

Calibration, monitoring and normalization aspects in energy performance improvement of commercial buildings

Summary

Tallinn University of Technology, School of Engineering, Department of Civil Engineering and Architecture, Nearly Zero Energy Buildings research group offer a 4-year PhD position in civil engineering.

Research field:	Building and civil engineering and architecture
Supervisors:	Jarek Kurnitski Martin Thalfeldt
Availability:	This position is available.
Offered by:	School of Engineering Department of Civil Engineering and Architecture
Application deadline:	Applications are accepted between September 01, 2020 00:00 and October 02, 2020 23:59 (Europe/Zurich)

Description

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Today, there is large existing building stock in Europe which is waiting major renovation to nearly zero energy buildings according to aims set in the EPBD directive that are to be implemented according to national Long Term Renovation Strategies and a European Green Deal Renovation Wave by 2050. While in Estonia and some other countries renovation grant systems and standard renovation practices exist and are widely used for residential buildings, non-residential buildings have become a subject of substantial energy performance improvement first time in the history. Therefore, it is important to build understanding about the starting point, i.e. current market driven renovation works and corresponding energy performance which is likely far behind from new targets.

Energy use of commercial buildings depends by large extent on HVAC systems, processes, occupancy and operation time of the buildings. Energy use patterns are highly dynamic and proper energy calculation input data is needed for meaningful energy simulations. Calibration against metered data and normalisation for a test reference year and standard use are important issues which need methodological development in order to be able for reliable predictions of high performance solutions.

The main research objective is to develop energy simulation based methodology and monitoring to improve the accuracy of design and performance assessment of cost-optimal buildings.

Research effort should focus to following topics:

1. State of art analyses of energy use in existing commercial buildings and for identification of common market driven renovation solutions
2. Implementation of the office building energy simulations with input data from national regulatory methodology and based on actual performance and user profiles
3. Analysing the building automation system information output in several office buildings in Estonia and conducting measurements of energy and indoor climate components, to evaluate the accuracy of BACS data
4. Development of cost-optimal solutions and energy simulation methods for commercial buildings
5. Development of climate and standard use normalisation methods including benchmarking with existing degree day method

Research tasks will include data collection and measurements from existing buildings, energy modelling and simulations, input data and methodology development, and simulated and measured performance comparisons.

Qualifications

The applicants should fulfill the following requirements:

- Master degree in the field of HVAC or energy performance of buildings;



- Some experience in energy simulations and indoor climate analyses in buildings



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