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Transient adjustment of UFAD systems in demand response operations JONG KEUN YU, PAUL LINDEN, UCSD — Transient responses of a UFAD system due to Demand Response (DR) are investigated theoretically and experimentally. DR activities can be categorized by reducing thermal loads and increasing room setpoint temperature, which change the thermal environment in a room and can cause occupant thermal discomfort. By comparing the filling box time (Baines & Turner 1968) and the replenishment time in which all the air in the enclosure is replaced by supply air, non-dimensional models of UFAD systems are proposed and validated by laboratory experiments using a salt-water analogy. Two-layer stratification in the model allows us to estimate the temporal temperature change in the occupied zone and the interface height. Various DR activities, adjusting thermal loads and room setpoint temperature, are simulated to reveal the dynamic thermal responses. This study suggests that the interfacial height quickly converges to steady state compared to occupied zone temperature. The experiments show good agreement with the theoretical predictions of DR responses.

Paul Linden
UCSD

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