



ensnare.eu

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What's inside

1. Key Exploitable Results (KERs) of ENSNARE: Driving Innovation in Building Renovation
2. Replication and Scalability: Paving the Way for Widespread Adoption



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We are excited to announce the successful conclusion of the ENSNARE project (ENvelope meSh aNd digital framework for building Renovation) After 4.5 years of dedicated research, development, and real-world pilot demonstrations, ENSNARE has delivered a comprehensive suite of innovative solutions poised to transform the deep renovation of buildings across Europe.

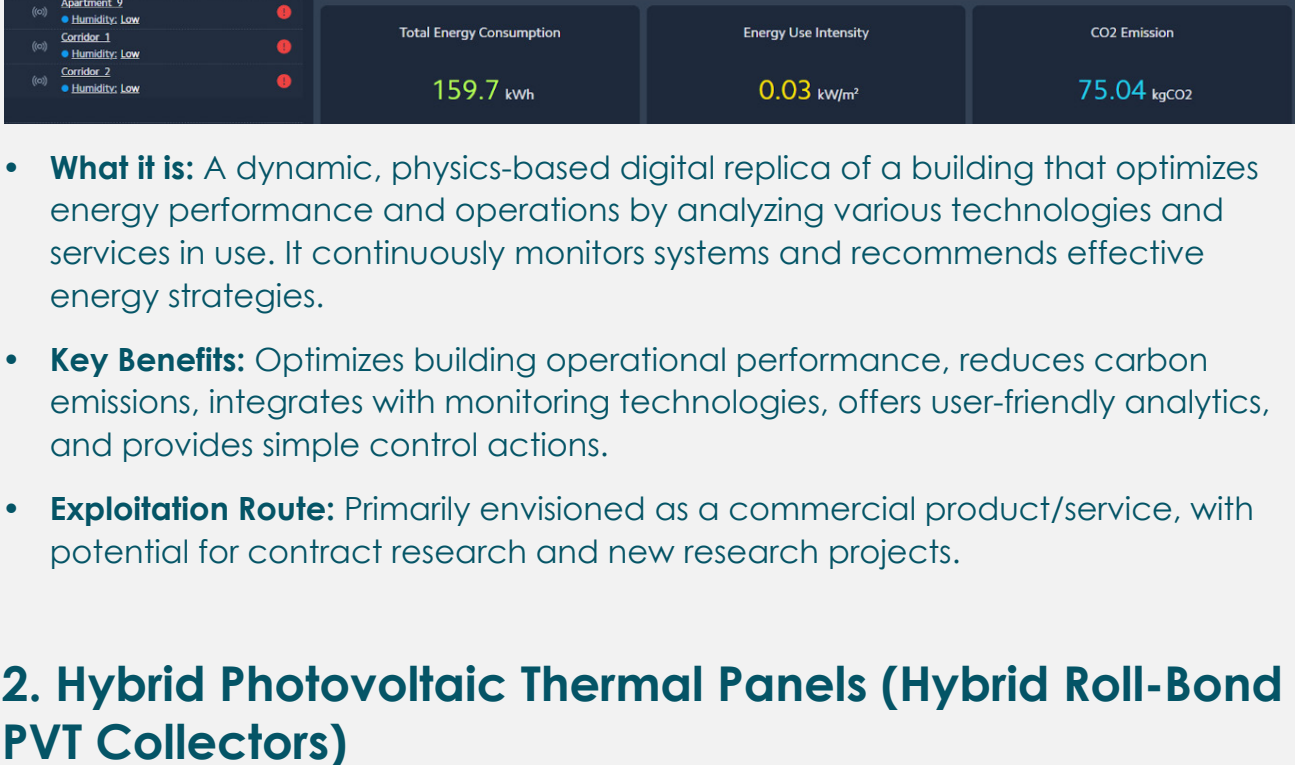
Our journey through pilot sites in Tartu (Estonia), Sofia (Bulgaria), and Sassa Scalo (Italy) has showcased the immense potential of our integrated ecosystem of digital tools and modular, renewable-energy-integrated, prefabricated façade systems. These demonstrations have not only validated our solutions but also highlighted the crucial role of industrialization and digitalization in accelerating Europe's renovation wave and achieving significant energy consumption reductions.

