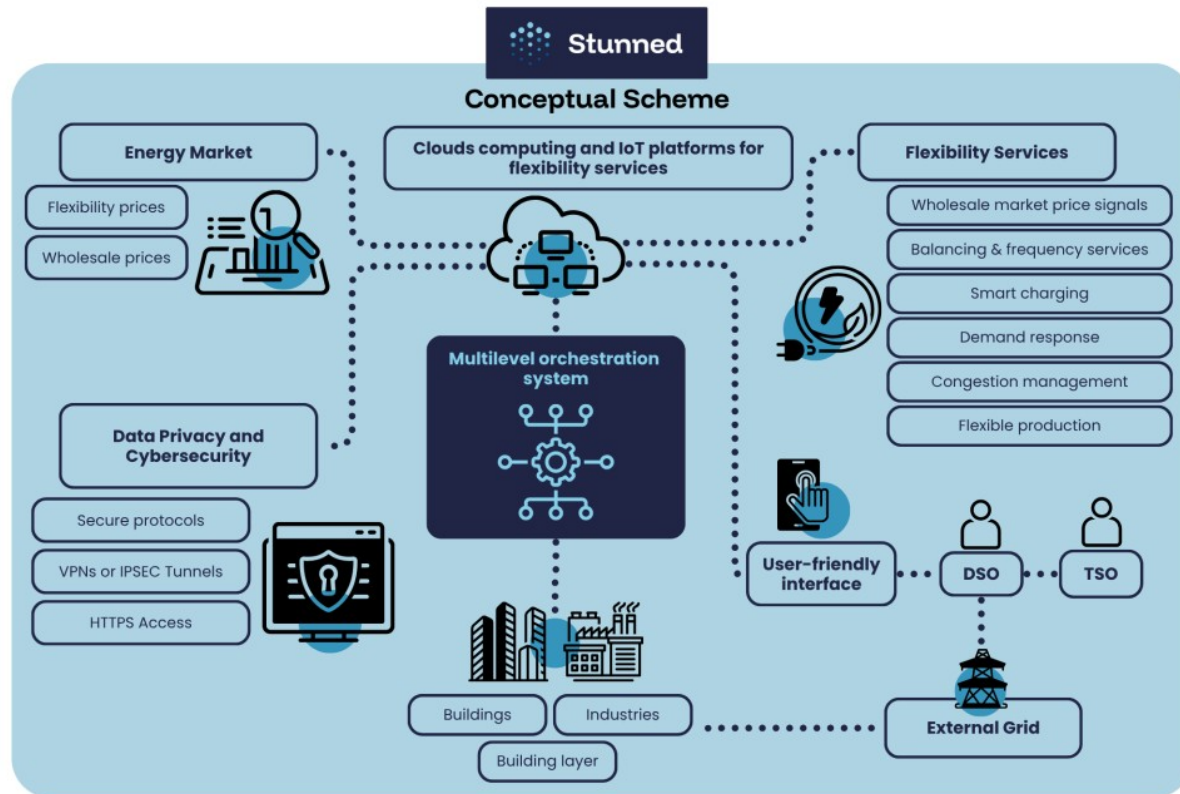
Main impact (environmental, social, economic) & Next steps

Project Overview

The main objective of STUNNED project is the **development and demonstration of a comprehensive HW/SW solution for the optimal management of complex energy systems of aggregated industrial sites and buildings** to operate in novel flexibility and standard electricity markets.



Project Overview



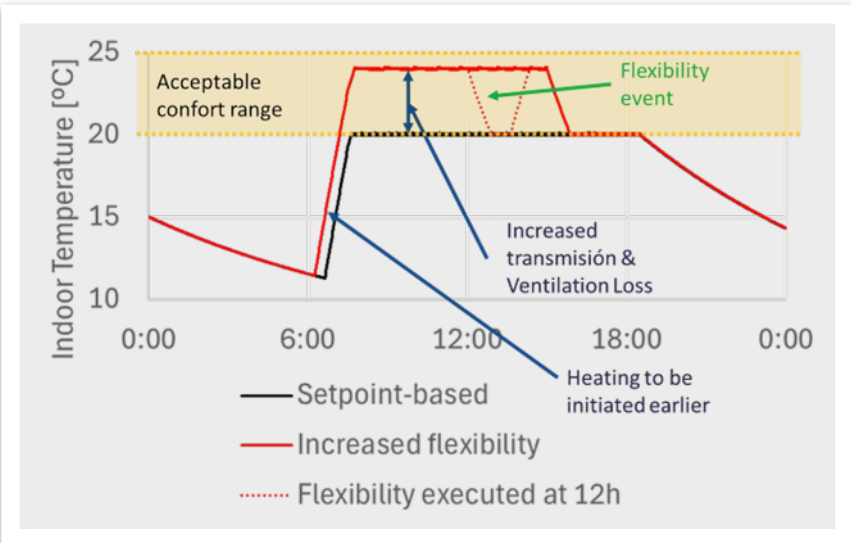
Addressing Operational complexity

Peak shaving/Load optimization vs Flexibility commitments → **A key Difference**

- **Load Optimization** → Decide when and how much energy to consume
- **Flexibility** → Commit willingness to change behaviour.

