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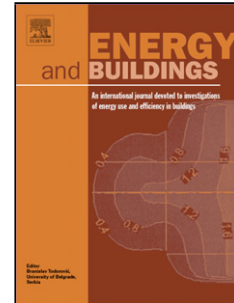
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Life-cycle cost analyses of heat pump concepts for Finnish new nearly zero energy residential buildings

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Highlights

- LCCs of heat pump based nZEB concepts of Finnish buildings were calculated.
- Altogether 28 concepts were analyzed and 36 sensitivity analyses were made.
- Ground source heat pump concepts proved to be the most economical.

Abstract

During the recent years in Finland, there has been a clear trend that ground source heat pumps are the most widely used main heating source in new detached houses. In addition, other heat pumps have been installed as a supporting heat source and/or to provide cooling. Similar trend cannot be seen in new apartment buildings but heat pumps could be utilized more widely also there.

Going towards nearly zero-energy buildings (nZEBs) is a new opportunity for heat pumps. The nZEB concepts often combine passive structural solutions and renewable energy production. This paper analyzes life-cycle costs (LCCs) of different heat pump based nZEB concepts for a Finnish new detached house and a new apartment building. The concepts included different heat pumps without and with solar systems. For the apartment building, district heating based concepts were also included as a reference.

For both building types, the LCCs were the smallest with the ground source heat pumps (GSHPs) followed by the air-to-water heat pumps. For almost all concepts, the LCCs were bigger for the solar included concepts. The economic order of the solutions did not change when the results were sensitized but the GSHPs were proven to be the most economic alternatives.

Keywords

heat pump, nearly zero-energy building (nZEB), life-cycle costs, residential building, Finland, case study

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