PLUG & PLAY BUILDING DEEP RENOVATION

EU Horizon2020 Collaborative Research Project 2016-2020

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EU HORIZON2020 COLLABORATIVE PROJECT

- Call H2020-EE-10-2016: Accelerated and cost-effective deep renovation of buildings
- Project duration: 48 months (1 September 2016 – 31 August 2020)
- Coordinator: Rizal Sebastian PhD (DEMO Consultants, NL)
- Consortium: 16 partners (8 SME, 5 large companies, 2 universities, 1 local government)
MAIN AIM AND VISION

Main aim
- 60% energy saving through deep renovation
- 15% cost saving compared to traditional renovation techniques
- 50% time saving and thereby reduction of disturbance during renovation

Vision
- Deep renovation: intervention > 25% of building envelope; or > 25% of building value; or transformation of building function (for vacant / obsolete buildings)
- Plug & Play: prefab solutions (building and HVAC components) to be implemented in short time without structural changes of the existing building
- Evidence-based: demonstrate the viability and replicability of practical innovations through real demonstration projects of various deep renovation typologies: - residential buildings - public buildings - transformation of public or historic buildings into dwellings
RESEARCH CHALLENGES

- PnP solutions of P2Endure must be:
  - Ready to implement (TRL 6+ → TRL 8)
  - Affordable
  - 50% faster from production to on-site assembly
  - Scalable & adaptable (in all European countries)

- Integrating and optimising practical innovations for deep renovation
  - PnP components for building envelopes
  - PnP technical systems
  - On-site 3D technologies

- Developing and implementing modular processes, BIM, mobile ICT tools
PROPOSED INNOVATIONS (1)

- 4M modular processes: Mapping – Modelling – Making – Monitoring

The P2Endure modular processes characterized by:

- Four main steps (the 4M):
  1. Mapping
  2. Modelling
  3. Making
  4. Monitoring

  The feedback loop (iteratively goes from step 4 to 1) leads towards replication for volume market.

- Three simultaneous activity-streams within each step:
  1. Off-site
  2. On-site
  3. Combined off and on-site

- Two inter-linked market levels:
  1. Local implementation
  2. EU replication

1. EU-wide replication

2. Implementation

3. Making

4. Monitoring

Plug-and-Play Building Deep Renovation
PROPOSED INNOVATIONS (2)

- Robot for 3D printing on-site
PROPOSED INNOVATIONS (3)

- Lightweight PnP panels

![Diagram of Lightweight PnP panels with TRC and EPS materials]
# Proposed Innovations (4)

<table>
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<th><strong>P2Endure Integrated Solutions</strong></th>
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<td><strong>PnP Components for Building Envelopes</strong></td>
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<tr>
<td>• Multifunctional panels</td>
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<tr>
<td>• Smart windows</td>
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<td>• Folding balcony</td>
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<td>• Rooftop retrofit modules</td>
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<td>• PnP smart connectors</td>
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<td><strong>PnP Building Utility Systems</strong></td>
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<td>• PnP HVAC systems</td>
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<td>• IEQ (Indoor Environment Quality) control systems</td>
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<td>• Compact energy storage</td>
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<td>• Connection to energy grid and RES production</td>
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<td><strong>On-Site 3D Technologies</strong></td>
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<td>• 3D laser and thermal scanning</td>
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<td>• 3D printing and robotics</td>
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REAL DEMONSTRATION CASES (1)

- Hogekamp, Enschede, The Netherlands
  Deep renovation and transformation of a vacant university building into student apartments, hotel and conference rooms
REAL DEMONSTRATION CASES (2)

- Deep renovation of a kindergarten building in Gdynia, Poland
REAL DEMONSTRATION CASES (3)

- Deep renovation and new RES system for historic hospital in Palmanova, Italy
DISCUSSIONS

- Exploring mutual synergies with the MODER project
- More information on P2Endure: www.P2Endure-project.eu

thank you!