Key Exploitable Results (KERs) of ENSNARE: Driving Innovation in Building Renovation

ENSNARE has delivered a comprehensive portfolio of 10 Key Exploitable Results (KERs), each contributing to a more efficient, sustainable, and industrialized approach to building renovation. These innovations span advanced building materials, smart energy management systems, and sophisticated digital platforms.

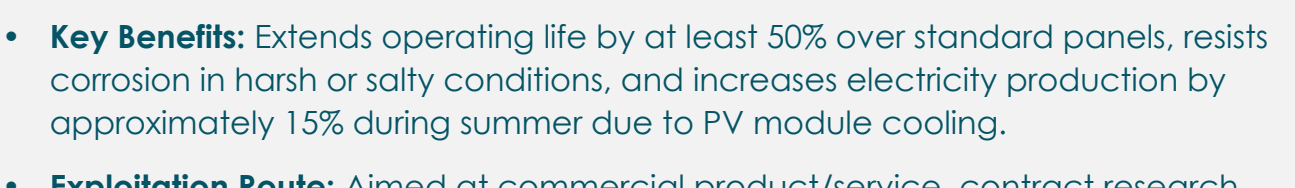
Here's an overview of the key exploitable results:

1. Operational Digital Twin



- What it is:** A dynamic, physics-based digital replica of a building that optimizes energy performance and operations by analyzing various technologies and services in use. It continuously monitors systems and recommends effective energy strategies.
- Key Benefits:** Optimizes building operational performance, reduces carbon emissions, integrates with monitoring technologies, offers user-friendly analytics, and provides simple control actions.
- Exploitation Route:** Primarily envisioned as a commercial product/service, with potential for contract research and new research projects.

2. Hybrid Photovoltaic Thermal Panels (Hybrid Roll-Bond PVT Collectors)



- What it is:** High-efficiency units that produce both solar power and heat from a single system. They feature unique anti-corrosive coatings within the aluminum roll-bond channels and a tight connection between thermal and photovoltaic components for improved performance and durability.
- Key Benefits:** Extends operating life by at least 50% over standard panels, resists corrosion in harsh or salty conditions, and increases electricity production by approximately 15% during summer due to PV module cooling.
- Exploitation Route:** Aimed at commercial product/service, contract research, new research projects, and potential for IP assignment, licensing, and spin-off.

3. Roll-Bond Solar Thermal Collectors



- What it is:** High-efficiency solar thermal collectors featuring aluminum roll-bond absorbers with inner anti-corrosive coatings and an outer optical solar-selective coating directly applied to the front side. Designed for façade installation, they maximize heat capture and durability.
- Key Benefits:** Resists corrosion for longer operation, captures over 96% of solar energy, improves heat transfer without welding barriers, and maintains stable, wave-free surfaces for façades.
- Exploitation Route:** Similar to the Hybrid PVT Panels, targeting commercialization, research, and IP-related routes.

