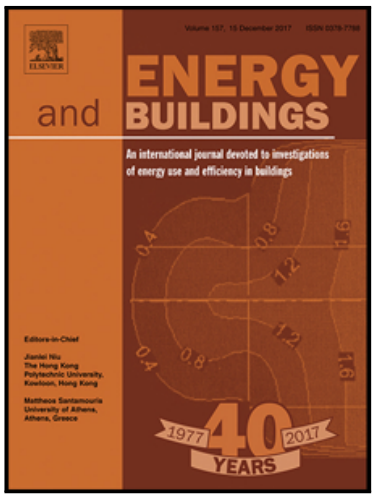

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Eco-feedback for Thermal Comfort and Cost Efficiency in a Nearly Zero-Energy Residence in Guilin, China

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***Abstract*—**City residence development in China is increasing at an annual rate of 0.5–0.6 billion m^2, causing vast increases in energy consumption by HVAC facilities and other appliances. Thus, governments and researchers are encouraging the use of renewable energy sources such as solar and geothermal energy in residential areas. However, high equipment costs and low energy conversion efficiency have reduced their acceptability to residents. Thus, researchers must determine the eco-feedback equilibrium point that achieves both economic benefit and thermal comfort. The objective of this study is to design and build a nearly zero-energy building (NZEB) with an HVAC system and an onsite solar photovoltaic system. Because HVAC systems typically account for more than 40% of total energy consumption in residences, a 24-h monitoring system was installed in the considered residential setting to measure the temperature, wind velocity, and energy in-out value with/without the HVAC system for several days in summer and winter. The thermal comfort period was analyzed and confirmed, and the air conditioner was switched on during thermal discomfort periods in one summer and one winter month. Temperature, humidity, wind, and energy data was recorded to calculate the average monthly energy consumption that provides all-day thermal comfort. Finally, two analyses were conducted; first, the real measured temperature after construction was recorded for thermal comfort analysis; second, the cost of renewable energy facilities and power consumption was converted to cost efficient rates to assess the feasibility of renewable energy input