

Interreg



CENTRAL EUROPE

European Union
European Regional
Development Fund

ENERGY@SCHOOL

STUDY VISIT REPORT

D.T.3.3.1 Study visit

Version 1
27 11 2018

Edited by :

LP UCBR by Naxta

LHS





ENERGY@SCHOOL- ENERGY OPTIMIZATION AND BEHAVIUR CHANGE INTO SCHOOLS OF CENTRAL EUROPE<< CE744

Study visit Report

Theme of the study visit:

Presentation of the experiences obtained in the field of refurbishing an existing school to the level of a plus energy building and visiting of a school involved in the Energy@School Project.

Partner in charge of the organization:

City of Stuttgart (PP9)

1. Venue of the study visit and general comments

The study visit took first place in the Uhlandschool. Its modernization is one of three realized plus-energy schools in Germany, but the only refurbished one and not new built. It is a model on the way to the sustainable supply of energy for buildings. The second part was the visit of the Ferdinand-Porsche-Gymnasium, a school taking part at Energy@School, where pupils presented their experiences within the project.

2. Purpose of the study visit

The purpose of the study visit was to exchange experiences in the refurbishment of an existing school to a plus-energy level with its building physics and its energy concept. In addition, the influence on the students participating in the Energy @ School project should be shown.

3. Program

Time	Program
10:00	Meeting at the town hall
10:00 - 10:30	Transfer to plus energy school (Uhlandschool)



10:30 - 11:00	Coffee break
11:00 - 12:00	Visiting plus energy school (Uhlandschool)
12:00 - 12:30	Visiting school involved in E@S (Ferdinand-Porsche-Gymnasium)
12.30	Lunch or end of meeting

- Brief description (3000 characters) of the best practices adopted or in progress analyzed during the study visit (*contents description, please add also some pictures*)

Uhlandschool

The Uhlandschool is one of 160 schools in Stuttgart. It is a primary and secondary school with 450 students. The main building, the pavilion and the gym were built in 1954, the extension building in 2004.

The research project began in December 2009, the renovation work started in 2013 and ended in 2016. The school started operation in March 2017. The goal was to reconstruct the school to a plus energy school. This means that the school will consume less energy on average than it will generate during a year.

The ambitious goal of modernization took place with the help of scientific support. Problems and factors for success were precisely analyzed by experts and led to a solution. The manufacturers implemented and combined numerous innovative elements for the first time in this project.



Figure 1: Presentation of the Uhlandschool



The Federal Ministry for Economic Affairs and Energy supported the project as well as the companies Robert Bosch and Saint-Gobain as industrial partners. The Fraunhofer Institute for Building Physics scientifically accompanied the research project.

In order to minimize the heating demand, highly efficient insulation materials for the building envelope were used. Vacuum insulation panels were installed in all floors next to the substrate and in the roof area as well. In the facade insulation, it is a mix of a new type of expanded polystyrene with optimized thermal conductivity, mineral wool for fire bashing and likewise vacuum insulation panels. The pipe routing, such as for rain gutters and lightning protection, is integrated into the thermal insulation. The windows contain a new type of decolored float glass and are triple glazed. They have a krypton filling and an optimized composite frame. With them, thermal bridge losses are minimized. Thanks to the modernization, heat losses via the building envelope was reduced by 80%.

The remaining energy demand is covered by locally available renewable energy, by solar and geothermal energy. A PV system on all of the roofs areas facing south as well as the parapet area on the south façade of the main building creates the power needed for the school.

The heat demand consists of room heating and hot water and is completely covered by four heat pumps via geothermal heat. The field of geothermal probes comprises 52 probes and is primarily located north of the main building. The probes are laid in with spacing of 8.5m, respectively, and have a depth of 90m. The heat transfer in the rooms is done by a low-temperature radiant panel system via capillary tubes, located in the ceiling and the parapet area of the wall. In summer, this structural component tempering supports regenerative cooling as well. Central hot water heating was dispensed with to the greatest extent possible.

