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## The use of attached-sunspaces in retrofitting design: the case of residential buildings in Portugal

Daniel Aelenei<sup>a\*</sup>, Hugo de Azevedo Leal<sup>b</sup>, Laura Aelenei<sup>c</sup>

<sup>a,b</sup>Faculty of Science and Technology, Universidade Nova de Lisboa, Caparica, 2829-516, Portugal

<sup>c</sup>National Laboratory of Energy and Geology, Paço de Lumiar 22, 1649-038, Lisbon, Portugal

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### Abstract

This study addresses the energetic performance of an attached-sunspace applied to an existing residential building in Portugal. Four configurations (two attached, one integrated and one partially integrated) are studied in six different climatic zones. In addition other key parameters are considered such as ventilation (with or without natural ventilation), shading devices (one external and two internal configurations), number of glazed surface layers (single glazed and double glazed) and orientation (South, East and West).

The thermal performance analysis, carried out using a dynamic simulation code, proved that energy savings for retrofitting design can be very important and that in climates with warm summers the risk of overheating can be considerably diminished through an accurate analysis based on modeling.

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*Keywords:* Attached-sunspace; retrofitting; residential buildings; thermal performance; simulation

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### 1. Introduction

The residential sector represents approximately 17% of the final energy consumption in Portugal, with nearly 25% of it being due to air conditioning. Approximately 65% of the residential building stock is built before the

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\* Corresponding author. Tel.: +351-212948580; fax: +351-212948398.

E-mail address: [aelenei@fct.unl.pt](mailto:aelenei@fct.unl.pt)