

EDITORIAL

Dear Reader,

After one year of project implementation we would like to welcome you to the second newsletter of the "German and Polish Energy Efficiency Project"! We are pleased to inform you about our current research activities, about events which were organized or which are planned in the framework of GPEE and about the first publication undertaken as part of the project.

On the next pages, current research activities carried out within GPEE concerning technical solutions of optimized facade systems will be described further and the recently developed "Energy Efficiency Mapping Tool" will be introduced. You will also be given additional information about the GPEE Specialist Seminar 'New Trends in Energy Efficient Facade Technology' which took place in Hamburg on 12 February 2014.

The 18th of June 2014 should already be highlighted in your calendars: GPEE is organizing a seminar dedicated to 'Planning for Energy Efficient Cities' as part of the EU Sustainable Energy Week EUSEW 2014! We look forward to seeing you there!



Maria Kowald



Prof. Dr. Walter Leal



Kathrin Rath

1ST PUBLISHED PAPER

On 3rd April 2014, the first GPEE paper on 'Simulation Assistance and Data Analysis for the Performance Evaluation of Buildings' was published and presented at the 8th International Conference Improving Energy Efficiency in Commercial Buildings (IEECB' 14) in Frankfurt, Germany.

The conference took place during 'Light+Building', the leading trade fair for architecture and technology, in Frankfurt, Germany. Light+Building is the number one industry event in 2014 for all experts involved in the conception, planning and management of buildings. The trade fair combines all sectors related to building design. The theme of Light+Building this year was 'Explore Technology for Life - the best energy is the energy that is not consumed'.

The GPEE paper explores the analysis of building energy performance. Modern, low-energy office buildings are a composition of several advanced components of constructions and systems. That is why the energy efficiency depends mainly on the management system that controls the building operation. The paper describes a case study at the Lodz University of Technology which uses an office building of the university as test bed. At this building, information for the control system was gathered with an ESP-r based simulation approach. Additionally, the energy monitoring of the building was managed with an open source software to gain comparable data. As a conclusion, an evaluation was made to compare the results of the simulation and the measured energy data.

Enjoy reading!

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FACADES

Existing university building marked out for installation

TECHNICAL SOLUTIONS FOR OPTIMIZED FACADE SYSTEMS – FIRST APPROACHES

The main research focus of the GPEE project is being examined at an office building of the Lodz University of Technology. Out of a standard 70s building, two rooms have been equipped with research facade technology, one at the east side of the building and one at the west side. Each experimental room has a reference room next to it without any energy saving technology. One of the project's research targets is to develop solutions to decrease energy demand for heating and cooling systems with the help of a rain-screen cladding facade system. Moreover, the right proportion of glass and opaque facade components provides a high level of indoor comfort.

Within the GPEE project, research is currently concentrating on thermal insulation material and building integrated photovoltaic (BIPV) facade technology:

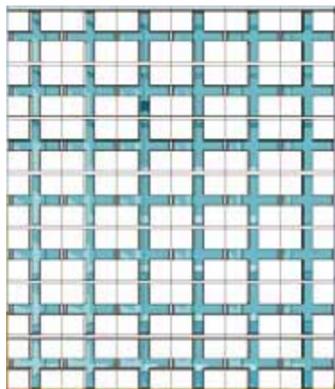
» Thermal insulation material

For the GPEE project, we decided to work not only with traditional insulation materials such as mineral wool or polystyrene, but to also add special Phase Change Material (PCM) to the insulation layer. As this material is not yet widely established, it will be analysed intensively in this project. The most important property of this material is the almost isothermal heat storage potential at desired temperature – melting point. The thermal storage by the PCM is based on a change of phase from solid to liquid while external heat is absorbed (e.g. during the day). Latent heat is released during change of phase from liquid to solid again while external temperatures decrease below the specific melting point. Therefore, the position of the PCM-layer in the facade has to be taken into account. Different boundary conditions need to be considered if it is positioned at the inner or at the outer part of the facade. Another question is whether to integrate PCM into the insulation material or to use it as a separate layer. Numerical

simulations are still in progress to design an original PCM-composite, taking into account the seasonal temperature fluctuation.

» Daylight utilisation and BIPV facade technology:

Building Integrated Photovoltaic systems (BIPV) are a further possibility for creating not only a passive facade but an active system that even provides energy for electricity demand. The challenge with this facade element is maximizing the power supply of PV Systems. The aim of the initial step of numerical investigation is to find the best solution, taking into account temperature stability of PV modules. Analyses in this regard are still in process.



Selected architectural facade concept

Another aspect of optimized facade systems is daylight utilization in combination with visual comfort. Due to the fact that the demand of cooling and heating energy due to solar radiation greatly depends on the magnitude of the transparent part, research as part of the GPEE project also concentrates on the evaluation of daylight availability for different window areas. Therefore, research is important in order to determine the most reasonable size and most suitable placements of windows.

