REPORT – STUDY VISIT TO GERMANY

"BEST PRACTICE EXAMPLES – TECHNICAL ASPECTS OF ENERGY SAVINGS IN BUILDINGS" (D3.4)

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INTENSE

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1) INTRODUCTION

This year, during the Sustainable Energy Week traditionally organized by European Commission in Brussels at one of the great events happening at this big "knowledge exchange" event, one of the presenters was discussing low energy houses. At his speech he highlighted fact that there are technical solutions but what make difference, is to bring these technologies to people. Moreover, it was brought examples from front runners as Germany and Austria is. Then he asked what Austrians made differently that passive house standard is getting common and it is becoming leader at the market with passive houses in Europe. Immediately, he presented Austrian experience at his answer and it was said that behind a success story lies creation of network, kind of "passive house showing rooms", where people could get a feeling. A feeling of a low energy house or passive house.

Recently, there has been increasing demand for energy supplies in order to keep residential, commercial and/or public buildings and their overall inner-living environment comfortable. According to studies, the building sector is emerging as the biggest potential for energy savings. Therefore, to reach the maximum energy performance of buildings, while maintaining the lowest energy consumption level, requires a combination of various technical measures ranging from a building's foundations to its roof. In some cases, small technical changes can cause a huge difference in energy consumption. To explore these technical potentials, there is an activity as a part of the INTENSE project trying to bring better understanding how technical measures can help us to reach the overall goal and it is – "energy saving".

Within the framework of the Intelligent Energy Europe funded project, "From Estonia till Croatia: Intelligent Energy saving Measures for Municipal Housing in CEE – **INTENSE**" we organized a **study visit** in Germany "**Best practice examples – technical aspects of energy savings in buildings" – 15 June to 19 June, 2009**.

… to give a feeling to key stakeholders from CEE countries.

At the beginning of the report I would like to express our acknowledgment to and our gratefulness to all presenters and hosts, moreover we would like to thank to all participants for their enthusiasm and active participation.

2) FRAMEWORK of the STUDY VISIT

The first we at work package 3 (INTENSE project) we set out the frame and we defined a message which we want to deliver to participants. We have defined the following key aspects:

Who is our target group	
Country coordinators from INTENSE participating countries	Partner cities from INTENSE project, participant should deal energy issues

Key concept of the study visit
1) Present passive house standard
2) Present different types of buildings in a passive house standard
3) Present buildings elements
4) Present building materials
5) Include also low energy standard
6) Present passive houses in different stages of construction

Picture 2.1: Different building types but reaching the same standard – passive house standard or low energy standard

This concept was more in detail elaborated and we set out the final agenda with assuring experts and sites which we visited. For more detailed information see *Appendix 1. Detailed program of the study visit.*

Moreover, with the line of our concept we thought that there will be useful involve people more actively to make it more exciting and interesting. There was kept in mind that presenting detailed technical solutions and other technical aspects require to be presented in catchy way. Therefore we prepared study visit in an interactive way as a following:

On one hand, there were created tandems from country coordinators and they became rappourters of the day. On the other hand organizers from WP3 based on presented technical aspects and visited sites prepared set of questions which were asked of participants from municipality. This activity is related to criteria activity with the frame of WP3.

3) EXPERIENCE FROM GERMANY – day by day report

Monday, 15 June 2009
"District of the future created by sounds solutions"

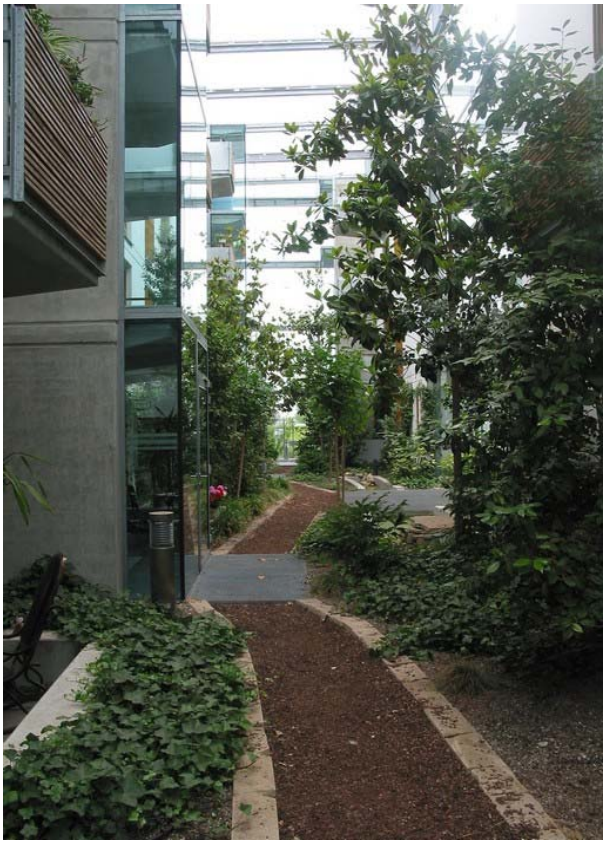
Day rappourters:
Irina Aleksejeva (Baltic Environmental Forum, Latvia),
Filip Čejka (REC, Czech Republic)

