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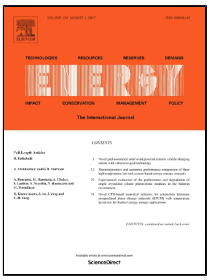

Window model and 5 year price data sensitivity to cost-effective façade solutions for office buildings in Estonia

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Window model and 5 year price data sensitivity to cost-effective façade solutions for office buildings in Estonia

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Abstract

This study provides information about development of cost-effective facade solutions during the last 5 years and illustrates the importance of different variables such as accuracy of window models, construction costs, energy prices, interest rate and inflation. The cost-effective South, East and West facade solutions were triple windows with window-to-wall ratio 22-40% and external wall mineral wool insulation thickness 150-200 mm, whereas larger windows could be used in the North facade. The economic variables and construction price changes have had the largest influence on the analysis of cost-effective facade solutions. Lowest energy use was achieved with large quadruple windows and automated external venetian blinds with an advanced control algorithm. Wider market uptake of efficient window solutions could allow more architectural freedom from the point of view of energy-efficient and financially feasible facade design. Using detailed window models instead of standard windows did not influence the cost-optimal facade solutions, but had energy and load effects in both directions.

Keywords: Energy simulations; cost-effectiveness; net present value; windows; glazing; façade design; energy efficiency

Highlights

- Window models did not affect cost-optimal solutions despite differences in energy use
- Triple windows with WWR 25-40% were cost optimal in South, East and West facades
- North facade tolerated larger triple windows with WWR 40-60%
- The economic situation and construction cost influenced cost-optimal solutions most
- Lowest energy use was achieved with quadruple glazing and automated external blinds

1 Introduction

Several countries in the European Union require making energy simulations to prove new buildings compliance with energy performance minimum requirements. It is reasonable to use the energy model of a building under design to optimize architectural and technical solutions. Simulation-based analysis helps to minimize energy use or reach a certain level of energy efficiency at lower cost. However energy and financial calculation results always include a certain degree of error due to simplifications made in the methodology and simulation models and in addition aspects that we cannot predict very accurately such as the occupancy profile or the economic situation. Some of these errors may affect the choice of