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Abstract

The majority of single-family houses in Sweden are affected by deteriorations in building envelopes as well as heating, ventilation and air conditioning systems, since they are about 30 years old. These houses are therefore in need of extensive renovation, which provides an excellent opportunity to incorporate energy efficiency measures to reduce both the energy consumption and also operational. Although former studies analyzed the cost effectiveness of various renovation packages, they mainly excluded the evaluation of energy price implications on cost effectiveness of different renovation package in Sweden. Accordingly, this study considers three energy prices and quantifies the payback period (PBP) and internal rate of return (IRR) of the packages, when renovating a single-family house in Sweden. The renovation packages included three distinct energy supply systems, commonly installed when implementing energy renovations: ground source heat pump (GSHP), photovoltaic solar panels (PV), and an integrated GSHP and PV system. The analyses of results show that the GSHP system provides higher IRR and the lowest PBP compared to the other two renovation packages, due to its high performance in reducing energy consumption and its relatively low investment cost. Furthermore, results show that raising the energy price can increase the IRR and reduce the PBP of the renovation packages and respectively. Moreover, increasing the interest rate adds on PBP of renovation packages, since it depreciates the cost for saved energy.