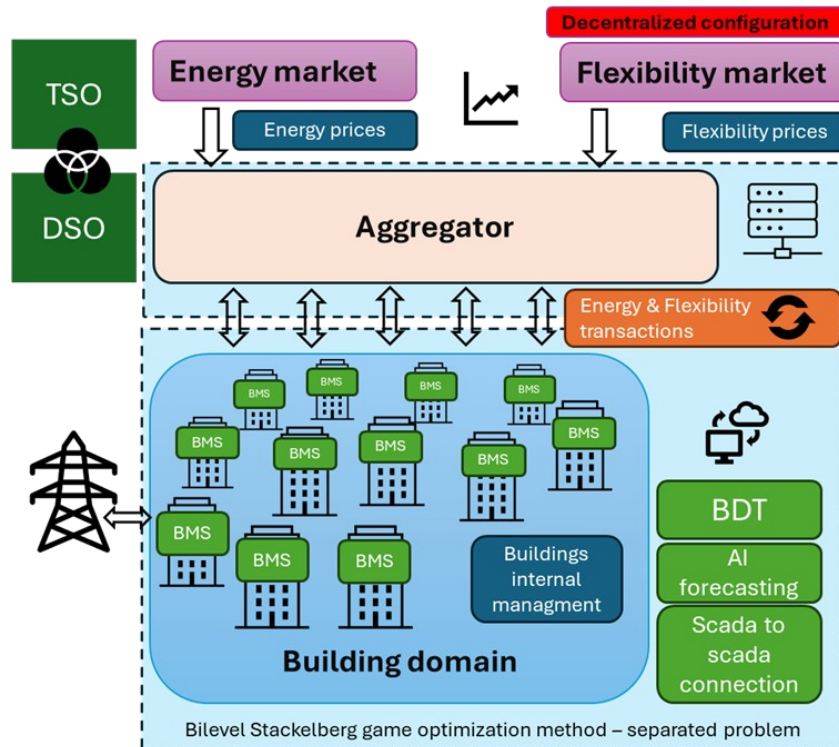
STUNNED Multi Path approach:

- Model energy & thermal paths at 0% and 100% flexibility execution
- All paths should stay within thermal constraints
- Then optimize costs & revenues

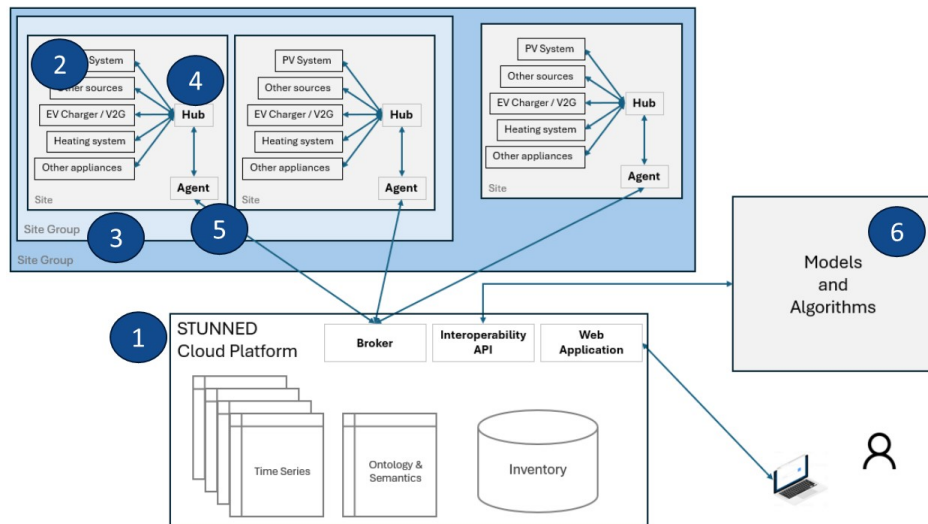


Addressing Operational complexity

- Bi-level Stakelberg game optimization method
- Centralized, decentralized, distributed configurations
- HW/SW solution
- Optimized solution for EC actors: Aggregators, Consumers, Producers, Prosumers
- Control functionalities
- Communication with external markets



Enabling digital and physical infrastructure



1. **STUNNED Cloud Platform:** User Interface, Hierarchy configurations, KPI visualisation
2. **Site:** Provides a network where the appliances and hub have visibility among them, as well as hub and local agent.
3. **Site group:** Composed of sites that are aimed to be managed together (i.e. energy community)
4. **Hub:** Component locally installed on each location to connect to local appliances via their protocols and act as a bridge between these appliances and the STUNNED Agent.
5. **Local Agent:** Acts as a link between the STUNNED Cloud Platform and the Hub
6. **Models and Algorithms:**
 1. Retrieve time series from the STUNNED Cloud Platform
 2. Calibrate models upon request
 3. Provide thresholds/conditions for the STUNNED Cloud Platform to configure calibration triggers
 4. Provide time series based on predictions to the STUNNED Cloud Platform

Governance and contractual innovation

Contracts and Fair Remuneration:

- Need for clear and balanced agreements between TSO, DSO, aggregators, prosumers, and end customers.
- **Interoperable contracts:** standard templates between aggregators and flexibility providers that simplify agreements.
- Remuneration schemes:
 - Combine availability and activation payments.
 - Performance bonuses and penalties for non-compliance.
 - Baselineing and submetering tools for transparent settlements.
- **Regulatory innovation:** regulatory sandboxes, TOTEX incentives, and participatory governance models.

Governance and contractual innovation

Governance must ensure:

- Transparency in access and settlement rules.
- Clarity in the distribution of risks and benefits.
- Non-discriminatory conditions for new actors.

Opportunities:

- Strengthen trust and engagement of small actors in the markets.
- Facilitate the integration of distributed resources and energy communities.
- Scale participation through harmonized and cross-border contracts.

Impacts and next steps

- Finalization of models and orchestration algorithms
- Setting-up HW/SW frameworks
- Detailed design for implementing STUNNED solution
- Fine tuning and testing



Project Overview



This Project has received funding from the
HORIZON EUROPE research and innovation
program under grant agreement
No 101096836.

