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## **A Simulation Approach to Estimate Energy Savings Potential of Occupant Behavior Measures**

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### **Highlights**

- Occupant behavior has significant impacts on energy use in buildings
- A simulation approach is proposed to estimate energy savings of behavior measures
- Five measures on lighting, plug-loads, HVAC, windows, and thermostat are studied
- Behavior measures can achieve up to 41.0% savings based on the simulation results
- Occupancy schedule significantly affects the energy savings of behavior measures

### **Abstract**

Occupant behavior in buildings is a leading factor influencing energy use in buildings. Low-cost behavioral solutions have demonstrated significant potential energy savings. Estimating the behavioral savings potential is important for a more effective design of behavior change interventions, which in turn will support more effective energy-efficiency policies. This study introduces a simulation approach to estimate the energy savings potential of occupant behavior measures. First it defines five typical occupant behavior measures in office buildings, then simulates and analyzes their individual and integrated impact on energy use in buildings. The energy performance of the five behavior measures was evaluated using EnergyPlus simulation for a real office building across four typical U.S. climates and two vintages. The Occupancy Simulator was used to simulate the occupant movement in each zone with inputs from the site survey of the case building. Based on the simulation results, the occupant behavior measures can achieve overall site energy savings as high as 22.9% for individual measures and up to 41.0% for integrated measures. Although energy savings of behavior measures would vary depending upon many factors, the presented simulation approach is robust and can be adopted for other studies aiming to quantify occupant behavior impact on building performance.

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