Opening of the study visit and welcome
Welcome: WP3 leaders and organizers.
Michal Tvrdoň, Jörg Faltin, Matthias Grätz opened the study visit and introduced to the goals and the agenda of this event. The WP3 leaders pointed out that the main aim of the project study visit is knowledge and experience transfer.
The participants made the introductory round.

Visited site: **Kronsberg district, Hannover, Germany**

Point of interest: **EXPO Housing estate Kronsberg**

- ca 2000 flats in low energy standard
- some of the buildings are quasi-connected by glass walls and by the fabric roof, providing shade in summer and sunshine in winter thereby sustaining milder climate conditions in the building entrance area; that allows the Mediterranean plant to be grown here as well as lowers the energy losses by the air-lock.



- the ventilation system is heat exchanger, but it's not installed in all houses.

- the rain water is held in the area of the housing estate by some little pounds and by maximisation of the natural rain water infiltration.

Point of interest: **Energy supply unit**

- combined heat and power supply unit
- consists of Caterpillar natural gas engine with 1.165 kW nominal output of the electric power (20 kV) and 1,656 kW nominal output of the heat energy
- the water is used for the heating system and domestic hot water of the housing estate Kronsberg
- the roof of the supply unit is equipped with photovoltaic field with ca. 5 kW nominal output. (see picture)
- the transmission losses is about 11% of produced energy.

Point of interest: **Solarcity housing estate**

- 106 flats for social housing
- equipped with 1350 m^2 of solar collectors on the roofs and 2750 m^3 underground hot water storage for the surplus
- the water is than used as domestic hot water and for heating

Point of interest: **Passive row houses, Sticksfeld str.**

- 32 flats in 4 row houses in passive energy standard
- average heat demand is 13 – 15 kWh/m^2/year

Tuesday, 16 June 2009

Holistic approach 1: long experienced research and training centre
holistic approach 2: energetic modernisation of a village

Day rappourters:
Konrad Kosecki (REC, Poland)
Sandra Oisalu (BEF, Estonia)

After arriving at the EUZ facility the group moved to a room in one of the EUZ houses to attend a introductory speech and presentation. Greetings and introductions were followed by a short speech given by mayor of the town of Springe, located in close vicinity of the E.U..Z facilities. Next, the group listened to a presentation given by the EUZ staff, about the complex, its history, its idea, mission and core activities as well as the technical developments in buildings of the EUZ complex. The presenters gave a short rundown of the Integrated Energy Concept, formulated by the EUZ and employed at the facility. The presentation was met with considerable interest, and members of the group asked the EUZ staff several questions, including specifics of financing and accounting at the EUZ (which is divided into a non-profit part and a commercial part), the efficacy of power generation at the facility and amount of power they input into the national grid and also about the technical specifics of the timber-powered heating system that the EUZ employs.
After the introductory session the group was split into two smaller teams, each of which went for a guided tour with one of the EUZ employees.
9:30 – beginning of the first guided tour. The group I joined was led by Mr. Welther, who was charged with a task of presenting to us the technologies used in constructing a passive house, according to EUZ know-how.
We began with a frank description of seven essential elements, that must be taken into consideration when building a passive house. These were:

- Proper insulation,
- windows,
- ventilation systems,
- air tightness,
- heating with solar power (either through panels or just by the means of natural light)
- energy efficient home appliances, bulbs etc.
- integrated planning and optimization of all construction elements,