***Multidisciplinary Approaches
and Software Technologies for
Engagement, Recruitment and
Participation in Innovative
Energy Communities in Europe***



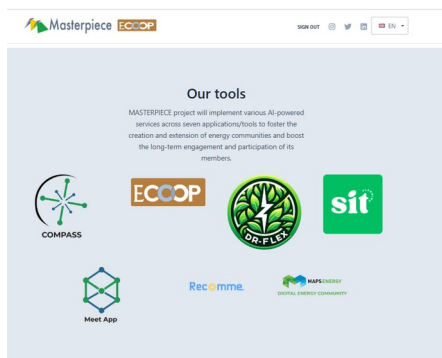
MISSION

MASTERPIECE aims at creating a **digital coordination and cooperation modular platform of services** that **will facilitate the creation and operation of energy communities**. The facilities given to members of the community to contribute to services and other developments will represent the distinction of the solution offered in this proposal, making it participative by design.

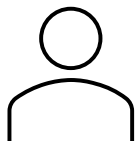
HOW?

MASTERPIECE **focuses on social innovations and participatory processes** to engage stakeholders. **ICT tools will support creating, managing, and replicating energy communities**. A digital platform ecosystem will **assist organizational, legislative, and operational activities**.

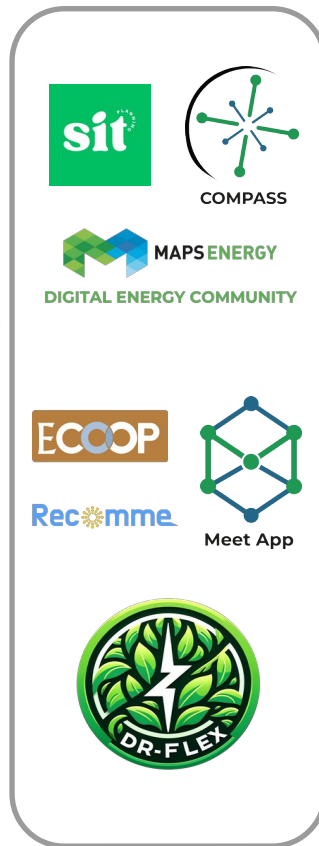
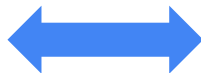
THE DIGITAL MODULAR PLATFORM



**MASTERPIECE LANDING
PAGE**



Centralized
authentication



GROUP 1
Simulation & EC
Management

GROUP 2
Discovery,
Awareness, Enrolment
Engagement, and
Profiling

GROUP 3
Flexibility, DR and
demand optimisation
framework

Interoperability
through NGSI-
LD data models



Secure
Digital
Platform



Project Overview

PILLAR 1: Optimisation & Activation

(Operational Complexity)

- Forecast and quantify flexibility at building and community level
- Optimise operation of distributed energy resources (DERs)
- Activate flexibility services reliably through automation and user engagement

PILLAR 2: Fair Market Participation

(Governance & Contractual)

- Ensuring interoperability with flexibility solutions via USEF
- Combine explicit and implicit signals to drive participation
- Explore flexibility markets within energy communities

PILLAR 3: Enabling Federation

(Digital & Physical Infr.)

- Build an interoperable digital platform for energy communities
- Enable seamless integration of diverse data and systems
- Connect physical assets with digital tools for real-time control

Results & Key Findings

PILLAR 1: Optimisation & Activation (Operational Complexity)

- **Advanced ML / neural-networks** with cyclic time features for demand forecasting and flexibility range
- Advanced optimisation methods (**Reinforcement Learning, continuous policy search**)
- Flexibility bounds (up/down) at building level for optimisation strategies per day
- **Direct control of controllable assets** enabling real-time operation and **user engagement for non-controllable assets**

PILLAR 2: Fair Market Participation (Governance & Contractual)

- **Theoretical study on local flexibility markets in energy communities**
- Explicit signals: **USEF protocol** for structured flexibility requests and grid interactions
- Implicit signals: **ENTSO-E market prices** integrated to incentivise behaviour
- Supports trust, engagement, and replicability across European contexts.

PILLAR 3: Enabling Federation (Digital & Physical Infr.)

- Data homogenisation across platforms, pilots, and countries
- Solution remain agnostic and reusable thanks to shared models and standards
- Interoperable solution through **common data models and NGSI-LD (adopted by FIWARE)**
- Flexibility solutions are applicable across domains (cities, industry, energy communities)

Impact

PILLAR 1: Optimisation & Activation (Operational Complexity)

Reliable integration of flexibility services supporting grid stability
Cost savings and increased efficiency for energy community members

PILLAR 2: Fair Market Participation (Governance & Contractual)

Transparent and fair frameworks enhancing stakeholder trust and engagement

PILLAR 3: Enabling Federation (Digital & Physical Infr.)

Interoperable, scalable solutions applicable to cities, industry, and communities

Next Steps

- Extend pilot demonstrations and validate results at larger scale
- Present results of the flexibility market study in the coming months

FEDECOM's 3 Pillars of: **Federated Energy Communities**

Project Overview

PILLAR 1: Optimisation & Activation (Operational Complexity)

- Forecasting & optimisation engine schedules EVs, heat pumps, storage, hydropower
- Multi-community dispatch strategies tested in Spain, Switzerland, BE–NL

PILLAR 2: Fair Market Participation (Governance & Contractual)

- Blockchain-enabled trading through GSY (Grid Singularity) DEX (decentralised energy exchange)
- KPI-linked remuneration with tolerance bands, penalties, & reward adjustments

PILLAR 3: Enabling Federation (Digital & Physical Infr.)

