WP4.3. Energy Performance Gap in building retrofit

Reasons behind the performance gap

Khoury Jad, Alameddine Zeinab (University of Geneva)

There are several independent and interdependent factors which can explain why retrofitted buildings do not perform as well as predicted. These factors can occur at different stages of the building retrofit process. Three parameter sets are identified in this study as the main causes for the discrepancy observed: i) inaccuracies due to the use of SIA standard values in the method to calculate the theoretical savings, in particular the unrealistic indoor air temperature and ventilation rates; ii) uncertainties in the input data used for the simulation and model limitations (e.g. design weather data, regulation type, shading factor, calculated surfaces, etc.) and iii) other factors related to quality of execution, operation, measurements and user behaviour (both occupant and energy operator).

In a first step, a sensitivity analysis is performed separately for 10 input parameters (set i and ii) and over 20 retrofit case studies. The analysis shows that the two most sensitive parameters are the indoor temperature and the air flow rates, which play a major role in the space heating demand calculation. It appears that each °C increase in the indoor temperature leads to a raise of the space heating demand by around 11%, whereas an elevation of the air flow rate of 0.2 m³/h.m² leads to an increase of about 17 MJ/m² (Fig. 2).

In a second step, the combination of the most sensitive parameters allows understanding the observed discrepancy between theoretical and actual energy savings. As a result, the performance gap can be divided into two parts as follows: the first represents the difference between the standard and optimal conditions of use; the second indicates the potential for optimization (difference between actual and optimal conditions of use).
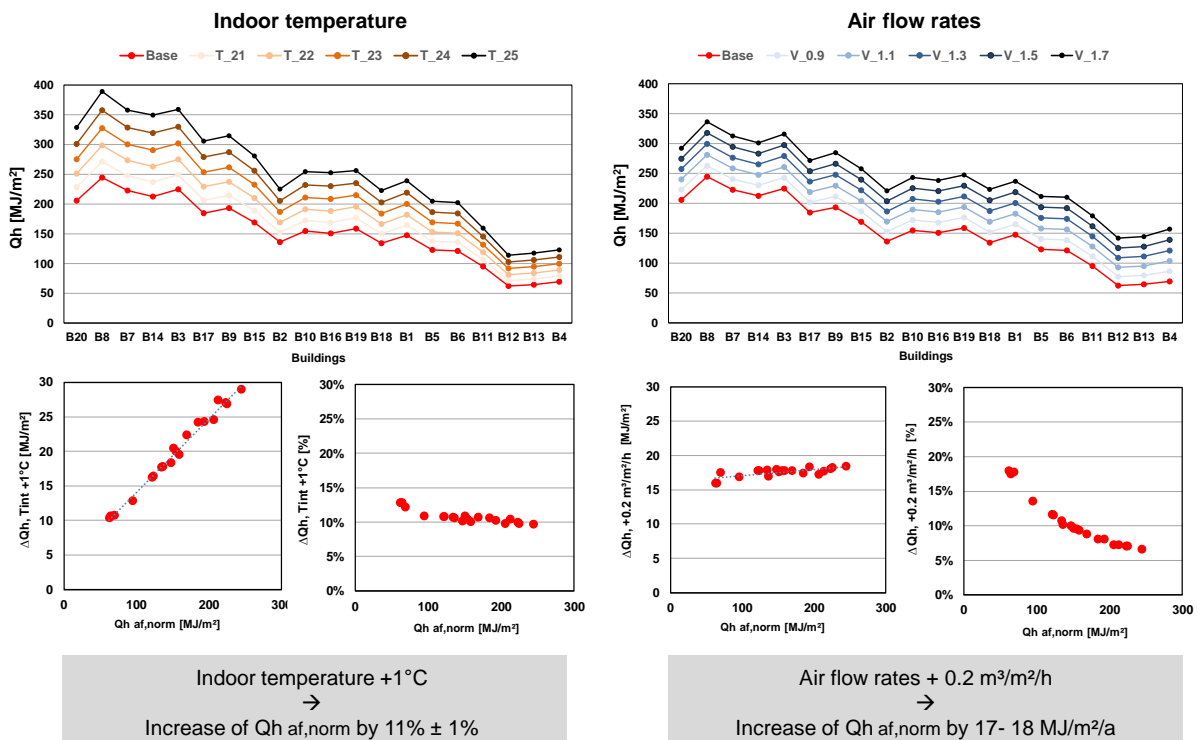

Figure 2: Sensitivity of space heating demand (Qh, model output) to various indoor temperature and airflow rates (results for 20 retrofit case studies B1- B20)