



Environmental Science Graduate Program Student Seminar Series

Ventilation Curtailment in Commercial Buildings to Reduce Peak Power Demand while Preserving Indoor Air Quality (IAQ)

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Smith 3150 | 11/15/19 | 2:00 - 3:00 pm

Abstract:

Peak electric power demand reduction strategies of many varieties have been studied, primarily for their ability to improve the cost effectiveness of generation, transmission and distribution infrastructure. As buildings constitute more than three quarters of this demand, numerous studies have examined peak reduction strategies in buildings. However, these strategies have mostly been confined to either reduction in thermal conditioning or the reduction of lighting levels, and to appliance operation in residences. The ability to modulate air quality control in commercial buildings during peak events has been studied much less. To this end, we conducted a simulation campaign in which we examined the resource offered by temporary ventilation curtailment in commercial buildings of different use types across the United States, with the constraints that any changes were safe and comfortable for occupants. To do this, we employed the building thermal and systems modeling tool EnergyPlus and previously developed equivalent ventilation theory. Results show that the resource offered by ventilation is of the same magnitude as that offered by thermal control strategies such as setpoint increase, or from lighting reduction strategies. Savings are highly dependent on building type and climate but range from 0-2 W/ft² and up to 40% of total peak building power demand. Depending on building type, this power shed can be conducted for 1.5-8 hours before acute exposure or odor concerns are expected, assuming a safety factor of 2.