- Open-source (GPL v.3) market architecture with GDPR-compliant protocols
- Validated hardware/software: hydrogen (ES), hydropower (CH), EV/V2G (BE–NL)

FEDECOM's 3 Pillars of: **Federated Energy Communities**

Results & Key Findings

PILLAR 1: Optimisation & Activation

(Operational Complexity)

- 15-min KPI monitoring of self-consumption, self-sufficiency, peak shaving
- Cross-border federation in BE–NL: EV/V2G flexibility with multi-currency settlement

PILLAR 2: Fair Market Participation

(Governance & Contractual)

- Transparent, auditable trades on GSY DEX
- Settlement logic coded on-chain: pilots tested positive adjustment, penalty, and hybrid models

PILLAR 3: Enabling Federation

(Digital & Physical Infr.)

- Secure trading enabled by off-chain storage + on-chain verification
- Diverse pilots: hydrogen + district heating (ES), hydropower + storage (CH), EV/V2G (BE–NL)

FEDECOM's 3 Pillars of: **Federated Energy Communities**

Impact

PILLAR 1: Optimisation & Activation

(Operational Complexity)

Improved RES hosting, enhanced demand flexibility, validated multi-actor dispatch

PILLAR 2: Fair Market Participation

(Governance & Contractual)

Builds trust with KPI-linked remuneration; provides replicable governance for communities

PILLAR 3: Enabling Federation

(Digital & Physical Infr.)

Offers open-source (GPL v.3) GSY DEX stack; proven integration of digital marketplace with real-world pilots

Next Steps

- Adaptive penalties, baseline estimation, forecast integration, green certification (D6.5)
- Pilot-scale validation of federated trading & remuneration (WP7)
- Dissemination of open-source (GPL v.3) components for replication across Europe



Next-Generation Integrated Energy Services for Citizen Energy Communities

Project Overview

Enhance the quality of life of European citizens & Improve the performance of energy system.

NEON exploited building energy efficiency, renewable energy generation and storage, and demand flexibility to:

- Increase energy savings
- Reduce CO2 emissions, and
- Provide cost savings across sectors.

Services:

1. Energy efficiency services for multi-measure building efficiency improvement.
2. Optimal energy asset scheduling (Renewal Energy Systems storage and electric vehicle charging) to improve self-sufficiency.
3. Advanced building control for optimal operation of heating/cooling systems, lighting, smart appliances, etc.
4. Demand response services to improve the flexibility of the grid.
5. Tailored services to ensure comfort, health (air quality, assisted living services) and safety requirements





Next-Generation Integrated Energy Services for Citizen Energy Communities

Project overview

Optimization & Activation Holistic optimization approach

Advanced scheduling and optimization of energy assets to maximize efficiency and flexibility at the demand side

Building Performance

- Multi-measure retrofit planning
- Digital control systems
- Performance monitoring

Demand Response

- Hybrid DR models
- Grid flexibility enablement
- Load management optimization

Fair market participation

Energy Performance Contracting

Innovative multi-actor EPC models ensuring fair risk distribution and transparent service remuneration

Legal Framework

- Cross-service integration rules
- EU Directive 2019/944 compliance
- Contractual structures

Financial Structure

- Risk distribution mechanisms
- Investment models
- Cost-benefit analysis

Enabling federation

Open Marketplace Platform

Decentralized platform using blockchain technology for secure and transparent energy and flexibility exchange among CEC members and stakeholders

Security & Transparency

- Blockchain technology
- Data security protocols
- Transparent transactions

Community Engagement System

Incentivized ranking system that rewards community members for energy savings and active participation in the marketplace





Next-Generation Integrated Energy Services for Citizen Energy Communities

Results and key findings

Optimization & Activation Holistic optimization approach

- ✓ Holistic asset scheduling framework
- ✓ Hybrid DR models deployed
- ✓ Smart grid data integration

Fair market participation

- ✓ Multi-actor EPC models defined
- ✓ Legal and financial frameworks
- ✓ Co-creation methodology

Enabling federation

- ✓ Blockchain marketplace platform
- ✓ Smart contract automation
- ✓ Incentivized ranking system
- ✓ Performance verification protocols





Next-Generation Integrated Energy Services for Citizen Energy Communities

Impact

Optimization & Activation Holistic optimization approach

- Framework for CEC deployment
- Validated business models
- Technical blueprints

Fair market participation

NEON has laid the groundwork for next-generation integrated energy services, empowering Citizen Energy Communities to actively participate in the energy market

Enabling federation

Long-term Vision

- Scalable to EU communities
- Replicable across sectors
- Foundation for future innovation



