

Accelerating Energy renovation solution for Zero Energy buildings and Neighbourhoods





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The EU project RenoZEB in numbers

- Call: H2020-EEB-2017
- 42 months: October 2017 February 2021
- 19 European partners
- 3 demonstration buildings + 3 virtual demonstration buildings
- \rightarrow To achieve:
- 16% cost reduction of renovation
- 60% energy consumption reduction
- 65% renovation process time reduction





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- Currently only **1.2 % of the building stock** is replaced annually
- To accomplish the 2050 targets increase the rate to **2.9% necessary**
- Currently retrofitting processes are expensive, complex and disturbing, with many uncertainties and several inefficacies
- Information is not properly shared, multiple errors and duplicated efforts

RenoZEB strategy:

- technological attractive solutions (multifunctional modular "plug and play" system)
- a well-designed renovation methodology
- cloud collaborative environment
- **involvement** of all key stakeholders
- **property value** as main trigger for nZEB renovation Market









Unlock the nZEB renovation market leveraging the gain on property value through a new systemic approach to retrofitting that will include:

- innovative components
- processes
- decision making methodologies
- to guide all value-chain actors in the nZEB building renovation process

4 main pillars:

- **Reduce energy consumption**, increasing the share of RES in buildings
- **Cost & risk reduction** with low disruption during building renovation, to attract customers interest
- **Replicability and adaptability** through modularity in order to capture a largescale renovation market
- Property-value as trigger





RenoZEB facade - The concept



- **Prefabricated window module** and roller shutter
- Multifunctional insulation boards
- Ventilation units with heat recovery
- Building Integrated Photovoltaics (**BIPV**) and batteries
- Building Integrated Solar Thermal Systems (**BIST**)
- Intelligent façade controller (integrated sensors and façade controller)
- "Click-in" fixing mechanisms









RenoZEB facade - Products selection



Prefabricated window module and roller shutter

Building Integrated Photovoltaics (BIPV) and batteries

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	TH I		
Ventilated façad e			
Plug and play	•••		
Low-cost multifunctional insulation boards	•		•
Commercially available PV modules	•••		
Commercially available solar thermal collectors	N/A	N/A	N/A
"Click in system " for air ducts, heat exchangers for			
ventilation, pipes and/or electrical or ICT cables			
Integration of hydraulic, electric and HVAC	••		••
Modular, Pre-cast and Easy Assembly-Disassembly			
minimize on-site work	•••		
in provie product que ity	••		
reduce contr			
Industrialization			
minimize on-site work			
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in onv a quality			
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Less intrusive system			
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on-size manue comp	•••		
programo-pary incluitorie			
optimized basing processes			••
Aeselete and functional integration	••		••
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expectations of the architects	••		••
integration and adaptation of multifunctional insulation	•	•	•
use of recycled material	•	•	•
re cy clability of the final solution	•	•	•
reduction of heat and pressure losses	N/A	N/A	N/A
fine protection	N/A	NVA	N/A
prefabricated window insulation frames	N/A	NVA	N/A
minimum of heatlosses	N/A	N/A	N/A
Integration of thermal and PV modules	•••	•••	•••
integration in b the RenoZEB envelop and building concept volution	•••	•••	•••
Connection elements	•••	•••	•••
Integrate subsystems in a holistic approach	•••		
Development of the Smart- Ib T faça de module	***		***
Love- constrain no re	N/A	N/A	N/A
Low-Intrusive Installation	•	•	
Emb edding in the module	•••		
Integration with PV and battery system			
Data collections system with common protocols	N/A	N/A	N/A
Flug & play solution			
Points achieved	35	35	35

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RenoZEB facade - Building and thermal analysis

Building's boundary conditions

- Existing load bearing structure
- **Existing openings**

Identification of facade panels:

- Primary panels (window unit)
- Secondary panels (opaque, technical units)
- Eventual aggregation of units









