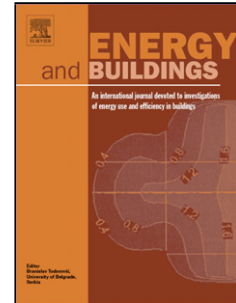


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Buildings energy consumption generation gap: a post-occupancy assessment in a case study of three higher education buildings

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Abstract

The existing stock of institutional buildings constructed before current thermal regulations is known to be high energy-consuming. In several cases, they contribute to a large share in local authorities' expenses, especially for those dedicated to education and research. These high consumption levels are due in general to low thermal regulations requirements and to the diversity of occupants, occupancy profiles and used equipment. We hereby report on a comparative study of the energy consumption of three campus buildings covering more than 50,000 m² useful ground area and located in Paris region. Used data were collected during more than three years between 2014 and 2017 and at different time steps, from yearly down to a 10-minute time step. Statistical analysis tools are used, to identify the main energy drivers and their relative weight in the overall energy consumption for instance. The impact of different thermal regulations is clearly assessed through a post occupancy study. Together with equipment, occupancy is shown to be the main electric energy consumption driver. The introduced tools lay the ground for a non-intrusive method for large tertiary buildings power demand curves decomposition and reconstruction.

Keywords: higher educational building, heat and electric consumption, positive energy building, statistical analysis, load curve

Nomenclature

AHU: Air Handling Unit

B1, B2, B3: respectively building 1, 2 and 3

BEM: Building Energy Model

HDD: Heating Degree Day

HDH: Heating Degree Hour

IAQ: Indoor Air Quality

IEQ: Indoor Environment Quality

LC: load curve

kWhpe/MWhpe: kWh/MWh of primary energy

OAT: Outdoor Air Temperature

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