PRESS RELEASE

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Decarbonizing Building Energy Demand: SATO's Milan Pilot Shows Energy Flexibility and Thermal Safety

Decarbonizing heating in buildings is a key part of climate change mitigation policies, but deep retrofit adoption of the EU building stock is progressing at a very slow pace (0.2%/y[1]). Having a multi-layer approach, SATO goes from its IoT self-assessment and optimization user-friendly platform to energy-efficient construction procedure, to possibly redefine the Nearly Zero-Energy Buildings (NZEB) outcomes, thus helping this change to step forward.

A deep thermal retrofit is based not only on a thick thermal insulation of the building envelope (≥ 25 cm), but also on properly addressing further unwanted heat losses and gains by incorporating highly insulated window glazing and frames, indoor ventilation with heat recovery, motorised movable external solar protections, and increasing airtightness of the envelope.

Politecnico di Milano tested the energy flexibility of such a construction in SATO's residential pilot in Milan, a public housing complex owned by the City of Milan, also a partner of SATO.

Chiaravalle complex after the retrofit meets the PassivHaus energy performance requirements, having reduced "***energy needs for heating***"[2] to only about 15 kWh/m^{2}a, resulting in energy savings of approximately 80% compared to the pre-retrofit "***energy needs***" (150-200 kWh/m^{2}a). The thermal capacity of the building mass can, as a consequence, act as an energy storage system (BaB, *Building as Battery* concept), now that the retrofit has eliminated the large thermal winter energy losses presently affecting a large part of the existing building stock.

Two unplanned heating power outages which have involved the entire building complex during winter season, allowed Politecnico di Milano workgroup to verify that under unpredictable circumstances, buildings which have undergone a deep retrofit of their envelope, as this one, are able to maintain thermally safe indoor conditions for at least 5 days (as seen in Figure 1). The tenants barely noticed the outage when it occurred, while the indoor temperature remained within the comfort zone until the heating system reset.

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[1] Erba, S.; Barbieri, A. Retrofitting Buildings into Thermal Batteries for Demand-Side Flexibility and Thermal Safety during Power Outages in Winter. *Energies* 2022, *15*, 4405. https://doi.org/10.3390/en15124405

[2] See definition at: https://www.iso.org/obp/ui/#search

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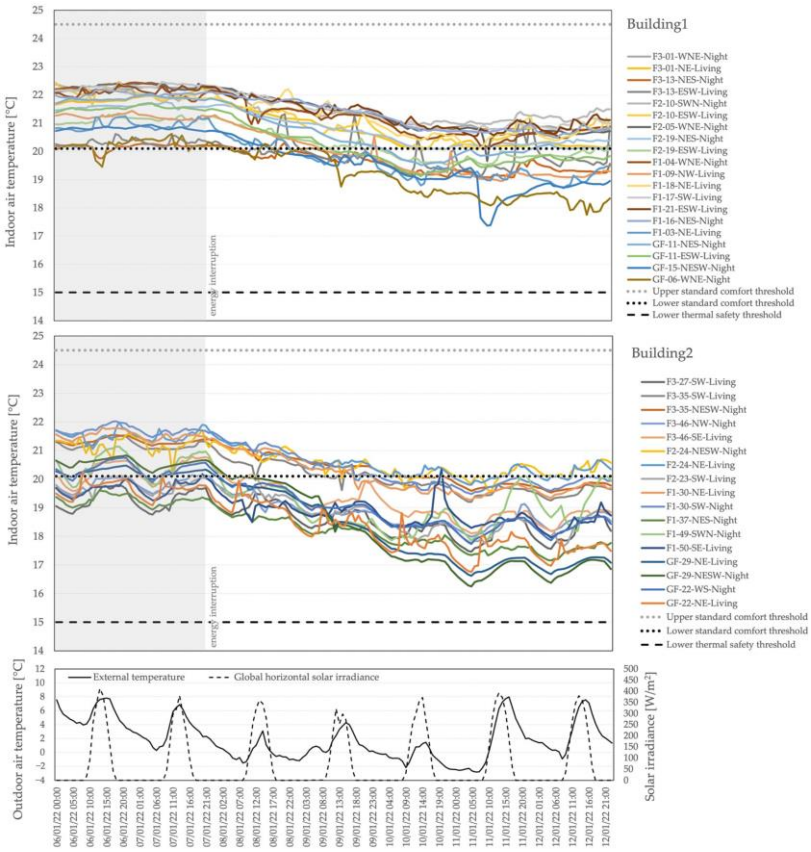

Figure 1: The energy flexibility of SATO's Milan pilot keeps the building in thermal safety during a 5 days energy outage[3]

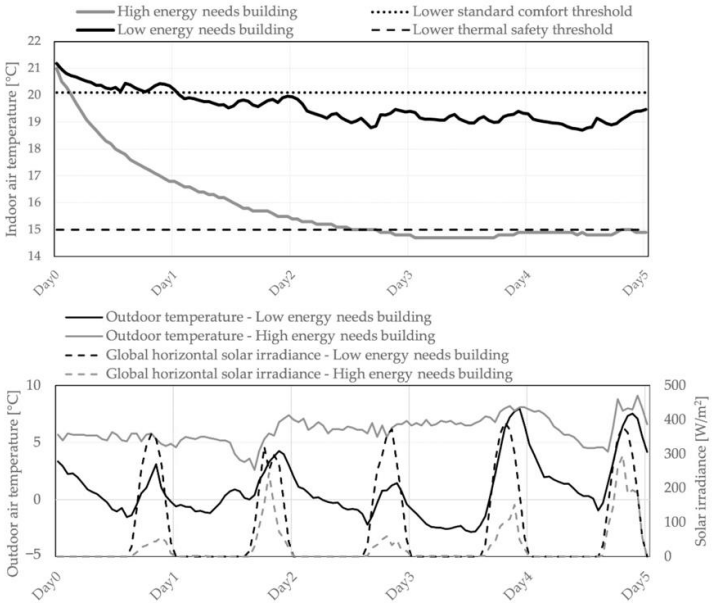

*Figure 2:*Graph of same typology building with high energy needs for heating[4]

[3,4] Erba, S.; Barbieri, A. Retrofitting Buildings into Thermal Batteries for Demand-Side Flexibility and Thermal Safety during Power Outages in Winter. *Energies* 2022, *15*, 4405. https://doi.org/10.3390/en15124405

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In comparison, Figure 2 shows a building of the same typology (multiapartment) with low insulation, double glazing but frames of bad thermal quality and no heat recovery on venilation. As seen in the graph, when the heating system is turned off, the temperature drops deeply below the comfort zone in a few hours with external temperarure around 5 C. As opposed to the retroffitted building of SATO, which temperature remains at about 20 C for two days and about 19 C for other 3 days without energy supply, while the outdoor temperature is around zero.

This kind of flexibility (the manager or users are not obliged to turn on the system at 6 in the moring each day to recover comfort after the night set-back) offers several benefits: enhanced possibilities of self-use of locally generated renewable energy, reduction of demand in coincidence with system peaks, adaptation to climate change and more frequent and extreme weather events.

In the context of SATO, future work involves the development of energy flexibility services to be provided to building managers, housing companies, and other stakeholders involved in delivering stable energy system operations and services.

About the project

Project title: Self Assessment Towards Optimization of Building Energy
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Consortium

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