OPTIMIZED FACADE SYSTEMS – THE ASPECT OF SUSTAINABILITY

The target of GPEE is not only to develop a zero emission building facade, but also to find the most environmentally friendly solution. Therefore, the whole life cycle of all facade material is analysed, including long term environmental impacts. The Life Cycle Assessment (LCA) will be calculated to develop a sustainable facade. All environmental impacts of the analysed facade components are evaluated with the MIPS tool (Material Intensity per Service Unit).

The facade can be constructed from six different previously designed panels. The goal of the research is to calculate the optimal number of each panel to be used on the facade. The optimization results will be calculated for two facades of the same size but different orientation.



The main components of future experimental facades: construction, insulation and external covering

ENERGY EFFICIENCY IN BUILDINGS – GPEE IMPLEMENTS ENERGY EFFICIENCY MAPPING TOOL

To analyse the potential for improvement of energy efficiency in buildings, many buildings must be examined in order to obtain a representative statement. In order to do so, a standardized tool for the benchmarking and analysis, the so called 'energy efficiency mapping tool' was developed based on the open source energy monitoring software JEVIs. The data input of the energy efficiency mapping tool will be the manual meter readings done by volunteers interested in contributing to the research on global energy efficiency potential. By implementing this tool, GPEE addresses the challenge of assessing a sample of buildings to determine areas where energy efficiency in buildings can be improved.

To motivate interested tool users to provide manual meter readings continuously, the GPEE project offers a smart web application, which can also be used via smartphone. To allow an easy meter reading of the main electricity and heating meter and to monitor the indoor temperature using the temperature sensor included, a tough GPEE metering-sticker is provided upon registration.



GPEE monitoring-sticker

All tool users will be able to view their data themselves via the energy efficiency map tool as well as getting automated energy efficiency reports periodically.

For more information please go to: www.gpee.net/en/tool



Audience at the GPEE Specialist Seminar

GPEE SPECIALIST SEMINAR 'NEW TRENDS IN ENERGY EFFICIENT FACADE TECHNOLOGY'

On 12 February 2014, the GPEE Specialist Seminar on 'New Trends in Energy Efficient Facade Technology' took place at the premises of Ausbildungszentrum-Bau in Hamburg GmbH. Speakers from Poland and Germany presented actual research results and implementation approaches, but also recommendations with regard to future facade technologies. In addition to an outline of innovative building components for zero-emission buildings by Dr. Dariusz Heim (Lodz University of Technology) a status report on the German market for thermal insulation was given by Peter-M. Friemert (ZEBAU GmbH, Hamburg). The impact of building management systems on energy efficiency of buildings was very vividly presented by Adrian Sienicki, also from Lodz University of Technology. Jan Gerbitz, project coordinator at IBA Hamburg GmbH showcased some good examples of sustainable, energy efficient and energy producing facades at IBA Hamburg. The Seminar was topped off with an overview of activities towards energy efficiency in buildings in Poland by Dr. Aleksander Panek, Warsaw University of Technology. Prof. Dr. Walter Leal, coordinator of the German-Polish project GPEE, pointed out, that 'specifically the development of innovative facade technology makes a significant contribution to the improvement of energy efficiency in buildings and therewith also to climate protection in cities'.

Around 50 participants from universities, private companies and public institutions attended the seminar.

The presentations held during the seminar are available at: <http://www.gpee.net/en/download/>

GPEE CONTRIBUTES TO EU SUSTAINABLE ENERGY WEEK EUSEW 2014

Europe's leading sustainable energy event is a European Commission initiative which invites public, private and academic institutions to engage in helping to meet the EU's energy and climate goals by organizing special events dedicated to the topic of energy saving and energy efficiency in one specific week.



Wälderhaus, Hamburg

For this purpose, HAW Hamburg is organizing an 'Energy Day' on 18 June 2014 at the Wälderhaus in Hamburg, Germany. Under the heading 'Planning for Energy Efficient Cities – Examples out of International Research Projects', representatives of the GPEE project and the EU funded project PLEEC (Planning for Energy Efficient Cities) will present current research results and activities to a wide audience.

The programme of the Energy Day will soon be available at:

<http://www.gpee.net/events/gpee-events.html>

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CALENDAR

» **Planning for Energy Efficient Cities
– Examples from International
Research Projects**

18 June 2014

Hamburg, Germany
Energy Day as contribution to EU
Sustainable Energy Week EUSEW 2014
www.gpee.net/events/gpee-events.html

» **BSO 14**

23-24 June 2014

London, Great Britain
Conference on Building Simulation and
Optimization
www.bso14.org/

» **Heat Transfer 2014**

2-4 July, 2014

A Coruña, Spain
International Conference on Simulation
and Experiments in Heat Transfer and its
Applications
[https://www.wessex.ac.uk/14-conferences/
heat-transfer-2014.html](https://www.wessex.ac.uk/14-conferences/heat-transfer-2014.html)

» **Baltic University Programme (BUP)**

16-20 September 2014

Nitra, Slovakia
Summer Course on "Energy Efficiency"

» **POLEKO 2014**

14-17 October 2014

Poznan, Poland
International Trade Fair of Environmental
Protection
<http://poleko.mtp.pl/en/>

THE GPEE PARTNERSHIP

The following partners form the GPEE partnership:



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