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FACTSHEET

# Efficient and Smart Climate Shell and Equipment Refurbishment

## PART OF SMART SOLUTION 1: EFFICIENT AND SMART CLIMATE SHELL REFURBISHMENT


Fig. 1. Aerial view of the building with 207 dwellings. Source: PMHB

LOW ENERGY DISTRICT

- External insulation of the façade, substitution and upgrade of blinds, monitoring of heating, consumption and solar thermal energy generation
- Increased comfort, reduction in noise pollution and humidity
- Involvement of residents through a community wide association for the decision-making process before, during and after the works

Barcelona

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## What is the solution?

Passive measures including external insulation in all façades and substitution and upgrade of blinds in all windows. Both wool and expanded polystyrene insulation will be employed, the former on ventilated façades and the latter on the rest of façades. Insulation design in each façade has been optimised in order to protect indoor spaces from weather conditions depending on the orientation and irradiation received.

## Business Model Used

The Housing Agency of Barcelona (Patronat Municipal de l'Habitatge de Barcelona, PMHB) was set up back in 1927 to provide affordable housing for citizens with limited incomes. Its mission is to refurbish existing housing while fostering sustainable urban development. The residential building in Passeig Santa Coloma 55-57 is one of the buildings whose energy refurbishment is financially supported by the Agency. Monthly rental for the tenants will remain the same but the building's value will be significantly increased thanks to architectural renovation and energy refurbishment.

## Integration with other smart solutions

The refurbishment of this building will be linked to measure 4.2, in which a platform to visualise the monitored energy data is being developed, and to measures 8.1 and 8.2, which cover the creation of an open data platform and semantic urban model.

## Expected Impact

The refurbishment of the building in Passeig Santa Coloma will have a significant impact on the heating demand of dwellings. The insulation technique is expected to lead to a reduction of the final heating energy demand of the dwellings by approximately 43% on an annual basis due to the better air tightness.

The fuel for space heating in this residential building is natural gas, thus any reduction in space heating demand will directly lead to a reduction in greenhouse gas emissions. Calculations predict approximately 84.3 tonnes CO2 savings every year.

The intervention will improve the thermal comfort of end-users by repairing thermal bridges (i.e. areas of the building's façade which have a significantly higher heat transfer than the surrounding materials) with the exterior, which will result in an overall improvement in thermal insulation of the building.

These benefits will be assessed by means of thermal imaging before and after the refurbishment. Thermal imaging allows the evaluation of the current condition of existing building skins through infrared thermography, a technique that shows the changes in temperature of the different elements of the façade over a period of time, thus enabling sources of energy inefficiencies to be easily identified.

The Housing Agency of Barcelona has also implemented a monitoring system for the existing 13 Domestic Hot Water installations fed by a solar thermal system on the rooftop of the building. This measure lowers the consumption of natural gas for Domestic Hot Water heating in the building.

Finally, continuous communication with residents regarding the progress of the energy refurbishments will help increase their awareness of energy issues.

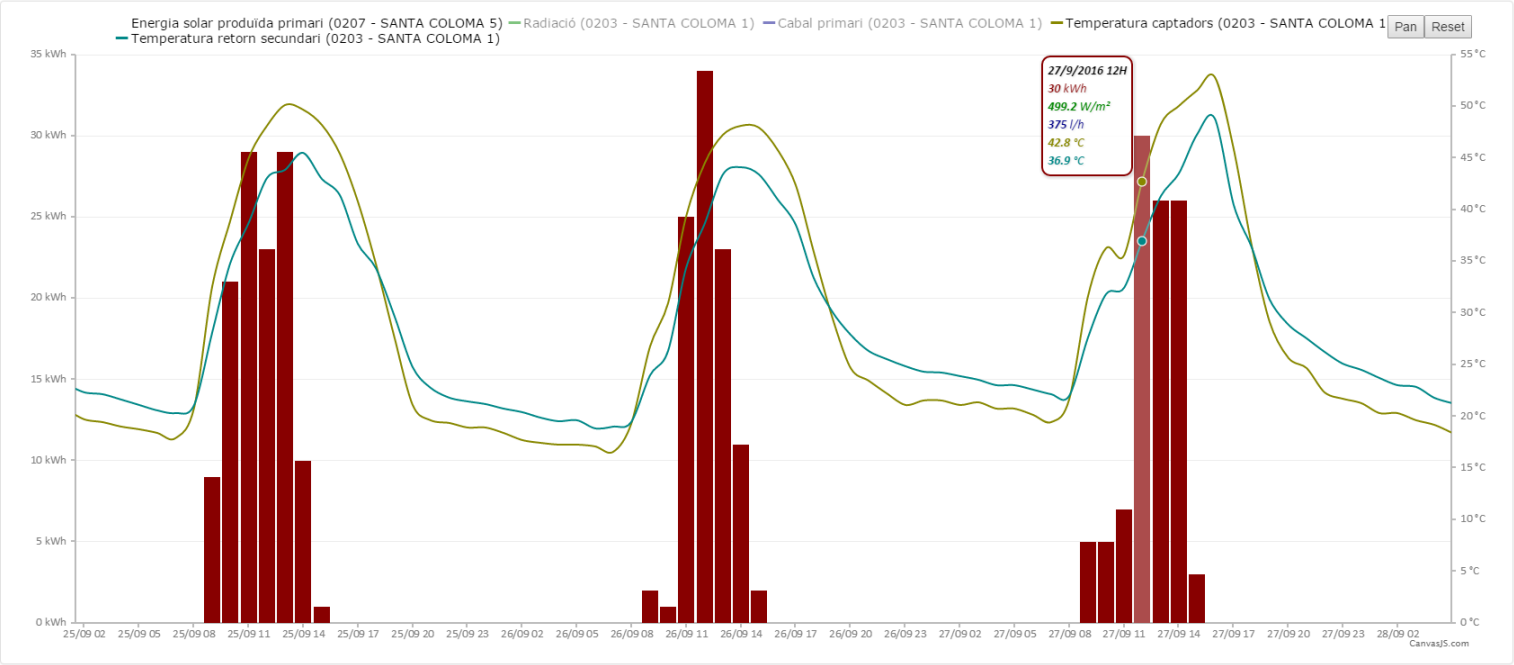


Figure 3: Data visualisation platform of the monitoring of solar thermal installations.

## Potential for replication

Passive measures are strongly dependant on city climate and architectural aspects. The type of wall insulation technique is dependent on the prevailing climate in the city, thus this measure may be replicated in cities with similar climate. However, in general terms the Housing Agency's engagement with social housing tenants regarding energy aspects and refurbishment processes could easily be replicated elsewhere.