# FANBOARD
# INNOVATIVE MODULE FOR BUILDING RENOVATION

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# RENOVATION OF THE BUILDING SECTOR

**Context:**

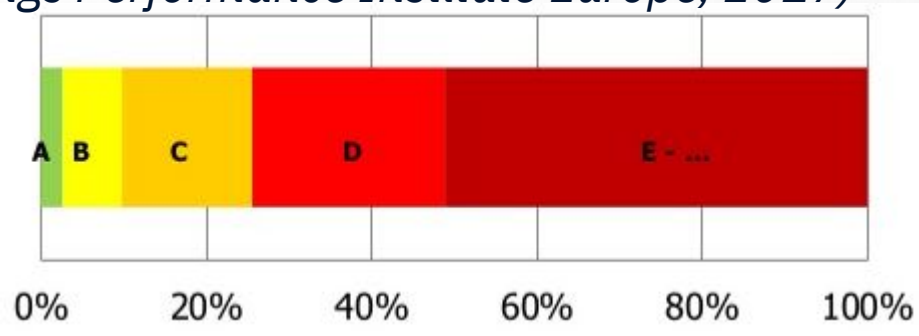
- Buildings are a major contributor to greenhouse gas emissions in the EU (about 20% of emissions)
- 3/4 of all buildings with EPC classes <= “D”

  → Building renovation plays a crucial role
- Strategies for building renovation:
  - improving insulation
  - upgrading heating and cooling systems
  - incorpore renewable energy sources (solar, etc.)

**Facts**

- Heat pump will be a key element in the decarbonisation of buildings
- External wall insulation is the best thermal insulation, but not possible in all buildings and expensive

*Share of buildings in the EU in different EPC classes (Buildings Performance Institute Europe, 2017)*




**Heat pumps will be the heating system of the future!**

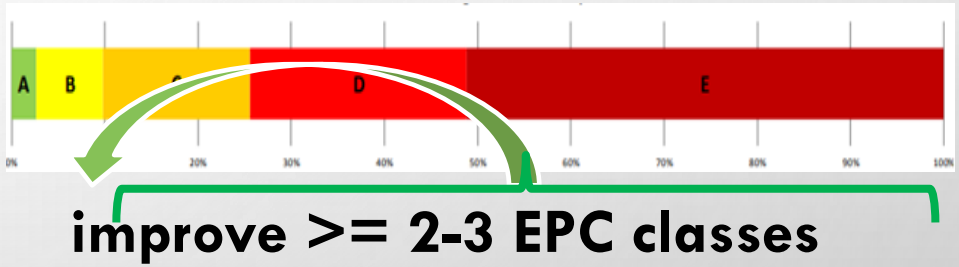
- Heating and cooling/refreshing function
- Electrification of the energy system (decarbonisation)
- Ready for electricity flexibility
- Low energy (electricity) consumption

# SPECIFICATIONS FOR A NEW RENOVATION APPROACH

**Specification for a better approach**

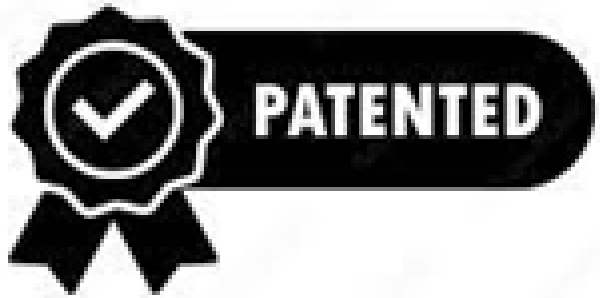
- A global, cheaper and performing renovation approach:
  - Moderate insulation of exterior walls from inside
  - Heat emitter change to fit best with heat pumps
  - Optional combination with heat recovery ventilation

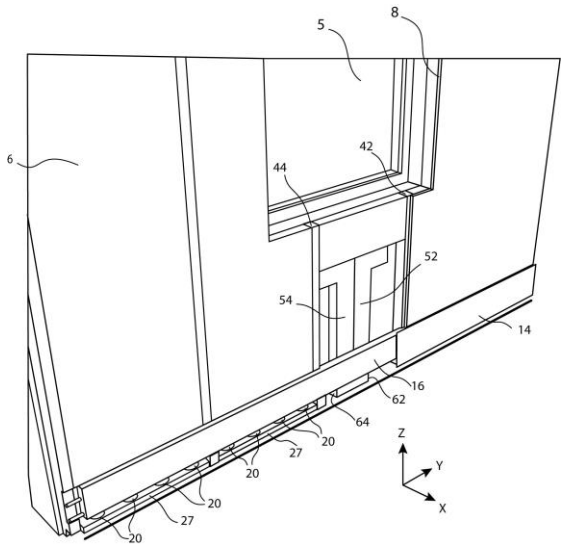
→ **FANBOARD**




- Characteristics:
  - Elegant, almost invisible
  - Best combination of costs / performances
  - Heating and cooling possible
  - Possibility of installation by professionals or in DIY
  - Designed for deconstruction and reuse&recycling

# FANBOARD SOLUTION FRENCH PATENT

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(74) **Mandataire(s) :** LOGIPI.