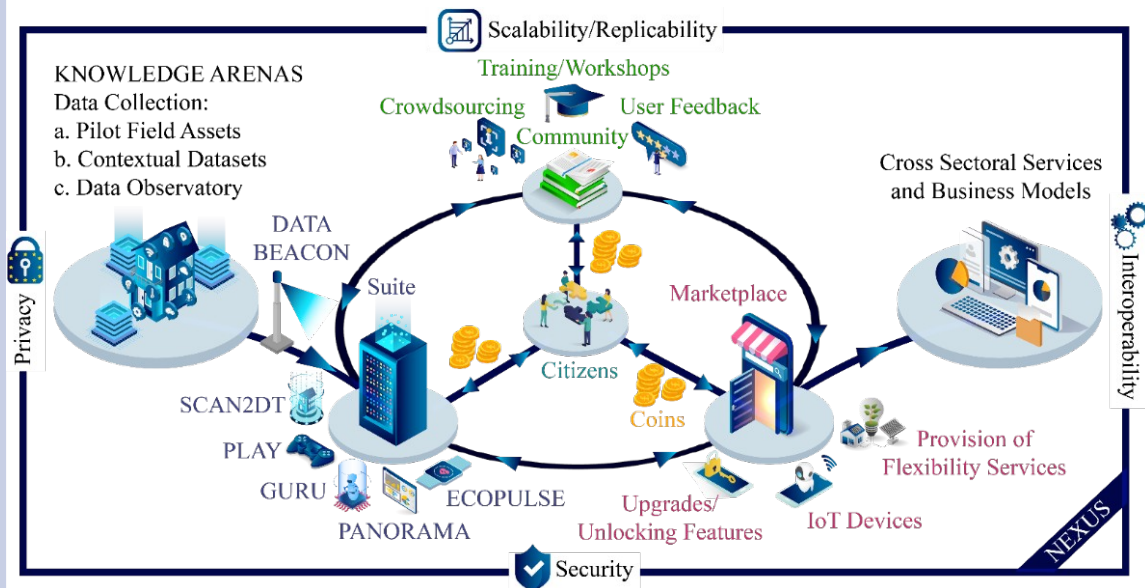
Project Overview

PILLAR 3: Enabling Digital and Physical Infrastructure: ENERGENIUS “Smart Energy Solutions for a Better Tomorrow”

Multi-disciplinary approach that integrates:

- Cutting-edge Digital Tools
- Symbiotic Ecosystem
- Innovative Engagement Methods
- Secure, interoperable and scalable Data and Service Framework.

ENERGENIUS shapes a holistic omni-channel experience with the citizens at the center.



Project Overview

PILLAR 3: Enabling Digital and Physical Infrastructure: ENERGENIUS “Smart Energy Solutions for a Better Tomorrow”

Integration of 9 cross-sectoral data spaces or Knowledge Arenas (KA):

1. Energy Data Dynamics
2. Environmental Conditions & Human Comfort Frameworks
3. Water Utilization Incentives
4. Health & Nutrition Fluxes
5. Urban Flow & Mobility Patterns
6. Financial Drivers
7. Real State Market Incentives
8. Tourism & Accommodation trends
9. Social Media insights



Energy Data
Dynamics



Environmental
Conditions & Human
Comfort Frameworks



Water
Utilization Incentives



Health &
Nutrition Fluxes



Urban Flow
& Mobility Patterns



Financial
Drivers



Real Estate
Market Incentives



Tourism &
Accommodation Trends



Social Media
Insights

Results and Key Findings

PILLAR 3: Enabling Digital and Physical Infrastructure: ENERGENIUS Suite a “one-stop-shop digital platform”

A comprehensive set of digital tools and services, tailored to enhance energy efficiency and promote sustainable practices:

1. S2DT: digital scanner to create DT
2. ENPLAY: serious game
3. GURU: AI recommendation engine
4. PANORAMA: Analytics Dashboard
5. EcoPulse: Smartwatch



<https://youtu.be/o5sWwPSVUug?si=CBsQ6LH6dJK0k1c3>



PILLAR 3: Enabling Digital and Physical Infrastructure: ENERGENIUS Target KPIs

KPI	Target	KPI	Target
# Pilot Sites: 3L-methodology	10	EcoPulse smartwatches acquisitions via ENMarkt	100
Pilot citizens and partner networks users involved	> 2000	Reduction in energy costs across ENERGENIUS sites	20%
Expected number of households adopting DT models via SCAN2DT	> 200	Anticipated energy savings via cross-sectoral synergy	15%
Fostered cross-sectoral business models	> 5	GURU influence on energy savings decisions	> 60%
Energy flexibility services integrated with utilities / DSO/Aggregators	> 3	Raise energy efficiency awareness in community users	> 30%
Creation of holistic servitization business models across all KAs	> 8	Energy efficiency renovations	25%

Next Steps

PILLAR 3: Enabling Digital and Physical Infrastructure:

ENERGENIUS is in M14. Main outcomes: Stakeholders Needs, Use Case elicitation and Architecture Blueprint

- 1st Development Sprint (M13-M18) Beta version of Tools
- Pilot preparation (M18): Leaders
- Demonstration phase 1 (M19-M21)

- 2nd Development Sprint (M22-M25) Update Tools and Service Integration
- Demonstration phase 2 (M26-M28): Leaders & Learners

- 3rd Development Sprint (M29-M32) Final Refinement
- Demonstration phase 3 (M33-M40): Leaders, Learners & Listeners
- Validation & Business Innovation (M30-M42) Replicability & Scalability

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INDEPENDENT's 3 Pillars of: **Federated Energy Communities**

Project Overview

PILLAR 1: Optimisation & Activation (Operational Complexity)

- Accurate, robust, and adaptive models for energy assets in buildings and industrial sites

PILLAR 2: Fair Market Participation (Governance & Contractual)

- Optimal and transparent aggregation of CEMS in multi-market setting

PILLAR 3: Enabling Federation (Digital & Physical Infr.)

- Seamless integration and plug-and-play deployment of CEMS on heterogeneous novel and legacy infrastructure in buildings and industry

INDEPENDENT's 3 Pillars of: **Federated Energy Communities**

Early Results & Key Findings

PILLAR 1: Optimisation & Activation

(Operational Complexity)

- Standard-compliant CEMS in buildings and industrial sites
- Hybrid asset modelling/forecast based on ML and Neural Differential Equations with dynamic error feedback

PILLAR 2: Fair Market Participation

(Governance & Contractual)

- Multi-market bidding to break market silos and maximise the benefits for consumer flexibility
- Facilitate cooperation between TSOs and DSOs so that the flexibility is not locked into local optima

PILLAR 3: Enabling Federation

(Digital & Physical Infr.)