4. PV Panels Based on Synthetic Stone Substrate



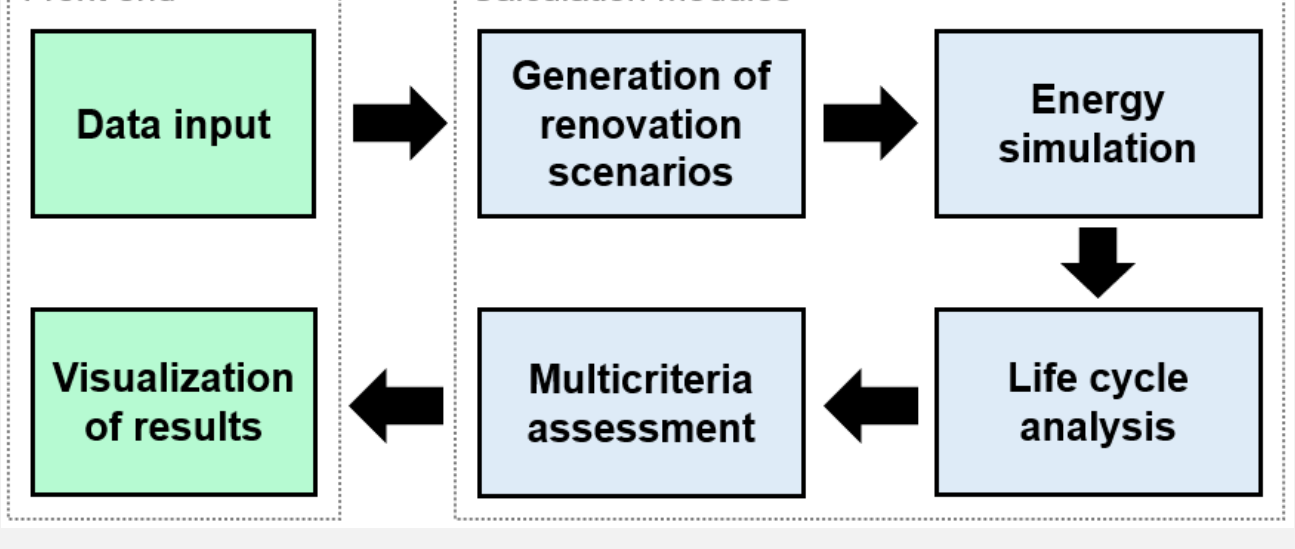
- What it is:** Photovoltaic panels that integrate solar energy into buildings using a unique combination of glass and synthetic stone substrates, offering a durable and visually appealing solution for energy generation.
- Key Benefits:** Provides long-lasting durability, offers versatile colors and finishes, is resistant to weather changes, is environmentally friendly, and meets aesthetic and heritage requirements.
- Exploitation Route:** Primarily a commercial product/service with opportunities for new research projects.

5. Modular Envelope Mesh



- What it is:** An aluminum-based façade system combining an insulated inner layer with an interchangeable outer layer featuring solar energy technologies. It's a modular, factory-assembled solution designed for building renovations.
- Key Benefits:** Speeds up installation with factory precision, reduces on-site risks and waste, adapts to diverse energy and design needs, enhances thermal performance, enables energy harvesting, offers financial certainty, and provides component traceability.
- Exploitation Route:** Focus on contract research and new research projects, with licensing as an indirect use.

6. Early Decision Support Tool (EDST)



- What it is:** A web-based tool that generates and evaluates customized renovation options for existing buildings, even with limited initial data. It assesses scenarios for energy efficiency, thermal comfort, environmental impact, and cost over the building's life cycle.
- Key Benefits:** Works with limited building information, automatically generates tailored renovation options, combines energy, comfort, cost, and environmental analysis without proprietary software, and delivers fast results for early-stage design and planning.
- Exploitation Route:** Envisioned for contract research, new research projects, and assignment of IPR.

7. Energy Storage Management System



- What it is:** Software that optimizes the use of renewable energy from solar panels, balancing electricity and heat generation with building demands and storage options. It manages electrical storage, thermal tanks, and heat pumps, adapting to factors like energy production, demand, and storage status.
- Key Benefits:** Optimizes energy use from solar panels, balances electricity and heat across storage and demand, and fully integrates with smart building systems.
- Exploitation Route:** Primarily for new research projects, with potential for contract research.

8. PV Panels based on Aluminium and PVT Panels Substrates



- What it is:** PV-Al is a BiPV module that uses a bare aluminum sheet, replacing the traditional rear glass. On the other hand, PVT is a BiPV module that uses backsheet replacing the rear glass, where the roll bond absorber is glued. This results in a lighter, cheaper, and better-performing module.
- Key Benefits:** Lighter than traditional glass-backed panels, improved performance with better heat dissipation, and lower production costs.
- Exploitation Route:** Focus on new research projects and assignment of IPR.

