

The Life Cycle Energy Consumption of Zero-Energy Houses



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Title of the Paper

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Form of Presentation

- Poster
- Presentation

Short Description (maximum 2500 characters)

Taking the building sector's huge impact on the environment into consideration, the European Union aims at 'nearly zero-energy' buildings by 2021, imposing strict requirements for the (non-renewable) operational energy consumption. The life cycle energy consumption of these nearly zero-energy buildings is an aspect of growing interest, encompassing both the life cycle embodied energy and end-of-life energy in building products, and the operational energy use throughout the building service life. Moreover, in Belgium zero-energy houses have to meet the passive house requirements in order to enjoy tax benefits. This contribution examines the life cycle energy consumption for various scenarios of zero-energy houses by means of life cycle analysis, thus revealing whether passive house requirements are useful for the Belgian context from the perspective of life cycle energy consumption. For the various zero-energy house scenarios, an analysis is also provided of the contribution of the different components, such as building construction materials and building services, to the total life cycle energy consumption.

Results reveal that a zero-energy house roughly consumes 2 to 4 times less non-renewable life cycle energy than a typical Belgian passive house, and 3 to 5 times less than a house following current standard building practice. Secondly, the results demonstrate that there is no clear distinction in favor of either passive or standard zero-energy house scenarios. In essence, the lower embodied energy in building services in the passive house scenarios counterbalances the higher building construction embodied energy and vice versa for the standard house. As a conclusion, passive house requirements are not considered a useful or essential criterion for zero-energy houses from a life cycle energy point of view. The research however reveals that the choice of building construction materials and of building services types are the determining factors for the life cycle energy consumption. Large energy savings up to 30 kWh/year/m² can be obtained through a proficient choice of building materials and building services for zero-energy houses. Regarding the embodied energy in building constructions, a timber frame house and massive brick house can be equally

energy efficient. For the embodied energy in building services, the embodied energy in wood pellets and in photovoltaic panels are of major importance.