We were then introduced to materials used by the EZ in constructing passive houses, some of which were actually an inventive use of age-old materials like hemp or a eco-friendly re-use of recycled materials like cellulose (obtained from paper waste).
Then we were shown technical and construction details of windows, designed to stop as much energy inside the house as possible (by the use of triple glazing), and fit in a way that prevents creation of thermal bridges and vapor condensation.
Next step in constructing/retrofitting a passive house is to make sure that it is airtight and there are no cracks and leakages that will allow an uncontrolled air circulation. To this end, the whole building envelope is layered with a special fabric

that covers all leaks. The fabric is a membrane that reacts to humidity/temperature, allowing for optimal performance in different weather conditions.
To check the air tightness of a building, the EUZ employs a Blower Door Test. The idea of the test is to measure volume of air that leaks into the building in a unit of time. This is achieved by installing an electric fan in the door (or a window). The fan the siphons the air out of the building. This leads to a decrease in air pressure inside. A pressure difference of 50 hPa is used to take measurements of the test. By dividing the rate of air exchange during the whole experiment (in m3/h) by the volume of the whole building (in m^3) we obtain a value that shows how much time is required for a total air exchange, i.e., how air tight the building really is. When conducting the Blower Door Test devices like a smoke-emitter and infrared camera may be of great help in locating the actual leaks in the building envelope, through which the air from outside enters the house.
After the Blower Door test, we were shown the ventilation system required for a passive house. It is fitted with an air-to-air heat exchanger, that allows for 90% heat conservation. The air from the outside enters the system, is warmed in the exchanger and then is distributed by a system of tubes to all "living" areas (rooms, bedrooms etc.). Used air from the inside is siphoned out of the house from "functional" areas, like bathrooms, kitchen etc.

Second half was dedicated to technical solutions in retrofitting and renovating existing buildings (including old houses of historic value) to modern-day, energy efficient standards.
Firstly, we were shown materials and solutions that can be used to improve the insulation of traditionally constructed houses. Samples of various insulating materials and their properties were shown, together with sample of technologies, that can be used when dealing with traditional building materials like bricks or wood. The group also learned that new windows should be installed in the new, retrofitted insulation instead of old building frame, as this prevents thermal bridges and related problems. Also, new insulations should be protected from humidity from the inside by the use of special membranes.
Following that we moved to the main EUZ building, built in 1928 and now protected as a cultural monument. Because of that reason this building couldn't be retrofitted with outside insulation, which called for special solutions in installing inside insulation and protecting the walls from rainwater and humidity. This inspired comments from the group, who stressed the fact that in different climate zones different technical solutions may be required.

Inside the house we were also shown early example of vacuum insulation, where ready-made wall segments with a 4 cm of vacuum inside are used to insulate the walls. Such elements have insulation properties equal to 20 cm of typical insulating materials. However, they are of standard sizes, which makes them difficult to use in existing houses where sizes and dimensions of rooms can vary greatly.
Inside the house the group was also shown a scheme of the whole EUZ facility with all heating, ventilation, water storage etc. systems.

The foundation NeuErkerode is 140 years old and their concept states- "A place to live" ("Ort zum Leben"). The village is meant for people with mental disabilities and the main idea is to give them a place to live and also work according to their needs. In general it is a village like any other but just some people are a bit different.

In the village live 840 people with mental disability and workplaces have been provided to them (art, handicraft, etc.). It has different facilities – integrated medical/psychological services, meeting point, education house for staff, special school, kindergarten, swimming pool, 2 retirement homes, etc. The village also has a biogas plant, which is supplying 25% of heat energy.

The village consists of 54 houses and the total area is 517 500 m^2. Consumption has been so far following:

- Heat, warm water – 16 500 00kWh in 2006with costs of 750 000 euros per year
  - From this 2 200 000 kWh from biogas plant
- Water consumption – 72 000m^3 with cost of 320 000 euros per year

The project "NeuErkerode 2015"

Due to these high costs the idea came to make an energy and ecology project called "NeuErkerode 2015". The main ideas of the project are to:

- save up to 80% of electricity and heat
- reduce energy costs at least 50% (starting point – costs were 1,3 million euros per year)
- reduce CO_2 emissions
- be a "lighthouse" project
- future aim – energy completely from renewables. At the moment the main idea is to save energy and the next step would be moving more and more to renewables. Currently there would also not be enough biomass to satisfy the total need.

