WP4.3. Energy Performance Gap in building retrofit

Characterization of the performance gap in building retrofit

Khoury Jad, Hollmuller Pierre (University of Geneva)

In the first part of the study, we analyse 10 recently retrofitted case studies. These cases involve 50 residential multifamily buildings, which comprise about 1'100 dwellings and cover a total energy reference area of approximately 110'000 m^2. These buildings are representative of those constructed during the post-war period (1946-1980) in the canton of Geneva and more generally in Switzerland, and offer the most important energy saving potential. For each retrofit, we calculate the theoretical and actual energy savings for space heating. Theoretical savings are given by the difference between the real space heating demand before retrofit and the expected demand after retrofit, stated in the building permit and calculated under normal conditions of use according to SIA standards. Actual savings are defined as the difference between the real space heating demand of a building before and after retrofit in real-life conditions of use and operation (e.g. with a room temperature of 22-23°C, instead of 20°C according to SIA standards).

As a major result of the study, we obtain a robust statistical correlation between theoretical savings (*ΔQh theor*) and actual energy savings (*ΔQh real*), which allows characterizing the energy performance gap (Fig. 1). It can be expressed as follows:

$$\Delta Qh\ real = 0.0009 * \Delta Qh\ theor^2 + 0.17 * \Delta Qh\ theor \quad \text{(equation 1)}$$

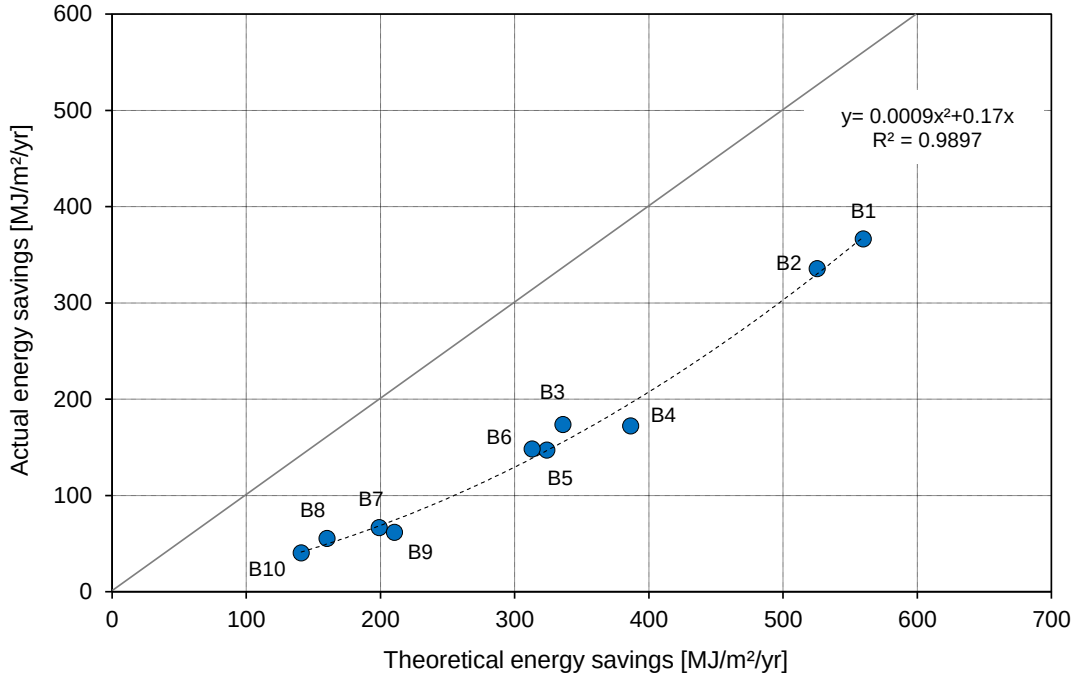

Figure 1: Actual versus theoretical savings of space heating demand, for 10 multifamily residential buildings.

This relation is established regardless of the nature of work carried out and can be viewed as a characterisation of the current retrofit and operation practices over a given period. Providing it is corroborated by additional case studies, this relation can be used as an average correction factor for the behaviour of users and entities involved in the retrofit, making it possible to estimate the actual savings based on theoretical savings.