9. Digital Platform for Envelope Retrofitting (DP4ER)



- What it is:** A structured digital solution that guides stakeholders through the deep renovation of buildings, supporting every phase from early planning and data collection to manufacturing, construction, and maintenance. It uses an open toolbox of modular tools linked to a digital building model.
- Key Benefits:** Speeds up renovation planning and execution, simplifies decision-making with early-stage scenario tools, integrates innovative solar façade solutions, and enhances communication across all project phases.
- Exploitation Route:** Envisioned for contract research and new research projects.

10. Automated Data Acquisition and Processing Tools



- What it is:** A set of technologies that streamline the collection and processing of building data for manufacturing and installing prefabricated renovation modules. It reduces preparation time while maintaining high accuracy through online data acquisition, automated on-site measurements, and drone-assisted targeting.
- Key Benefits:** Reduces preparation time, enables online planning without early site visits, enhances measurement accuracy with automated tools and UAV support, and simplifies integration using standard file formats.
- Exploitation Route:** Primarily for new research projects, with potential for commercial product/service.

Replication and Scalability: Paving the Way for Widespread Adoption

A core focus of ENSNARE has been to ensure the replicability and scalability of its solutions, enabling their widespread adoption across diverse building stocks and geographic regions. The project has developed a comprehensive strategy to facilitate this, including:

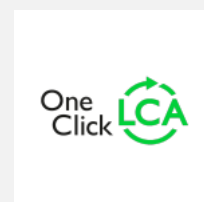
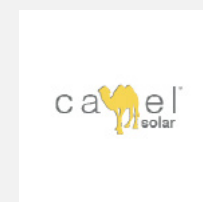
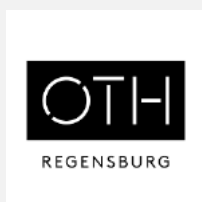
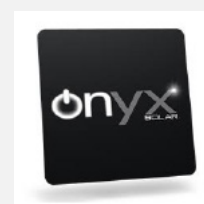
- Market Versatility and Segmentation:** The ENSNARE solution primarily targets the residential building retrofitting market across Europe, with pilot validations in diverse climates and regulatory environments (Estonia, Bulgaria, Italy) demonstrating its adaptability. Beyond residential, the modular design and integrated renewable energy technologies show promise for public, commercial, and industrial buildings, ensuring broad applicability and scalability.
- Addressing Market Challenges:** ENSNARE directly addresses critical market barriers such as high costs, lengthy processes, lack of skilled labor, integration complexities, and regulatory hurdles. The industrialized approach minimizes on-site work and reduces labor needs, while digital tools streamline design, planning, and real-time energy management.
- Competitive Advantages:** The solution stands out through its emphasis on automation in data acquisition, modularity of façade systems, seamless digital-physical integration, and circularity in component design, allowing for upgrades rather than full replacements. This holistic approach differentiates ENSNARE from fragmented competing solutions.
- Post-Project Exploitation:** A significant number of KERs are slated for further development through new research projects, aiming to reach higher Technology Readiness Levels (TRLs) and full market readiness. Plans include pilot implementations, technical refinement, industrial validation (e.g., developing mass manufacturing capacity, process automation), and product certifications like CE marking and Environmental Product Declarations.
- Educational Exploitation:** Digital tools developed within ENSNARE are planned to be integrated into training programs, courses, and academic projects, fostering awareness and skills development among future professionals in the construction sector.
- IPR Management and Business Planning:** The project has established robust Intellectual Property Rights (IPR) management and business planning to support the transition from research to market, including exploring contract research, licensing, and IP transfer.

The ENSNARE project concludes with a strong commitment from its consortium partners to continue the development and uptake of its innovative outcomes. By providing a blueprint for more digital, sustainable, and industrialized renovation practices, ENSNARE is poised to make a lasting contribution to Europe's renovation ecosystem and its climate neutrality goals.

Who are we?

The consortium

ENSNARE is an Horizon 2020 EU funded project carried out by 19 partners from 12 European countries: 11 SMEs, 5 research institutes, 2 corporations and 1 public body.



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