- Wide interoperability based on EN 50491-12-2, IEC 62746-4, and SAREF ontology
- Modular micro-service architecture (containerised) and DevSecOps for plug-and-play deployment of CEMS and AEMS

INDEPENDENT's 3 Pillars of: **Federated Energy Communities**

Impact

PILLAR 1: Optimisation & Activation

(Operational Complexity)

Drive RES uptake, increase resilience of energy system in the context of high share of renewables

PILLAR 2: Fair Market Participation

(Governance & Contractual)

Demonstration of a wide variety of DSFM services in operational day-to-day energy and flexibility markets in four countries

PILLAR 3: Enabling Federation

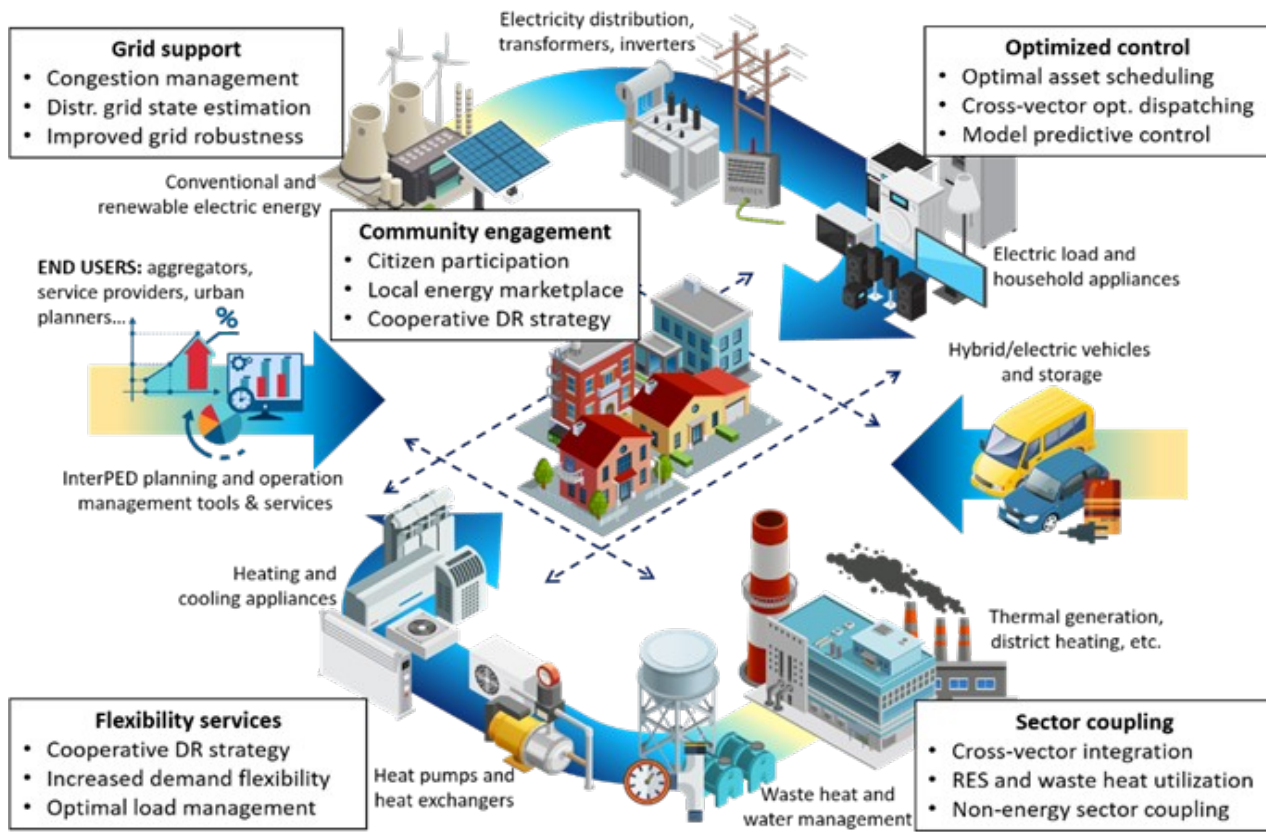
(Digital & Physical Infr.)

Qualify complete CEMS/AEMS systems by deploying large-scale pilots in four countries on top of a wide variety of energy management systems

