CommONEnergy

The project, what we did, what we developed... what we learnt

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CommONEnergy consortium

PARTNERS

23 organizations from industry, SMEs and research institutions, covering:

• Monitoring and control system manufacturer
• HVAC, Refrigeration and Lighting manufacturer
• Storage systems manufacturers
• Solar system manufacturer
• Materials manufacturer
• Building enterprises
• R&D experts (building physics, HVAC+R systems, monitoring, lighting, materials)
• Engineering/Architectural consultants
• Building owners
Objective
Re-conceptualize shopping malls through deep retrofitting as based on a comprehensive systemic approach involving innovative technologies and optimized solution sets.

Targets
• Up to 75% reduction of energy demand
• Power peak shaving
• 50% increased share of renewable energy source
• Improved indoor environmental quality
• 7 years of PBT

Numbers
• 3 demo cases
• 4 years
• 23 organizations and 3 third parties
Nearly all retail locations use mechanical cooling systems to ensure indoor thermal comfort, and mechanical ventilation to guarantee a good IAQ. Roughly 80% of the total electricity consumed by a shopping centre is ascribed to ventilation, lighting and indoor conditioning.
Stakeholders in the shopping centres’ renovation process

Source: SINTEF
Indoor Environment Quality based retail business ...

The WGBC retail metrics framework has three categories, or types of measurements:
1. Environment
2. Experience
3. Economics

Shopping centre renovation rate is 4.4% (with possible exploitable energy measures).
The structure and layout of shopping centres are in constant change due to the evolving requirements of the retailers.

Shopping centre renovation rate is 4.4% (with possible exploitable energy measures).

Smaller size and location moving back towards the city centre vs adding leisure and pleasure functions, then increasing size and complexity.

Green Retail

Awareness and knowledge (needing reliable data to be transformed in information) as the first and cheapest action.
EU shopping centres building stock

Source: ICSC, Eurostat as elaborated in CommONEnergy by TU Wien

FP7 European Union Funding for Research & Innovation
The reference shopping centres in the EU building stock

Selection criteria
• Climate condition
• Market saturation
• Location
• Shopping centre typology
• Building typology
• Opening year
The project demonstration cases

Valladolid, Spain - “Mercado del Val” A local market situated in the old town of Valladolid

Trondheim, Norway - “CitySyd” A suburban shopping centre built on the outskirts of Trondheim, and one of the largest malls in central Norway.

Modena, Italy - Modena “Canaletto” Is located in a residential area, close to the train station and city centre.
Performance-based renovation potential

Shopping Center Archetypes

<table>
<thead>
<tr>
<th>Shopping Centre features</th>
<th>General data</th>
</tr>
</thead>
<tbody>
<tr>
<td>* year of construction</td>
<td>* climate</td>
</tr>
<tr>
<td>* specific shape</td>
<td>* urban context</td>
</tr>
<tr>
<td>* façade orientation</td>
<td>* size</td>
</tr>
<tr>
<td>* structure</td>
<td>* typology</td>
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<tr>
<td>* materials</td>
<td>* …</td>
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</tbody>
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Bill of materials to launch procurement procedure (investment)

RETOFITTING POTENTIAL

- Performance (Energy&IEQ)
- Innovation
- Viability
- Costs

REPOSITORY OF

- Robust technologies + solution-sets as best practice in reference buildings
- Energy/economic impact
Overview of the project main achievements

Focus on technologies ...

CommONEnergy technologies for shopping centres retrofitting:

- Natural ventilation and ventilative cooling
- Daylighting and advanced artificial lighting approach for energy efficiency
- Modular Multi-functional Climate Adaptive façade system
- Multi-functional smart coating
- Greenery integration
- Panel for thermal & acoustic requalification
- Integration of solar collector in building envelope and energy system
- Storage (battery + H2) and Grid Interaction
- Coupled HVAC & refrigeration as based on natural refrigerant (e.g. CO₂)
- i-BEMS for smart supervision and management of shopping centres

Source: Epta
Overview of the project main achievements

... and support tools

- Integrated design process
- Integrative modelling environment
- Economical evaluation and definition of retrofitting scenarios
- Lean Construction Management procedures
- Continuous commissioning platform
- Sustainability assessment

Source: Fraunhofer IBP
Guidelines on how to approach shopping centre renovation

A reading for:

1. Designers
2. Facility managers
3. Owners (investors)
Final comments and vision

- Shopping centre energy retrofits are **highly replicable** (also considering similar buildings e.g. airports and train stations) and can be linked with other retrofit activities.

- In the retail context, sustainability is appealing only (or mainly?) **from a business prospective**

- Shopping centre specificities should be addressed in **EU directives** (e.g. EPBD, EED) and relative national legislative frameworks

- After a drastic reduction of energy needs, shopping centre could become sort of **energy hub** in demand/response and RES integrated smart grids
THANK YOU!

www.commonenergyproject.eu