

<https://doi.org/10.7250/CONNECT.2026.024>

# IMPACT OF BUILDING USAGE REGIME ON THE RESIDENTIAL ENERGY LABEL OF HEAT PUMP-HEATED BUILDINGS

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**Abstract** – The current study investigates the influence of building usage regimes on the residential energy performance label of buildings heated by heat pump systems. While energy labels are commonly perceived as indicators of a building’s technical quality, this research emphasizes the significant role of occupant-related factors in determining final energy classification outcomes. The analysis focuses specifically on consumer-side variables, including the number of occupants, duration of daily occupancy, lifestyle characteristics, and energy consumption behavior, and evaluates how these parameters affect overall energy use and the resulting energy label. Different household usage regimes are examined to illustrate variations in residential energy demand under otherwise identical technical conditions. Case scenarios include pensioner households, where occupants typically remain at home for longer periods and maintain higher indoor comfort temperatures, as well as families with children, whose energy use patterns are shaped by irregular schedules, increased domestic hot water demand, and higher electricity consumption for household appliances. By comparing these distinct usage profiles, the study quantifies the extent to which occupant behavior alone can influence building energy performance indicators. The results demonstrate that buildings with the same construction quality, thermal envelope characteristics, and heating system efficiency may receive different energy label classifications solely due to differences in user behavior and occupancy patterns. This finding highlights a critical limitation of current residential energy labeling systems, which rely primarily on measured or calculated energy consumption values without adequately accounting for behavioral variability. In heat pump-heated buildings, the amount of electrical energy required for space heating and domestic hot water production is strongly dependent on the availability of latent energy from the surrounding environment, which in turn affects the proportion of electricity drawn from the grid. User-driven demand fluctuations therefore directly impact system performance and annual energy consumption figures. These findings underline the importance of incorporating usage-related parameters when interpreting residential energy labels, particularly in financial and regulatory contexts. Energy labels are increasingly used in mortgage approvals, bank loan assessments, and real estate valuation processes, where they may influence financial decisions and perceived investment risks. Without acknowledging the role of occupant behavior, energy labels may not accurately reflect the intrinsic energy efficiency of a building. Consequently, a more nuanced interpretation framework is required to ensure fair and technically sound evaluations of residential energy performance.

**Keywords** – *Consumer-side impact; energy consumption patterns; electricity grid demand; latent energy; occupancy patterns*