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- **SOLUTION FOR BUILDING RENOVATION**
- **PATENT DELIVERY: 15 DECEMBER 2023**

- BASE SOLUTION:
  → WALL INSULATION + FANBOARD

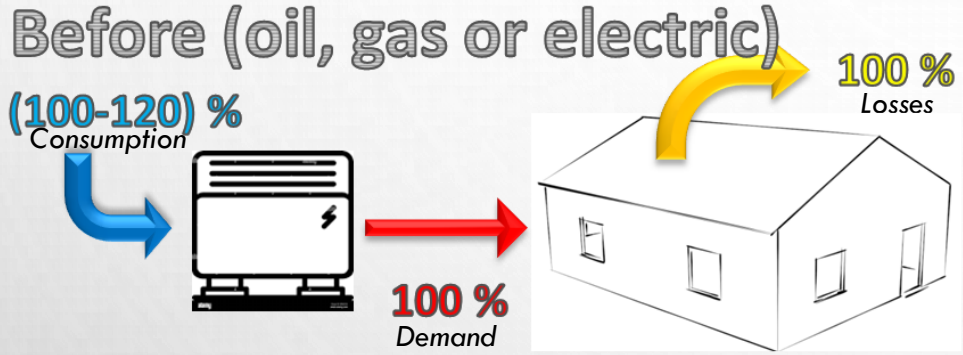
- 2 VARIANTS: OPEN AND CLOSED FANBOARD

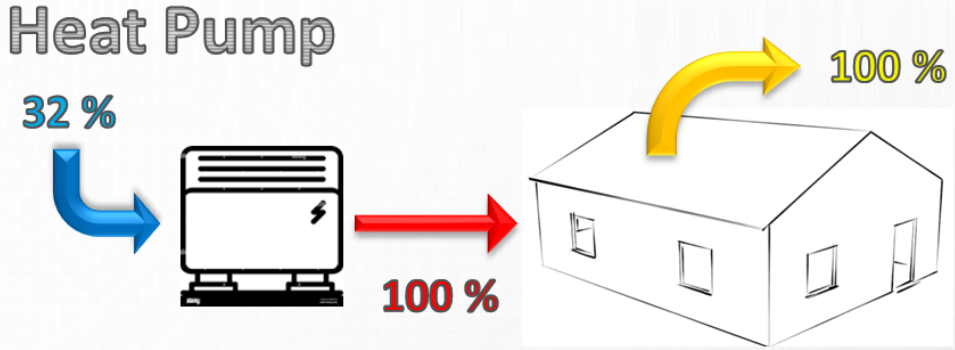
- 2 ADDITIONAL OPTIONS FOR OPEN VARIANT:
  - COUPLED WITH HEAT RECOVERY VENTILATION
  - COUPLED TO MICRO HEAT PUMP

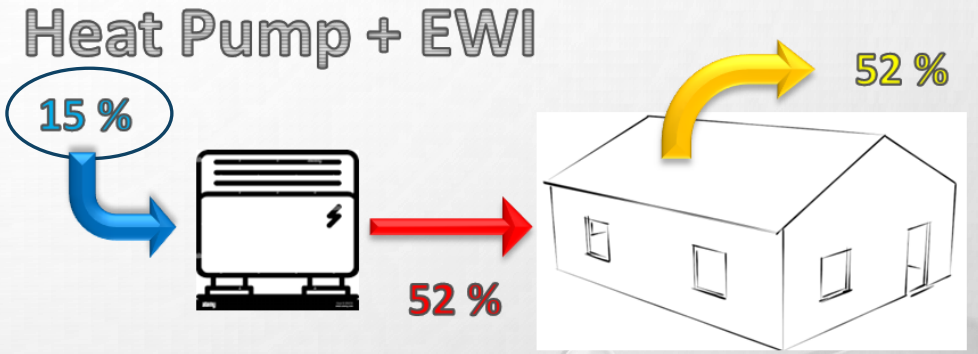
- **COUNTRIES:**
  - FRANCE: PATENT
  - GERMANY: UTILITY MODEL

