

## Co-Alignment of Comfort and Energy Saving Objectives for U.S. Office Buildings and Restaurants

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**Abstract :** Post-occupancy research shows that only 11% of commercial buildings met the ASHRAE thermal comfort standard. Many buildings are too warm in winter and/or too cool in summer, wasting energy and not providing comfort. In this paper, potential energy savings in U.S. offices and restaurants if thermostat settings are calculated according the updated ASHRAE 55-2013 comfort model that accounts for outdoor temperature and clothing choice for different climate zones. eQUEST building models are calibrated to reproduce aggregate energy consumption as reported in the U.S. Commercial Building Energy Consumption Survey. Changes in energy consumption due to the new settings are analyzed for 14 cities in different climate zones and then the results are extrapolated to estimate potential national savings. It is found that, depending on the climate zone, each degree increase in the summer saves 0.6 to 1.0% of total building electricity consumption. Each degree the winter setting is lowered saves 1.2% to 8.7% of total building natural gas consumption. With new thermostat settings, national savings are 2.5% of the total consumed in all office buildings and restaurants, summing up to national savings of 69.6 million GJ annually, comparable to all 2015 total solar PV generation in US. The goals of improved comfort and energy/economic savings are thus co-aligned, raising the importance of thermostat management as an energy efficiency strategy.

**Keywords :** energy savings quantifications, commercial building stocks, dynamic clothing insulation model, operation-focused interventions, energy management, thermal comfort, thermostat settings

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