The first project started in March 2007 and then one house (Elm House) was reconstructed. The second project started in May 2009 and in frame of that other 53 houses will be reconstructed - with 2 houses they have started and these two were also shown from outside.

Elm House

In more detail Elm House (Haus Elm) was introduced. It was built in 1972 – that was the time when 1 l of oil cost 10 cent. That means that walls were thin, foundation was thin, windows were made of aluminum and the consumption is 33l per m^2. In average German houses have consumption of 12l/m^2 and new buildings 2-3l/m^2. The area of the house is 1200 m^2.
The house was opened after reconstruction in February this year and now it has consumption of 8-9 l/m^2 – which was achieved by following steps:

- installing triple glass windows with very thick warmth insulation – 60 cm from outside (before it was 20 cm)
- exclusion of thermal bridges in the whole building (insulation is that good that even snow does not melt on the roof of the house)
- intelligent control and feedback control systems (i.e. special doors with airlock; when opening windows radiators stop warming e6tc.)

The ventilation factor of the house is 0,8 (80% of the air is exchanged in an hour) – that high rate is needed because of the specialty of the inhabitants.

Total reconstruction cost of Elm house was 2 million euros out of which total energy cost was 1 million euros.

With these measures the heat consumption was reduced for 80%. That experience will be transferred to other 53 houses.

Wednesday, 17 June 2009

"Frankfurt a.M. as a leading European city in planning and building of energy efficiency in buildings"

Day rappourters:
Irena Brnada (REC Croatia),
Zdravko Georgiev (SOFENA)

Frankfurt - called also "a City of energy efficiency, passive houses, electricity saving and co-generation" - is a city with cca 670.000 inhabitants, a concentrated inner part with high-rise buildings and a historical mediaeval center, big rural parts, and a forest in the south as integral part of the city. Thanks to that 'green belt', it was possible to integrate the airport inside the city area, providing a lot of jobs (but also noise pollution).

Dr. Werner Neumann, Head of Frankfurt Municipal Energy Agency (*Energiereferat,* 100% in municipal ownership), presented in detail the Energy and Climate Saving Concept of Frankfurt and the principles of energy management of public buildings applied. He informed that the *Energiereferat* was founded as part of the City's Environmental Department in 1990, with the aim to set up and implement the Energy and Climate Saving Concept. The City, as a founding member of the "Climate Alliance", has set an aim of reducing CO2-emissions by 50% until year 2010. The work is concentrated in 3 main fields:

- office buildings and electricity saving
- energy planning and CHP
- residential buildings and renewable energies

Energy and Climate Saving Concept of Frankfurt focuses on three main aspects:

1. EE and energy saving - 90% of energy could be produced within own region, no need for big power grids to bring energy from far away
2. CHP co-generation - biggest saving potential. Framkfurt's *Energiereferat* collected information on several thousand CHP plants in Europe, which present a big potential. Sizing according to needs is crucial in order to avoid heat wasting.
3. Renewable energy - plans for biogass installations, to be fed by corn from agriculture, which will be re-processed to quality of natural gas, with a guaranteed economical feed-in tariff for 20 years. Many other countries adopted such tariffs, as well as a Renewable Energy Act based on German model (subsidies were found to be non-sustainable instruments). Tariffs are regionally based (used for regional economy), not paid to the state.

This is a good example of a dedicated municipal administration. IFEU institute calculated the CO_2 balance for Frankfurt at 8.3 million CO_2/yr (2005 data), out of which 50% is electricity, so saving electricity is an important tool for reaching the targets. Reduction achieved was 6% CO_2 since 1990 (10% per capita), which is quite low, as increase of high-rise office buildings has been 82% opposed to 15% increase of apartment buildings. Therefore the City started with electricity saving campaigns, where people get bonuses for savings. Target is set at 3 million tons CO_2 reduction by 2025.

