SAVING ENERGY THE EASY WAY: AN ANALYSIS OF THERMOSTAT MANAGEMENT

Edward Vine
Lawrence Berkeley Laboratory

ABSTRACT

One of the most effective and least expensive means of reducing household energy use is to maintain low indoor temperatures during the winter and high indoor temperatures during the summer. There is a need to determine how households are managing their thermostats in order to: (1) estimate energy- and cost-effectiveness of energy retrofits for individual households, utilities, and the nation; (2) improve the marketing of energy-reducing programs; (3) estimate the potential for energy reduction in homes; and (4) improve our general understanding of thermostat management.

We analyzed data on self-reported winter and summer thermostat settings and control strategies that were collected in recent surveys by utility companies, and state and federal energy agencies. We constructed several hypotheses to examine how thermostat behavior was related to conditions internal and external to the occupants: socioeconomic characteristics of occupants (age, education, income, home ownership, and race), building characteristics (house type, size, and age), space conditioning fuel and system, climate, and energy audits. We also examined thermostat management during the day (time-of-day) and over time and analyzed its relationship to energy use.

We found that thermostat behavior (especially during the summer) was not fixed, but varied and was sensitive to some conditions. Certain groups—younger people, better educated individuals, audited households, multi-family households, and residents of warmer climates—were responding to energy reduction at a greater rate than their counterparts. Households were lowering and raising their thermostats during the day and during different seasons and were also shutting off their heating and air conditioning systems when their home was unoccupied. In fact, many households reported settings below 68°F in the winter and above 78°F in the summer, the standard temperatures used in many energy models and programs. We were unable to find consistent relationships between self-reported thermostat settings and several other variables (e.g., income, home ownership, dwelling size, and race). Because of the difficulty in interpreting the relationships between thermostat behavior and its correlates, we believe that larger sample sizes, uniform sampling designs and instruments, and multivariate analysis will produce more consistent results. In addition, metered temperature and thermostat setting data should provide a more reliable and accurate measure of indoor temperatures and thermostat management than self-reported data.