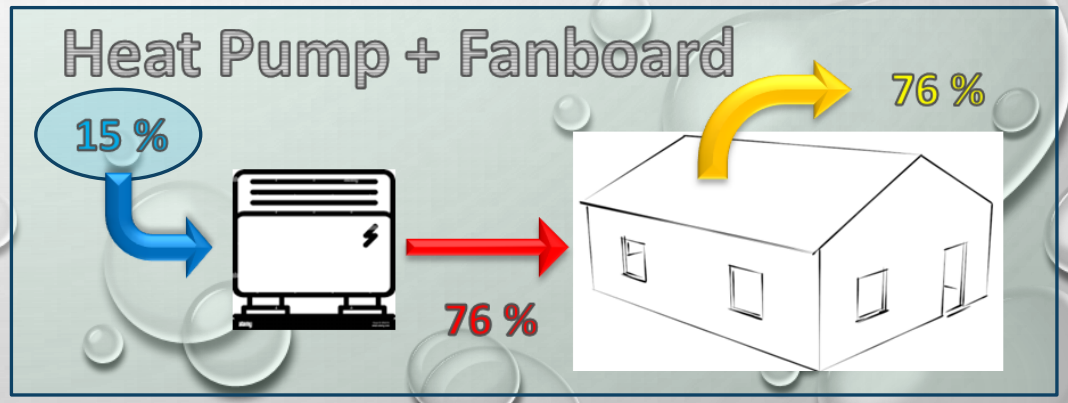
# FANBOARD SOLUTION
## SIMPLIFIED COMPARISON OF RENOVATION VARIANTS

| | |
|---|---|
| *Case:* | *single family house in France* |
| *Initial wall U-value:* | *1.2 W/m²/K* |
| *Window U-value:* | *3 W/m²/K* |
| *New system:* | *Air/water heat pump* |




<u>Fanboard</u>

- similar consumption compared to external wall insulation (EWI) and standard emitter (reason: higher heat pump performances)
- at lower investment costs

# MODULE FANBOARD
# OBJECTIVES AND CHARACTERISTICS

**Possible building usage types**

- Mainly existing
- Types :
  - Residential, office
  - Buildings where external wall insulation is impossible

**Thermal and energy performance characteristics**

- Very low temperature emitter for maximum heat pump performances
- Very fast reaction time allowing very accurate control
- Integration with decentral heat recovery ventilation
- No problems with moisture problems due to thermal bridges

**Practical characteristics**

- Heating and cooling possible
- Almost invisible (baseboard with 20cm height, depth of 15-20mm measured from wall)
- Flexible design: colours and type of baseboard cover. Integration of LEDs possible for design.
- Air curtain in front of all external walls: increase of wall temperature and decrease of air temperature
- Thermal network, electric cables etc. can be integrated below baseboard cover
- Option of integration with decentral heat recovery ventilation: no visible air inlets or outlets
- Ideal for global renovation: small investment for global renovation and optimal impact