The focus of *Energiereferat*'s work is to act as facilitator, organizing round tables between partners, sometimes setting up feasibility studies as a first step of a project (e.g. on installing a CHP plant in some facility). The Agency works in partnership with consultants, planners, investors thus combining energy efficiency and climate protection with economic development and creation of jobs. The City plans to set up energy information centres, and organise regular discussions with practitioners. Frankfurt is a member of EnergieCites, and involved in several European energy-related projects, as well as issues publications, brochures (*How to involve your local community, How high-rise office buildings can be energy efficient*) and organises citizen forums. The City acts in energy arena through its numerous roles:

- energy consumer (own buildings) - showing energy efficiency by example
- urban planner/owner (1/4 of all dwellings in Frankfurt are in municipal ownership - 100.000)
- adviser, communication, coordination (guides and manuals, direct contact with investors during construction)
- energy supplier - promoting co-generation There are 3 large co-generation plants in Frankfurt area (one on waste, two coal and/or steam fired, which supply power to the grid; one wood-fired CHP also supplies heat to chemical industry).

Energy management of public buildings in Frankfurt has a tradition of more than 20 years, and the 5-people Energy Management Unit focuses its daily work on metering (i.e. automatic data collection), operating optimization, and energy optimization of new municipal-owned buildings.

The Display Campaign (European Municipal Buildings Climate campaign) was joined also by Frankfurt, in order to promote displaying of energy certificates as incentive for further energy efficient behaviour. It was established that on over 1.000

m2 of 285 public buidings there are 33 million EUR/Yr energy costs, and a 15% saving potential was possible through an infomation campaign and training courses for caretakers (non-investment measures). An incentive measure was introduced - a bonus equal to the amount of 50% of saved money is offered to office buildings that managed to save energy, which in that way can ensure bonus for their employees. Reduction of energy demand takes time, more money to modernise equipment etc. and shows results only after 10+ years, therefore it is hard to convince politicians, but Frankfurt experience with public buildings shows that savings grow exponentially when looking at all 3 components below (5-10 bigger than costs). The proof: 10 million EUR of saving was realised annually on public buildings only by metering (10% of total costs).

	Energy saving potential	Costs-savings ratio
Energy metering	over 5%	1:5 - 1:10
System optimisation (automated control boards, integration of all systems, unified spare parts)	over 15%	1:3
Investments	over 30%	only 1:1 - 1:2

The *Energieausweis* (EPC) used in Frankfurt contains more information than the German standard (savings both in KWh and in EURO), including recommendations for improvements. Further, an online cost calculation scheme for new investments was developed, to additionally convince politicians, and for investors to be able to compare alternatives. The online system allows also graphic presentation of savings over time for every public building.

Public lighting is managed by a separate company, but contractually obliged to implement energy savings; while the City administration doesn't manage solar energy use due to high investment costs, but rather encourages private investors to apply this technology, especially on schools.

Main achievements & lessons learned:

- *Guidelines for economical construction* (including energy efficiency requirements) adopted by the City Parliament, now are an obligatory part of the construction permit (building contract).
- Introduction of a passive house as a building standard - now in Frankfurt there are 2 passive schools (among first passive-house-schools in Europe), 3 kindergardens and cca 800 residential facilities. Director of a residential housing company has become a driver for this process - and a good promotor of the municipal energy efficiency policy, which also creates positive competition with the municipality in their building of public service facilities (schools etc.).
- Frankfurt tries to do more, but also has learned where are the limits - EE is voluntary in the privately owned buildings, which target group can be reached only by various promotional measures
- Better legal framework is needed to oblige more population, because the local administration cannot set their own levels different from national

City planning - district heating is most cost-effective and energy-efficient where there's most concentrated / intensive heat demand (where co-generation can be made).

After lunch, the INTENSE group visited the refurbished residential social housing city district Karl-Kirchner-Siedlung. Frankfurt Housing Company owns and manages the buildings constructed in 1960-1963. There are 2 CHP plants and the network supplies the half of the blocks and there are planes for extension. The experts visited one of the district heating plants, which consists of one CHP unit and 2 boilers. CHP unit runs on natural gas and has 30 kWp electrical power. The engine was installed in 1999 and has 15 years lifetime. New CHP unit will be installed after reconstruction of all old houses. There is a space foreseen for additional unit on the site. Passive houses strategy for the district (and in general) leads to 80% reduction of CO2 emissions, as 50% comes from the insulation and 30% from the CHP.
The following questions were further discussed:

- The cost of a CHP unit, lifetime and maintenance.
- Heat energy metering and billing
- New perspectives for changes of the legislation regarding electricity use for own needs from CHP units
- Environmental effect