Figure 1: Phase 1 – existing building

Figure 2: Phase 2 - houndary conditions





Figure 3: Phase 3 - identification of baseline

Figure 4: Phase 4a - primary modules designed





Figure 5: Phase 4b - secondary modules designed

Figure 6: Phase 4c - module aggregation design





.65 sheath

280 insulation

120

50

300

No condensation predicted

. 15

Realistic

brickwork inner lea

nlaster (de

unventilated air laner

external wall U-value = .11

thickness fm) Total = 4

7



RenoZEB in demo

DURANGO (Spain)

 $U_{CW} = 0,14 \text{ W/m}^2\text{K} < 0,28 \text{ W/m}^2\text{K}$

VORU (Estonia)

 $U_{CW} = 0,127 \text{ W/m}^2\text{K} < 0,13 \text{ W/m}^2\text{K}$

OPAQUE UNIT (max 1200 x 3000 mm) BASE COMPONENTS:

- Unitized system prefabricated off-site
- Installation on-site on brackets fixed to the slab edge
- Aluminium structure
- Various external finishing
- Mechanical restraint to guarantee the possibility to replace finishings with other materials or technical elements









RenoZEB in demo

DURANGO (Spain)

 $U_{CW} = 0,66 \text{ W/m}^2 \text{K} < 1 \text{ W/m}^2 \text{K}$

VORU (Estonia)

 $U_{CW} = 0.47 \text{ W/m}^2\text{K} < 0.63 \text{ W/m}^2\text{K}$

WINDOW UNIT (max 2200 x 3000 mm)

- Each type of window (materials, openings typology), with/without roller shutter integrated
- Eventual ventilation integrated in window monoblock









RenoZEB in demo

DURANGO (Spain)

 $U_{CW} = 0.149 \text{ W/m}^2\text{K} < 0.28 \text{ W/m}^2\text{K}$

VORU (Estonia)

 $U_{CW} = 0,13 \text{ W/m}^2\text{K} < 0,13 \text{ W/m}^2\text{K}$

PV UNIT (max 1000 x 3000 mm)

 PV integrated in facade with cavity for ventilation to preserve panel effieciency and eventually to use heated air for ventilation











RenoZEB in demo

DURANGO (Spain)

 $U_{CW} = 0,139 \text{ W/m}^2 \text{K} <$ 0,28 W/m²K

VORU (Estonia)

 $U_{CW} = 0.12 \text{ W/m}^2\text{K} < 0.13$ W/m²K

SOLAR THERMAL COLLECTOR UNIT

(max 2000 x 3000 mm)

Water thermal solar collector with • water to be used also for DHW to have higher water temperature







RenoZEB facade - Prototype









Concept

- Objective: to develop a collaborative environment to integrate deep renovation value chain around Open BIM standards such as IFC
- Support the digitalization of the whole process and the integration of all actors



nD Collaborative Environment **Architecture**







0.4 0.6

0.8

Ongoing work: KPI management

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KPI weights





Ongoing work: IFC viewers



Detailed mode Building view (with internal navigation)



Georreferenced view

(GIS context)

Automatic IFC to KML conversion & web viewing (cesium libraries)





Other functionalities

• Issue management & collaboration

Issues

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Integrated Services



Development of **integrated services** to facilitate **RenoZEB renovation process**:

- **Design Tool** to create the building model.
- **E-catalogue** of renovation solutions
- **Configurator** to help during the design process.
- Management Tool for construction and logistics.









Development of an Innovative Data Repository



- Facade insulation
- Floor insulation
- Roof insulation
- Window systems
- Heating and Cooling systems
- Ventilation
- Photovoltaic panels







Configurator to design and analyse **RenoZEB** solutions







Sustainable Place 2019 – Michele Vavallo

Smart logistic and construction management tool

- **READ IFC ENTITIES**
- CREATE A QR CODE FOR THAT ENTITY
- ADD INFORMATION TO THE QR CODE
 - DATES
 - PDF, YOUTUBE
- GANNT CHART WITH ALL THE ELEMENTS





Solinte





Thank you for your attention

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