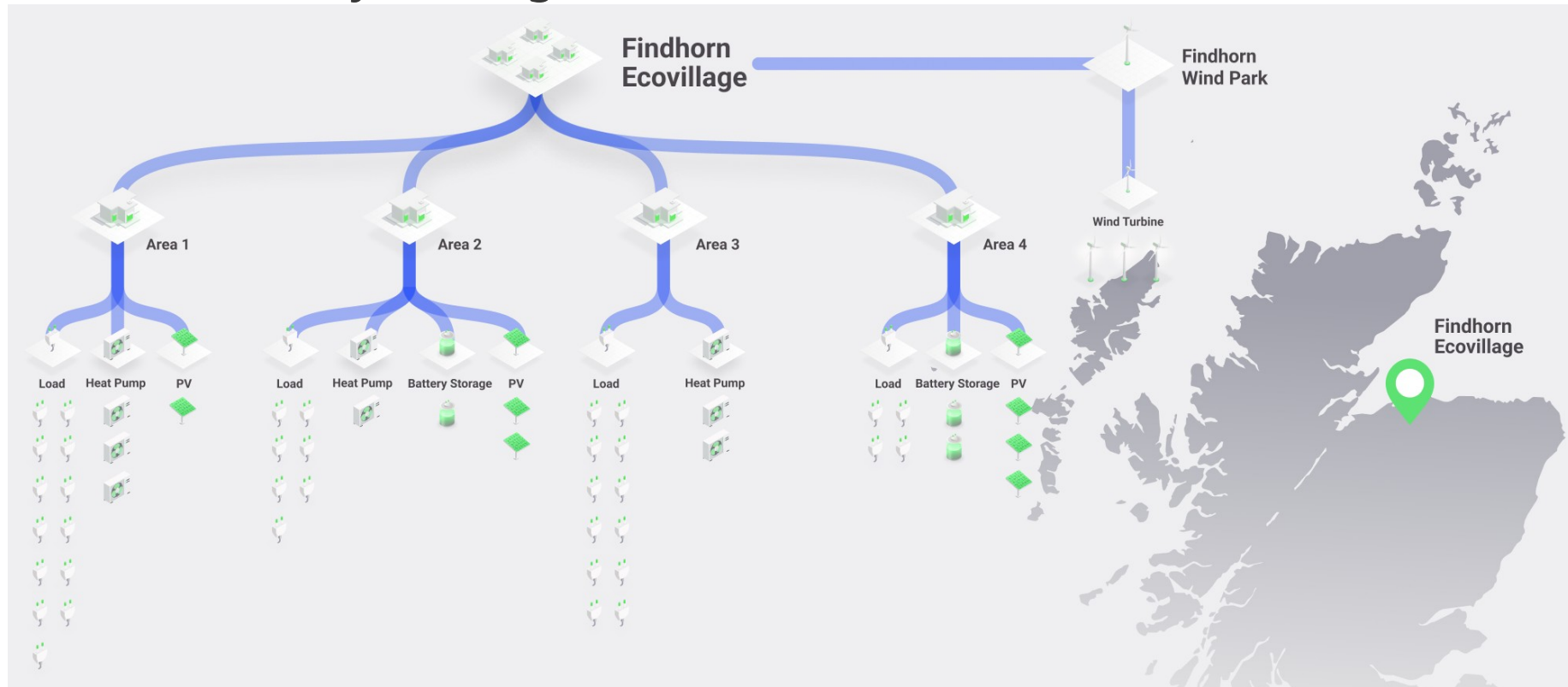
Next Steps

- First-phase pilot validation of the MVP of the system (WP6)
- Incorporating pilot feedback and developing final system prototype (WP3-5)
- Final system validation & best practices for EU-wide uptake (WP6-7)

Project Overview

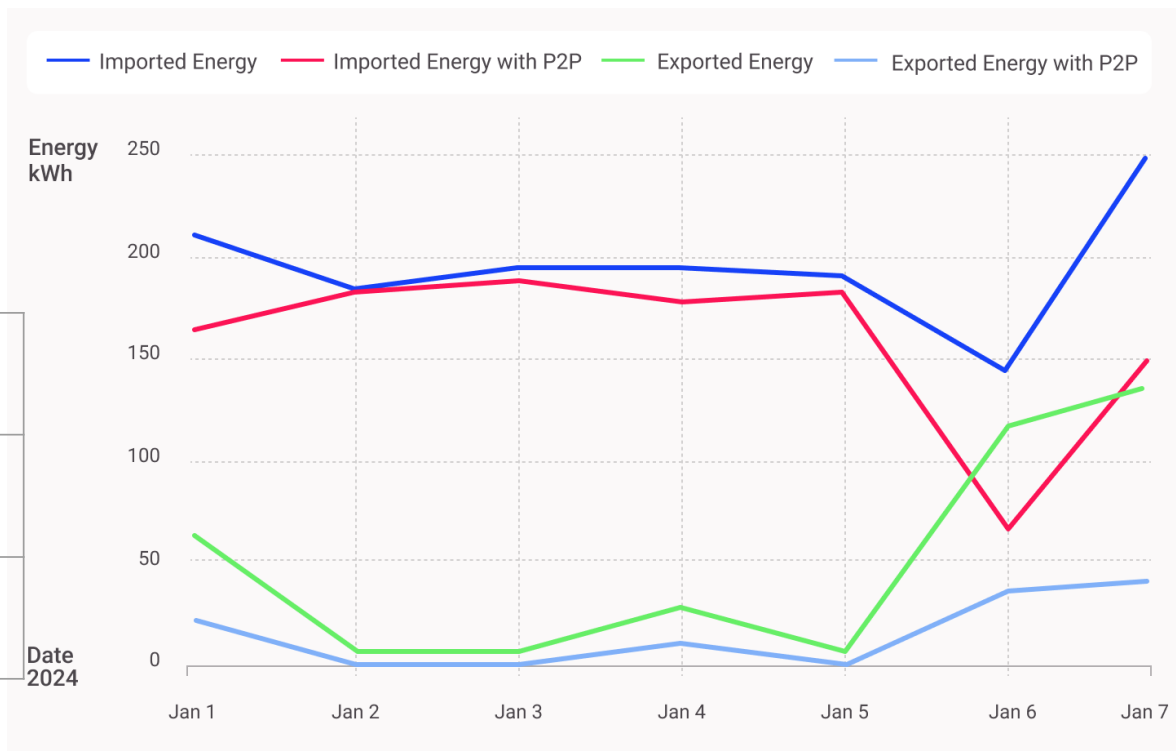


Results & Key Findings



Results & Key Findings

Costs Savings	23.8%
Self-Sufficiency	From 25.2% to 49.7%
E/WH	+17,1% COP





Impact & Next Steps

Integrating ICT for PEDs: Deploy a cloud-based solution enhancing sector coupling and demand flexibility.