The second site visited was the construction site of new passive multi-storey buildings in Hansaallee. 9 buildings with 171 apartments are under construction as in November 2009 the first ones will be available for their private occupants. The insulation material is 35 cm thick mineral wool (for fire protected walls) and perlit. There is a ground floor cooling system for summer period based on 2 heat pumps and 40 wells, 130 m deep. One of the blocks is covered by solar thermal panels and the others – with PV systems. The windows are prefabricated insulated construction (80-100 kg weight), which avoids thermal bridges; they are fixed to the walls but lays within the insulation layer. The glazing is triple as the space between glasses is filled with krypton (U-value 0,76). Some of the façade windows have noise insulation as well. The blower test has shown very good air exchange rate results – 0,2-0,4. The ventilation system with heat recovery is individual for each apartment and could be adjusted by the households. The investment cost was lower than planned due to the economic crisis and now it is almost equal to the conventional building technology. Cost reduction comes also from the lack of heating system and related to it measuring and billing.

Thursday, 18 June 2009
"Institutions and example giving projects"

Day rappourters:
Magda Burlacu (REC Romania)
Péter Szuppinger

Two comprehensive presentations by:
1. Tobias Loga, IWU
2. Zeno Bastian – The Passive House Institute

Main points of interest emphasized during presentations:
- Features of passive house: 3 panes glazing, thermal insulation, avoiding thermal bridge effect, air tight envelope, and ventilation system
- Building Typology – software application for gathering data on energy consumption
-Energy performance certificates –problems, consequences in calculation procedures (not in every EU countries is applied the same data acquisition)
-Energy demand for new buildings/refurbishment – annually 2.5% of existing buildings are refurbished; this rate is very much influenced by information, advice, funding.

Questions/discussions arise related to:
- insulation: technical possibilities for interior/exterior, taking into account conditions such as: humidity, etc. the kind of materials to be used foe different parts of the building: walls, roof, ceiling, frames etc.
-average time for construction of a multistorey building
-occupation level – if there are still empty apartments who is paying for the utilities? What are the risks for tenants?
-comparison between the new buildings and refurbishment of existing ones, in terms of costs, taking into account the new standards.
-what is normal standard for new buildings- according to EC directives
-how can the "building typology" be applied in different countries? We (institutes/different countries) can involve in ongoing European projects such as TABULA, some references: www. building-typology.eu , www.ig-passivhaus.de, www.passiv.de

1st site: Project „Rotlindstraße"
Refurbishment of buildings from the 50's with 36 cm cellulose insulation and with passive house windows to a passive house level (air tightness: original 2.5 1/h will be 0.3 1/h) and with oilseed rape cogeneration plant.

The project is a very ambitious refurbishment of 6 (5?) multi-storey buildings. The buildings are owned by ABG (municipal housing company) and rented by citizens. The inside features of the buildings and also the façade are almost totally changed during the implementation. We had the opportunity to see the different phases of the refurbishment. One building was almost ready, one was in the phase of inside jobs, two were in the phase of "demolition" of old inside structures and there were two which were still inhabited.

The heat consumption of the original 220 kWh/m² will be decreased to 10-15 kWh/m² which is in a technical term quite good result. The cost of refurbishment is around 1 300 euro/m² which is a little bit less then building a new a house (around 1600-1900 euro / m²).
There is a social aspect of the refurbishment as well. The inhabitants who originally lived in the flats were offered with other flats to live in during the refurbishment and then they have the opportunity to move back. Anyhow now it seems that 90% will not move back. The rising rental cost could be one reason for this, although it was explained that the heating cost will decrease significantly.

2nd site: Project „Mitscherlich-Haus"
Refurbishment of high rise residential building (insulation, cogeneration, facade solar collectors, concierge service)

This project involved two old nurse hostels. One of the buildings was demolished the other one was refurbished. The heat demand of the building was reduced to 50-60 kWh/m² , small (30-40 m²) flats were joined into 80-120 m² flats. Solar panels were also added to the south façade of the building. In the cellar a co-generation heating centre is working.

Analyses of possible transfer of best practice:
The site visits were very interesting from the technical point of view. We saw how the most innovative building components are working in practice.
On the other hand the financing and implementation of this kind of projects works in a very different way in Germany. For me it seems to be very hard to transfer this kind of project scheme into the CEE region. The main reason behind this is the fact

that in Frankfurt these flats are owned by a strong municipal housing company (ABG) who is able to invest into refurbishments. In most of the CEE countries municipalities do not own big housing stocks. In most of the cases multi-storey buildings are owned by individual flat owners and this means that here should be a common agreement among several owners (which is hard to be reached) and the resources should be ensured partly by the owners (which is also a crucial issue).

