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Presentation title:	**Multi-Objective Evaluation of Cooling Passive Building Envelope Technologies for Optimal Thermal Performance and Indoor Comfort**	

According to statistical data, southern Europe is consistently identified as the most vulnerable region in Europe regarding mortality rates associated with extreme heat. This alarming trend underlines the urgent need to shield the urban building sector against adverse summer conditions by implementing energy-efficient interventions. For this purpose, the present study investigates the passive building envelope technologies of local shading, electrochromic, and thermochromic windows, through a multi-objective evaluation of retrofit scenarios with thermal performance and indoor thermal comfort criteria. Thermochromic windows are active year-round with a mean color transition temperature of 34°C. Electrochromic windows, by contrast, are only activated when cooling is required. For both types of chromogenic windows, total solar transmittance is 76.3% in the bleached state and 8.4% in the tinted state. Local shading is applied to each window as an inclined shading element. It is evaluated as a standalone retrofit measure, either as a static element present year-round or as a movable system applied exclusively during the summer period or combined with chromogenic window technologies. To support this multi-objective approach, eight retrofit scenarios are modeled on a single-story, fully electrified residential building, which features south- and east-oriented windows, in Athens, Greece, using the DesignBuilder software coupled with the EnergyPlus simulation engine. Thermal comfort is evaluated using Fanger's thermal comfort model, which lies among the most established models for defining the thermal indoor environment conditions for occupancy. The indices Predicted Mean Vote (PMV) and Predicted Percentage of Dissatisfied (PPD) are calculated to assess indoor thermal comfort conditions. The combination of electrochromic windows and movable local shading yields the highest annual electricity savings at 22.2%, reduces the PPD by 15.8% and lowers the average absolute PMV by 17.4%. No heating energy penalty is observed, as both passive cooling technologies operate exclusively during the summer.

Short CV:	

Evangelos Vidalis is a Mechanical Engineer and PhD candidate at the National Technical University of Athens (NTUA), at the laboratory of Refrigeration, Air Conditioning and Solar Energy. His research focuses on innovative materials and energy systems for energy-efficient buildings. He has contributed in five publications and presented at international conferences, actively contributing to both research and education in his field.

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CV:	

Evangelos Vidalis is a graduate Mechanical Engineer from the National Technical University of Athens (NTUA) and a PhD candidate at the Laboratory of Refrigeration, Air Conditioning, and Solar Energy of the same institution. As part of his undergraduate studies, he completed his thesis titled " PV system simulation with Skelion (SketchUp)" which focused on the design and optimization of photovoltaic installations through modern simulation tools, aiming to investigate energy performance under various application scenarios. His doctoral dissertation is titled " Design and analysis of high-performance buildings, adjusted to the new climate requirements, with the use of innovative materials and energy systems," and focuses on the research and evaluation of innovative materials and technologies to reduce energy consumption in buildings, as well as adapting them to the increasingly significant climate challenges. Throughout his research journey as a PhD candidate, he has made valuable contributions to the scientific community with five (5) publications in international scientific journals and has participated in two (2) scientific conferences. He is also an active member of the research team at the Laboratory of Refrigeration, Air Conditioning, and Solar Energy, contributing to the development and implementation of research projects. Furthermore, he plays a vital role in the operation of the laboratory by supervising diploma theses and supporting its research and educational activities.

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