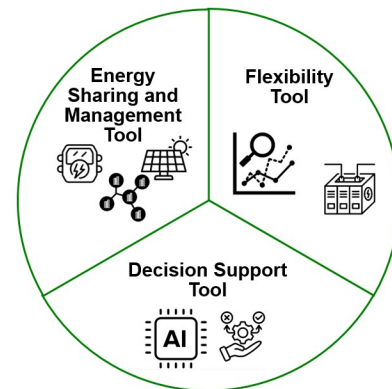
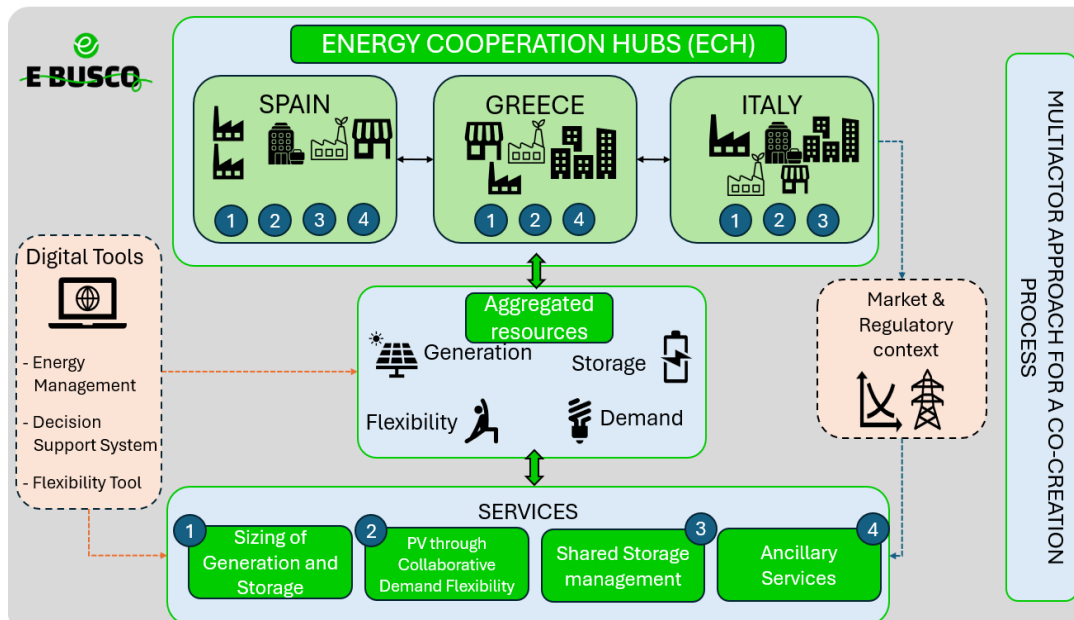
Large-Scale Validation: Demonstrate the InterPED solution in diverse pilots, targeting a 30% unlock in demand flexibility.

Replicability Plans: Extend InterPED's impact beyond the project with strategies for adoption in 'follower' districts.

E-BUSCO 3 Pillars of: Energy Cooperation Hubs (ECH)

Project Overview

Demonstrate how collaboration strategies among companies can increase the penetration of renewable energy sources, reduce their emissions and drive the energy transition in EU businesses.



E-BUSCO 3 Pillars of: **Energy Cooperation Hubs (ECH)**

Project Overview

PILLAR 1: Optimisation & Activation (Operational Complexity)

- Complementarity of businesses (loads) and baseline definition
- Management of shared energy assets
- Collective PV, storage and flexibility tested in Spain, Italy and Greece

PILLAR 2: Fair Market Participation (Governance & Contractual)

- Design of business collaboration contracts and remuneration schemes, adapted to market and regulatory framework, and stakeholders requirements

PILLAR 3: Enabling Federation (Digital & Physical Infr.)

- 3 DT: Energy Sharing & Management, Decision Support and Flexibility Tools.
- Adaptation of the tools to the context of each ECH (automated control of different loads)

E-BUSCO 3 Pillars of: **Energy Cooperation Hubs (ECH)**

Results & Key Findings

PILLAR 1: Optimisation & Activation

(Operational Complexity)

- 5-min monitoring
- PV, demand and flexibility forecasting models for next-day activation planning
- 1-hour activations
- Thermal storage, operational setpoints

PILLAR 2: Fair Market Participation

(Governance & Contractual)

- Market-indexed prices (5-15% cost savings).
- Ancillary services through aggregation
- Cooperation agreements: Remuneration and penalisation schemes should be defined.

PILLAR 3: Enabling Federation

(Digital & Physical Infr.)

- Different levels of development: tools should be adapted.
- ES (flexibility and dynamic prices already on place), IT (starting to develop LFM), GR (changing from net metering to net billing)

E-BUSCO 3 Pillars of: **Energy Cooperation Hubs (ECH)**

Expected Impact

PILLAR 1: Optimisation & Activation

(Operational Complexity)

Optimized self-consumption & flexibility, increase of investments on renewables: collective PV & storage

PILLAR 2: Fair Market Participation

(Governance & Contractual)

- Cohesion in energy strategies & broader cooperation among businesses
- Fair remuneration and collaboration schemes for all stakeholders

PILLAR 3: Enabling Federation

(Digital & Physical Infr.)

Replicable, adaptative and scalable DT for ECH (different regulation, sectors and type of loads: retail, industry, agricultural).

Q&A