Ventilation in the building takes place via a hybrid ventilation system. De-centralized ventilation devices with highly efficient heat recovery of at least 90% are built into all classrooms. Need-based ventilation takes place through the measured CO₂ concentration in the respective room. The rooms can be simultaneously ventilated via the windows. In the summer months, mechanical ventilation should be turned off. A sun protection system prevents overheating in the summer and has a light guidance function in the upper third of the blind to sufficiently provide daylight to the classrooms. At the same time, a system for automatic cross ventilation is installed.

The lighting of the main building is supplied by LED light technology. One differentiates between areas with high-quality lighting tied to a workplace and generally lighted areas. The amount of lightness is regulated by LED luminaires controlled by daylight and presence.



Figure 2: Geothermal heat pumps in the cellar of the Uhlandschul

Ferdinand-Porsche-Gymnasium

The Ferdinand-Porsche-Gymnasium is a school involved in the Energy@School project. Two Junior Energy Guardians introduced the school's achievements in energy saving and introduced us to the school's climate change exhibition, which consists of 36 panels created by students themselves as part of the project. As an example, the energy savings of LEDs compared to light bulbs based on graphs and a metrological setup was illustrated. As users, the students exert a great influence on the energy consumption and often know in their buildings, where and when which energy can be used or saved. In Stuttgart, the schools receive prize moneys depending on the amount of activities carried out and the energy savings achieved. Thereby, the Ferdinand-Porsche-Gymnasium earned a prize money of 1.350€, which they can spend for their own purposes. These price moneys were partly used to build the school's own PV system, which was also shown during the study visit.



Figure 3: Achievements of the Ferdinand-Porsche-Gymnasium presented by JEGs



Figure 4: PV system on the roof of the Ferdinand-Porsche Gymnasium



5. Topics discussed during the study visit in line with the project objectives

- Refurbishment of a school to a plus-energy level
- State of the art of thermal insulation
- Geothermal heat pumps
- State of the art building equipment, especially lighting and ventilation
- Energy savings in schools

6. Target groups of the study visit

PPs, SEGs, Energy Engineers

7. Brief description of the participants (*please include some pictures*)

Project partners of Energy@School, Municipality Employees, SEGs and JEGs



Figure 5: Participants in front of the Ferdinand-Porsche-Gymnasium



Please answer to the following questions as partner in charge of the study visit organization:

1. How the study visit contributed to the exchange of experiences between the participants

The study visit gave the participants the opportunity to participate in experiences in the refurbishment of an existing school to a plus-energy level and the requirements needed to come up with that standard. Also best practice of JEG activities were shown.

2. How the study visit supported the Senior Energy Guardians - if already identified - to the successful dissemination of experiences

It gave the SEGs the opportunity to get in touch with JEGs in Germany and to learn about the energy saving measures in the schools of Stuttgart.

3. How the study visit improved the know-how of the participants, thanks to the presentation of the best practices made by the visited companies/schools/others and the open discussion on a topic linked to the project

The study visit gave an overview about the maximum possible potential of building equipment and suggestions, possibly to carry out a similar project in their district.

4. Feedback collected from the target groups:

- a. Did the study visit meet your expectations?

The study visit met our expectations; there was many intersections with the Energy@School project.

- b. Was the focus of the study visit in line with the project main topic?

Yes, we visited a school that is a pilot project in the field of energy savings and a school involved in the E@S-project, which had great success in saving energy in the past.

- c. Have the participants been actively involved during open discussion sessions and in a feedback?

The participants were always allowed to ask questions and to discuss with each other and with the presenter.



5. Suggestion for the next study visit (organization, contents, timing, etc.)

Not too much standing.

Better Timing with the departure of the flights home.

Less coffee breaks.



EVALUATION FROM THE PARTICIPANTS

Please ask to one of the participants to fill in the following questions:

1. Did the study visit meet your expectations?

Yes, it did. We had the opportunity to be familiar with the newest RES solution adapted in 2 schools in Stuttgart. Hosts from City Hall of Stuttgart and schools' staff gave excellent lectures on their achievements and smart meters installed.

2. Have the visits been in line with the project topics?

As mentioned above, all spots we visited were connected with the aim and project topic.

3. Can the best practices be transferred also in your country?

It could be smart solutions adapted in school building - energy smart school system. In Poland we would like to start a similar project. We are looking for possible sources of funding.

4. Suggestions for the improvement of the next study visit?

Everything was OK.