THE PATH TO NET ZERO CITIES: AN ANALYSIS OF COUPLING ELECTROCHROMIC GLAZING (EC) WITH BUILDING INTEGRATED PHOTOVOLTAICS (BIPVS) IN AUSTIN, TEXAS

Dariya Fallon

ABSTRACT

In recent years, new construction has witnessed a rise in the adoption of building-integrated photovoltaics (BIPV) and smart glazing strategies, however, costs have remained one of the concerns and create barriers for implementation.

Considering Austin's population is predicted to double by 2050, this study utilized the DOE high-rise apartment stock commercial building model to analyze both the annual cost and energy savings of employing PV and smart glazing technologies. Applications of electrochromic glass (EC) in isolation (that is, without BIPV) resulted in an average 27% reduction of building energy use intensity (EUI), while applications of mono-crystalline silicon (mono-Si) panels and dye-sensitized cell (DSSC) facade panels in isolation (without EC) yielded 38.9% and 29.7 % reductions, respectively. Notably, coupling both EC and BIPVs resulted in an average decrease in building EUI of 73% and 65% for Mono-Si and DSSC panels, respectively. In terms of costs, dye-sensitized cells coupled with electrochromic glass proved to be "twice as good" (in terms of the payback period decreasing by half, and consequently the cost-benefit ratio improving by a factor of two), when compared to mono-crystalline silicon cells with EC glass.

Currently, less than 1% of buildings in Austin are net-zero, while Austin's 2021 Climate Equity Plan seeks to achieve a 25% reduction in emissions for existing buildings, followed by a goal to achieve net-zero operational carbon emissions for all new constructions by 2030. As a result, this study can aid the strategy for reduction in emissions and advance Austin closer to its goal of net-zero emissions by 2040.

Dev Niyogi

Michael Garrison