# Qualitative comparison with classic emitters

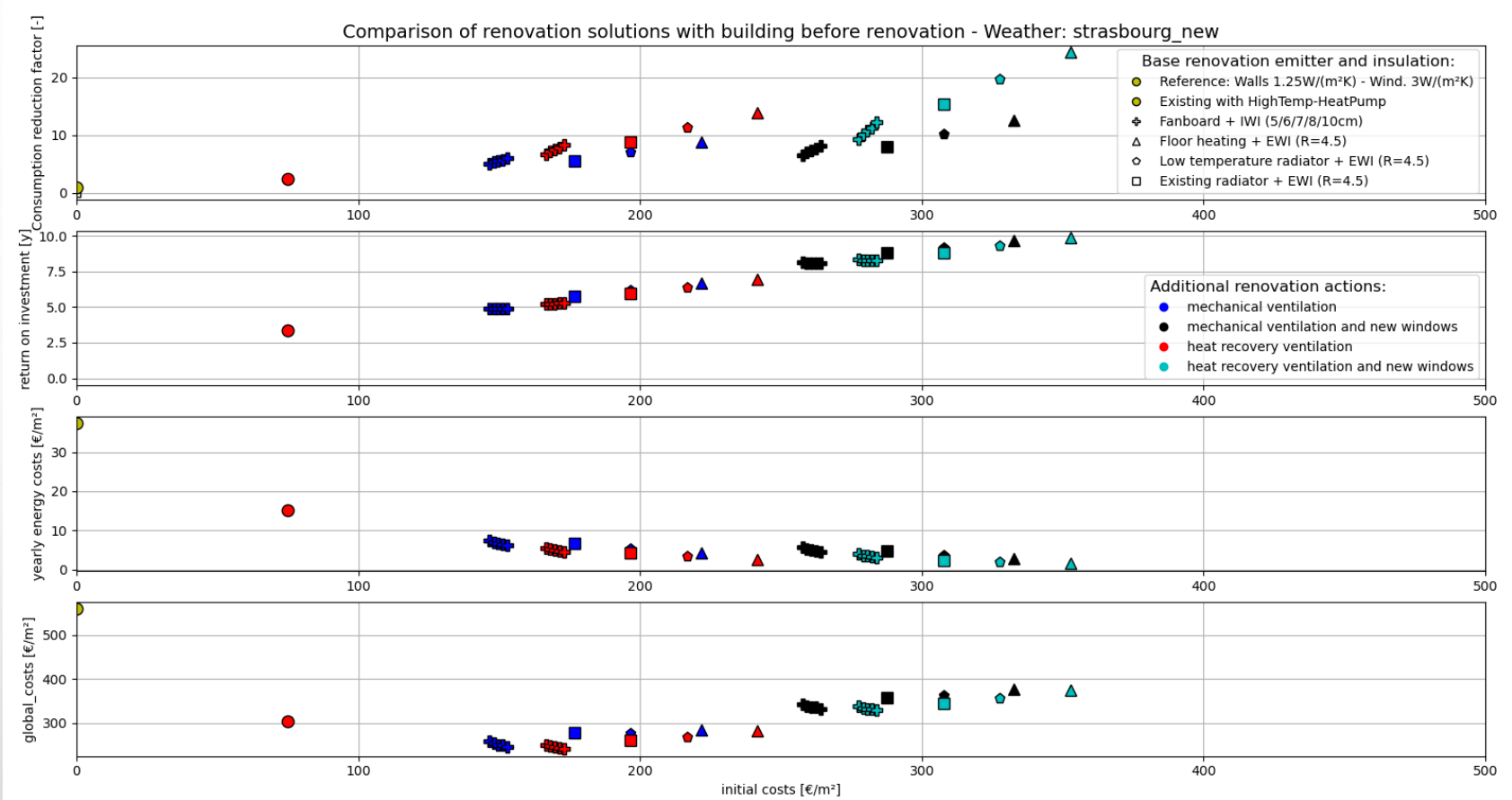
| Emitter characteristics Suitability and fitness for renovation and heat pumps | Potential HP performance | Uniform of room temperature (heating) | Uniform of room temperature (cooling) | Radiative share of emission (heating) | Occupant Comfort - air velocities | Occupant comfort - Acoustics | Cooling / refreshing ability | Design/visibility of emitter | Investment costs of solution | Suitability for renovation | Robustness and risks (damage etc.) | Potential degradation of performances by objects (carpet, curtains, furniture) | Fast thermal response and control ability | Inertia for flexibility issues | Global non-weighted score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Radiator ("standard") | | | | | | | | | | | | | | | |
| Radiator / low temperature (fan-assisted) | | | | | | | | | | | | | | | |
| Split Air conditioning | | | | | | | | | | | | | | | |
| Ducted heat pump | | | | | | | | | | | | | | | |
| Underfloor emitter (wet system) | | | | | | | | | | | | | | | |
| Underfloor emitter (thin/dry) | | | | | | | | | | | | | | | |
| Ceiling emitter | | | | | | | | | | | | | | | |
| Wall emitter | | | | | | | | | | | | | | | |
| Innovative wall emitter (Fanboard) | | | | | | | | | | | | | | | |

This table has been filled in from expert knowledge. Even thought to be objective, it is to some extent subjective

# FANBOARD – DIY CASE STUDY

**Comparison of different renovation practices**

- Attached single family house 120m²
- Paris climate conditions (typical year)
- U-values before renovation:
  - Walls: 1.25 W/m²/K
  - Windows: 3.0 W/m²/K
  - Roof/floor: 0.35 W/m²/K
- Compared emitter types:
  - Fanboard solution
  - Existing hot water radiator
  - Low temperature radiator (fanless)
  - Floor heating
- Ventilation:
  - in all cases mechanical ventilation
  - for heat recovery: 80% efficiency
- Air/water heat pump
- Insulation: EWI with R=4,5W/m²/K
  IWI with wood insulation (0,04W/m²/K)
- New windows: double glazing (U-value: 1.2 W/m²/K)
- Constant electricity price: 30cts/kWh
- 15 years for global costs calculations




*Transient simulation of building and energy system – Time step of 1 hour, 1 year*

