



Reducing the financial risks of the performance gap caused by Occupant Behavior in Energy Performance Contracting

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Chair: Building performance

Introduction

Building owners are becoming more aware of the benefits of having low-energy buildings. But investing in sustainability is expensive and therefore not always achievable. Energy Performance Contracting (EPC) could offer a solution. In an EPC agreements are made between an Energy Service Company (ESCO) and the building owner about the energy conservation measures that will be taken to lower the future energy use of the building (see figure 1) [1, 2]. The savings can be split between the ESCO and the client which makes it profitable for both parties. But sometimes the actual energy use is due to uncertainties higher than predicted, which is also known as the performance gap [3]. The financial risks often go to the ESCO.

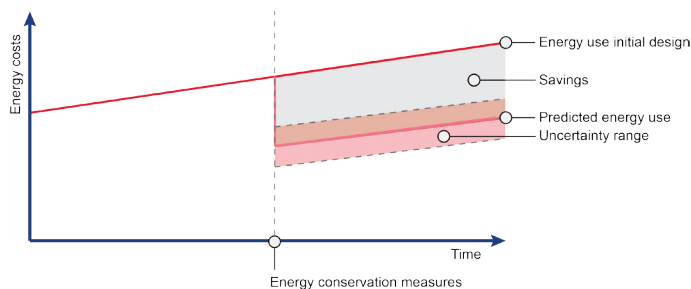


Figure 1: Scheme of the basics of Energy Performance Contracting

However, the performance gap cannot always be attributed to the ESCO. It can for example not influence whether people turn on the lights or lower the blinds. While it is generally known that Occupant Behavior (OB) has a large influence on the total heating or cooling energy use of a building [4]. Therefore more knowledge about OB is needed to reduce the financial risks for ESCOs. One way is to make better predictions of OB, however uncertainties will always remain. Another way is to quantify a building's sensitivity to OB and adopting the results in EPCs.

For the sensitivity analysis, the usability of the newly developed Impact Indices (II) method will be tested [5]. It is supposed to be quicker and easier to use than the local and global sensitivity analyses, while it still takes the interactions between inputs into account [6]. Instead of being case-specific, this method could offer generalization based on the simulation results. Also its possible application in Energy Performance Contracting will be analyzed.

This leads to the following research questions:

- How is Occupant Behavior included in Energy Performance Contracts?
- Is the Impact Indices method a convenient alternative to quantify a building's sensitivity to Occupant Behavior?
- How can the financial risks in Energy Performance Contracting be reduced by using this method?

Research objectives

- Create awareness about the effect of OB on a building's total heating and cooling energy use
- Reduce the financial risks caused by OB by adding clauses to an EPC and by making steps to follow for realization or renovation of a building in an OB-proof way

Method

The Impact Indices (II) method is based on the heat balance. The output of the heat balance is used to create formulas for calculating an II, and it will be calculated for blinds use, equipment use, lights use, presence, and the heating and cooling setpoint.

In figure 2 the different steps of the method can be seen. First the II method will be tested in IES VE by using the BESTEST base case 600 to understand the basics of the method. Then the II method will be compared to the results of a local sensitivity analysis. This comparison is done to check whether the method is working in the expected way. Furthermore, several case-studies provided by Strukton WorkspHERE will be analyzed to their sensitivity to OB. The results will be used for the final step of reducing the financial risks.

References

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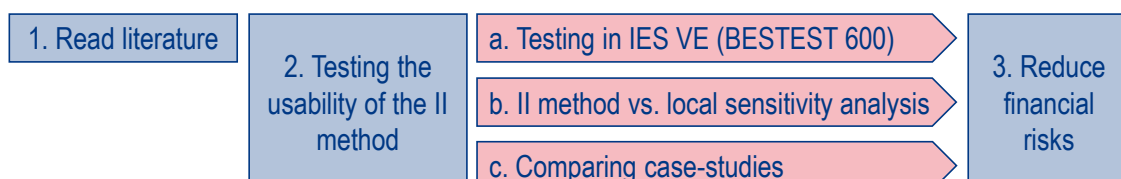


Figure 2: Method