Abstract

The Passive House standard represents perhaps the current state-of-the-art in low-energy building design. It is often hailed by its advocates as a cost-optimal standard to be applied to both new and existing dwellings in order to achieve Ireland's energy and CO_2 reduction targets. However, meeting the rigorous standards of Passive House in existing buildings is demanding and generally requires significantly-higher initial capital investments. This paper summarises a research study involving an investment appraisal of an individual dwelling retrofit constructed to the Passive House standard. The research aim was to determine if the Passive House standard could become a cost-optimal model for the deep-retrofit of Irish dwellings. The problem was investigated using energy analysis (DEAP v3.2) and Life Cycle Cost Analysis tools (BLCC5), applied to a real-life case study Passive House dwelling retrofit project. Total life cycle costs for the baseline (pre-retrofit) dwelling, the Passive House retrofitted dwelling, and a range of alternative retrofit scenarios were computed. An economic appraisal using Life Cycle Cost Analysis, together with sensitivity analysis, demonstrates that the deep retrofitting of an existing dwelling to the Passive House standard can become cost optimal, if longer investment periods (≥ 43 years), lower discount rates (≤ 2.6%), or higher fuel inflation (≥ 7%) are considered.

Keywords:
Low-energy Retrofit, Passive House, Cost-Optimal, Life Cycle Cost Analysis.