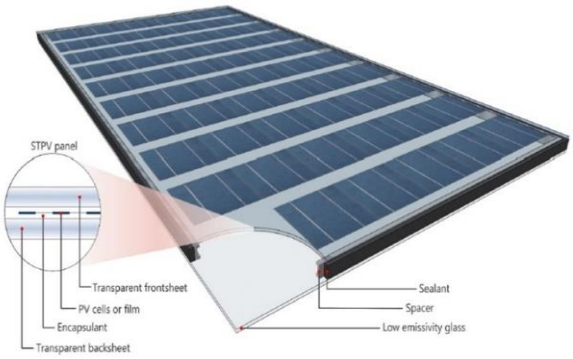

SHEDDING LIGHT ON THE BEHAVIOR OF PHOTOVOLTAIC WINDOWS

Prof. Costa Kapsis

Imagine windows, skylights or glass walls that generate electricity as well as letting in light. That's the idea behind semi-transparent photovoltaic (PV) glazing, which sandwiches PV cells or film between layers of glass.

As these materials gain traction, the international performance ratings for glazing need to keep pace. That includes the solar heat gain coefficient (SHGC) rating — a measure of how much of the sun's heat is transmitted into the building through the glass.

Although there are well-established methods for calculating the SHGC of conventional glazing, integrating PV technology changes the picture. So WISE researcher Costa Kapsis teamed up with international colleagues to develop modified formulas.

There are unique variables to consider. Conventional glazing is uniformly transparent. But in some forms of PV glazing, only certain sections are occupied by solar cells. That means different areas of the glazing absorb and transmit different amounts of heat. Meanwhile, when PV glazing is in electricity-generating mode, the SHGC drops because a portion of the solar energy gets converted to electricity.

The researchers developed a simple method for calculating SHGC for different PV glazing scenarios, taking into account variations in transparency, the power-conversion efficiency of the PV layer, and whether it's generating electricity.

When they applied their methodology, they found that generating electricity had a big enough impact on the SHGC to warrant incorporating their formulas into international standards. In doing so, they hope to make PV glazing more mainstream, creating greener buildings that generate more renewable energy.

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***Partners**: German Federal Ministry for Economic Affairs and Climate Action; Japanese New Energy and Industrial Technology Development Organization; European Union's Horizon 2020 research and innovation programme; Spanish Ministry of Science and Innovation; European Regional Development Fund; U.S. Department of Energy*

Source: *Wilson, H., Kuhn, T., Ishii, H., Valencia-Caballero, D., Chivelet, N., Peng, J., Yang, R., Zang, Y., Ge, H., Ye, K., Jonsson, J., & Kapsis, K. (2024). Component-based SHGC determination of BIPV glazing for product comparison. Energy and Buildings, 320, 114592*.

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