Friday, 19 June 2009
"energy efficiency in public buildings" and participant impressions

During the week we have had opportunity to get introduced passive house standard or low energy standard in different types of building. At the end of the study visit we were invited to the lobby of the Commerzbank head-office building which is not just a part of Frankfurt skyline but moreover they applied technical measures to operate this kind of building in certain level of energy consumption.

To reach this there were applied architectural idea of combining transparency and functionality.

- Technical basics to reach certain level of low energy consumption:
- Equilateral triangle base
- The floors are organized around central atrium
- Prevent settle of the building there are 111reinforced concrete piles
- For substantial energy savings and natural ventilation there is applied layer façade
- Sky gardens
- Cooling control – building is cooled by a water filled chilled ceiling
- Ventilation can be regulated by employees what is no that common for this kind of building.

These were just few measures applied in this huge building at the European Manhatan. But what was more important to conclude that there is high level of planning, consulting with specialists and Energiereferat of Frankfurt.

After this presentation the study visit was closed.

CONLUSION

… to give a feeling to key stakeholders from CEE countries.

As we stated at the introduction, study visit in Germany on best practice examples and on technical aspects of energy savings in buildings brought a lot more than just a feeling and it can be concluded that was very successful in seeking positive examples which are enhancing the energy savings in buildings. With regards to the study visit, it was primarily dealt with the following:

- Passive house as a different building types from family houses to energy efficient skyscraper;
- Technical aspects of passive house;
- Passive house in different stage of construction;
- Retrofitting of old buildings on a passive house standard;
- Advantages and disadvantages of passive house buildings;
- Adjustments according to local climate conditions and passive house standard;
- Proper planning as a base for performance of every single house;
- Concept of the energy city Frankfurt and their energy performance towards being sustainable;
- Different source of heating and enhancement of CHP in Germany.

We could experience that a passive house standard, recently as the best practice is neither a new discourse, nor a pilot action, and there are continuously diminished constrains and worries from opponents. In the list of experiences gained during five days above we were trying define main message given to participant. If we could define all mentioned aspects in one word then I would name as the main message COMPLEXITY as the critical point when applying technical measures.

APPENDIX I

Detailed Program of the Study Visit in Germany
15 June – 19 June 2009

"Best practice examples – technical aspects of energy savings in buildings"

Monday, 15 June 2009		
"District of the future created by sounds solutions"		
Time	**Program**	**Place**
10:30 – 11:00	**REGISTRATION**	Lobby of the **Cityhotel Königsstraße** in Hannover
11:00	• Introduction round of all participants • Introduction to the study visit (*Matthias Grätz, technical organisation and Michal Tvrdoň, lead of WP3, INTENSE*)	Hannover, Cityhotel Königsstraße
11:45	**TRANSFER** to KroKus – Kronsberg district	*KroKus*, Kronsberg district centre, Hannover
12:30	**LUNCH**	*KroKus*, Kronsberg district centre, Han.
13:30 – 17:30	**SITE VISIT** *Mrs. Karin Rumming, City of Hanover* Energy efficiency optimization through low energy house construction method and optimized energy provision by a diverse district heating systems. • Green architecture and energy savings; • CHP as a district heating which produce both heat and electricity; • Solar houses (different technical aspects of the solar systems and energy savings). • Passive house inside, heating system	*KroKus*, Kronsberg district centre, Hannover
17:30	COFFEE AND CAKE	*KroKus*, Kronsberg district centre, Han.
17:30	**DAY CONCLUSION** • Transfer back to the hotel and free program	Hannover

Tuesday, 16 June 2009
holistic approach 1: long experienced research and training centre *holistic approach 2: energetic modernisation of a village*