# FANBOARD – COMMERCIAL CASE STUDY

**Comparison of different renovation practices**

- Attached single family house 120m²
- Paris climate conditions (typical year)
- U-values before renovation:
  - Walls: 1.25 W/m²/K
  - Windows: 3.0 W/m²/K
  - Roof/floor: 0.35 W/m²/K
- Compared emitter types:
  - Fanboard solution
  - Existing hot water radiator
  - Low temperature radiator (fanless)
  - Floor heating
- Ventilation:
  - in all cases mechanical ventilation
  - for heat recovery: 80% efficiency
- Air/water heat pump
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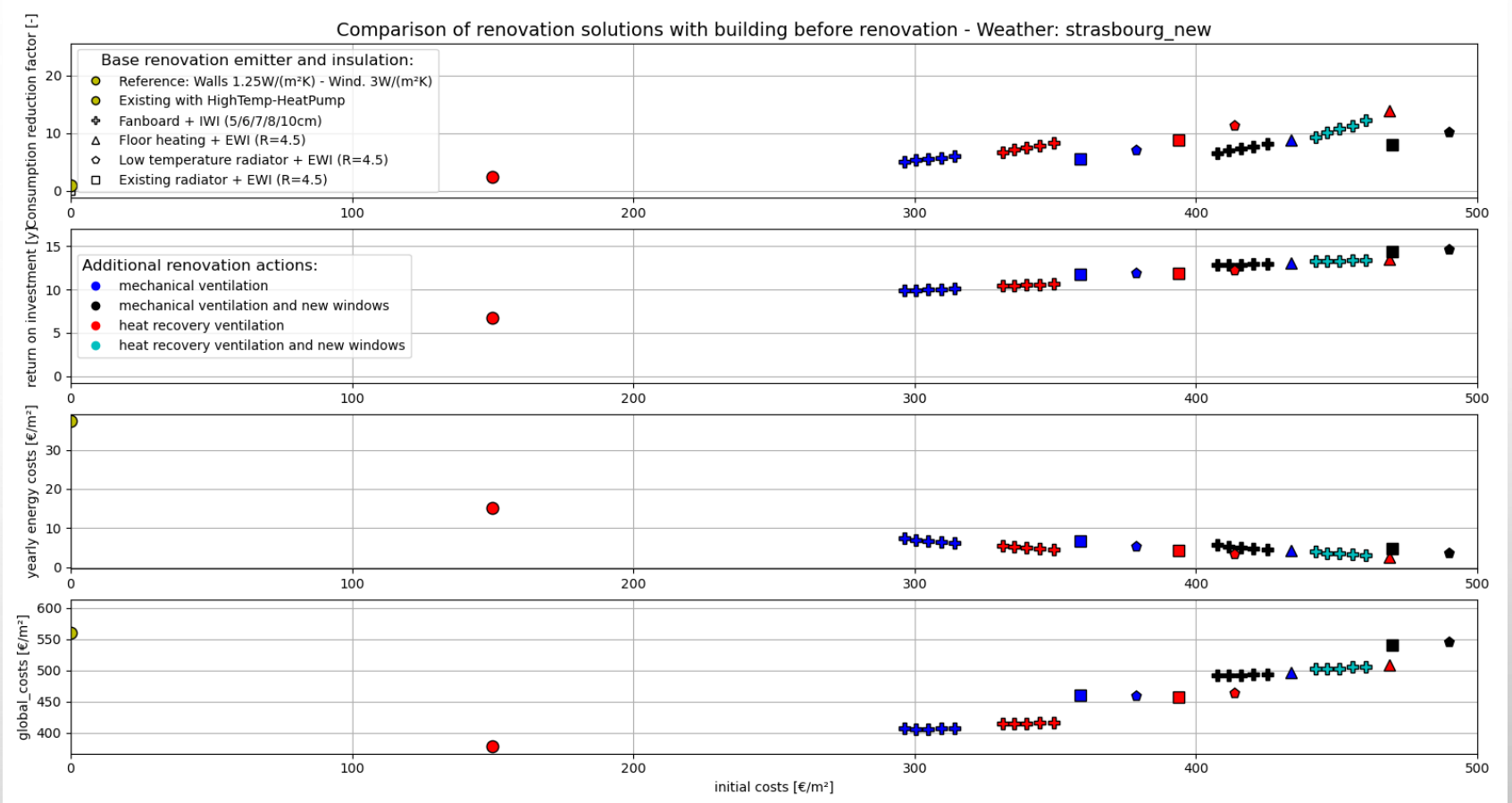


*Transient simulation of building and energy system – Time step of 1 hour, 1 year*

# THANK YOU

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