2ndSkin

A zero-energy refurbishment approach for residential apartment buildings by applying an integrated façade solution
Content list

Motivation and objectives
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Energy Use and Building Sector

• All new buildings must be nearly zero energy buildings by 31 December 2020

• Zero-Carbon Built Environment by 2050

• Clear ambition to refurbish the building stock
Existing buildings

- By 2050, 70% of the building stock
- Built under far lower energy and sustainability standards


Energy labels for non-residential buildings in the Netherlands in 2010 (source: AgentschapNL)
2ndSkin Project Objectives

Innovative, integrated façade technology
- Zero energy consumption (Null op de meter)
- Minimum intervention to the interior

Business Development
- Low cost
- Upscalling
- New business model of supply chain

User Aspects
- Renovation acceptance
- Monitor behaviour and energy use
- Improve interaction with new systems
Post-war, multi-family apartment buildings:

- Post-war 30% of residential building stock
- Bad energy performance and comfort
- High density, limited surface for renewable energy, limited financial resources
- Possibility to use the concept in more building types
2ndSkin Project Phases

- Flagship 2014-2016
2ndSkin Project Phases

- Flagship 2014-2016
- Demonstrator 2016-2018
- Scaler 2018-2019
2ndSkin Project Phases

- Flagship 2014-2016  Mockup
- Demonstrator 2016-2018  12 NOM
- Scaler 2018-2019  180 NOM-ready
Flagship Mockup

Testing technical feasibility
2ndSkin Technical solution

Remove existing windows
Ventilation layer
Wall insulation and new windows
Cladding
Roof insulation
Heat-recovery ventilation
PV panels
Households profiles

Different energy consumption based on demographic household type

Energy Performance

Zero-energy target can indeed be met, for specific cases.

Heating demand can be covered.

<table>
<thead>
<tr>
<th></th>
<th>Before renovation (apartment blocks, based on WoON)</th>
<th>After renovation (scenario 1. inefficient appliances, unchanged behavior)</th>
<th>After renovation (scenario 2. efficient appliances, heat recovery shower, adapted behavior)</th>
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</table>

Savings:
- 93% before renovation
- 66% after renovation (scenario 1)
- 78% after renovation (scenario 2)
12-apartment building zero-energy renovation
Soendalaan, Vlaardingen, NL
Urban, architecture, Design Concept

Post war (1952) district with identical blocks
The project focuses on one block of 12 apartments
Existing building

Simplex construction system
Proposed renovation
Façade system

External insulation
Façade system

Window replacement
u-PVC frames and
Triple glazing panes.
Façade system

Roof replacement with prefabricated panels
Façade system

Remove and replace balconies
Façade system

Remove and replace balconies
Building systems

New installation installed in an installation box on the balcony

Ventilation with heat recovery

Ground Source heat pump COP6
Building systems

New installation installed in an installation box on the balcony

Ventilation with heat recovery

Ground Source heat pump COP6
Zero Energy guaranty

Zero energy is guaranteed by the building services provider for 25 years

This is achieved with eliminating the demand

And on site energy generation
Realised renovation
User Acceptance
User

Renovation
User

Monitoring, currently ongoing
Lessons learned

- Zero energy refurbishment is achievable with current technology
- Potential for product development
- Business model with energy contracting
- Role of the user
- Main restriction is the high investment
Potential for upscaling

- Stepped renovation (NOM-ready, no-regret)
- Prefabrication and integration
- Alternative building systems
- Low temperature
- Synergy between building and district

Refurbishment is an integral part of buildings' lifecycle and it going to happen.

The challenge is to realise this task efficiently and effectively
Thank you for your attention