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Time	Program	Place
8:00	**TRANSFER** to Springe-Eldagsen to ***e.u.[z.]*** (approx. 30km) by bus	Lobby of the **Cityhotel Königsstraße** in Hannover
9:00 1st session	**PRESENTATION** *e.u.[z.] – energy and environmental centre* • Welcome by Mr. Aden, the vice mayor of Springe • Energy-concept of e.u.[z.]; • Demonstrations; • Low-Energy-Guesthouse and Passive House in wooden construction; • Using of ecological materials; • Examples of construction details.	*e.u.[z.] – energy and environmental centre*, Springe-Eldagsen www.e-u-z.de
	COFFEE BREAK	
11:00 – 12:00 2nd session	**PRACTICAL EXCERCISES** *e.u.[z.] – energy and environmental centre* • Blower Door Measurement; • Thermal imaging; • Solar experiments.	e.u.z., Springe-Eldagsen
12:00 -13:00	**LUNCH** (Grain food)	e.u.z., Springe-Eldagsen
13:00	**TRANSFER** to Neuerkerode (approx. 85 km) by bus	Neuerkerode
14:30 – 16:30	**PRESENTATIONS** *Mr. Andreas Wyborny* • realizing the concept of an optimized village: 80% savings in heating energy, electricity and water until 2015; **SITE VISIT NEUERKERODE** *Mr. Andreas Wyborny* • Renovated building; • Saving electricity; • District heating; Biogas plant (optional).	Neuerkerode
16:30-17:00	COFFEE AND CAKE	Neuerkerode
17:00	**TRANSFER** to Frankfurt/M	
Approx. 20:00	**DINNER**	Butzbach
Approx. 22:00	**ARRIVAL i**n Frankfurt/M by bus	Frankfurt/M

Wednesday, 17 June 2009

"Frankfurt a.M. as a leading European city in planning and building of energy efficiency in buildings"

Time	Program	Place
09:00	**TRANSFER** to Frankfurt/M Energiereferat (by	Energiereferat,

BEF Germany
Matthias Grätz
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	walking approx. 2 km)	Frankfurt/M
09:30 - 10:30	**PRESENTATION** *Mr. Dr. Werner Neumann* (Energiereferat of the City of Frankfurt) • Energy and Climate Saving Concept of Frankfurt; • Discussion.	Energiereferat, Frankfurt/M
10:30	Coffee break	
11:00 – 12:00	**PRESENTATION** *Energiereferat of the City of Frankfurt* • Energy management of public buildings; • Discussion.	Energiereferat Frankfurt/M
12:30 -13:30	**LUNCH**	
14:00 – 17:30	**SITE VISIT** ">80% CO_2 -reduction in new and modernized buildings" • Passive house Building at the raw construction (Hansaallee); • Refurbished residential social housing city district with insulation and small district heating with cogeneration plant (Karl-Kirchner-Siedlung).	Frankfurt/M
19:00	**DINNER** - common dinner in Sachsenhausen ("*Appelvine*" restaurant)	Frankfurt/M

Thursday, 18 June 2009		
"Institutions and example giving projects"		
Time	**Program**	**Place**
08:30	**TRANSFER** to Frankfurt/M Energiereferat (by walking approx. 2 km)	Energiereferat, Frankfurt/M
9:00 – 10:30	**PRESENTATION** *Mr. Tobias Loga* (IWU – Institute for housing and environment) • Types of multi-storey buildings and therefore specialized methods and solutions of energetic optimization; • Discussion.	Frankfurt/M Energiereferat
10:30	Coffee break	
11:00 – 12:30	**PRESENTATION** *Mr. Zeno Bastian* (PHI – Passive House Institute) • History of the passive house institute;	Frankfurt/M Energiereferat

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	• Activities of the PHI in other European countries; • Outlook on upcoming European legislation and passive house; • Comfort of living and working in passive houses/quality aspects of passive house; • Discussion.	
12:30 -13:45	**LUNCH**	Frankfurt/M
14:00 – 17:30	**SITE VISIT** (options will be confirmed) *Project "Rotlintstraße"* • Refurbishment of building from the 50ties with cellulose insulation and oilseed rape cogeneration plant to passive house level; or *Project "Mitscherlich-Haus"* • Refurbishment of high rise residential building (insulation, cogeneration, facade solar collectors, concierge service); and *Refurbishment of public building* i.e. school with improved lighting (Green lighting award) and cogeneration.	Frankfurt/M
19:00	**DINNER** – proposal for restaurants	Frankfurt/M

Friday, 19 June 2009		
"energy efficiency in public buildings" and participant impressions		
Time	**Program**	**Place**
8:00	**TRANSFER** to Palmengarten Frankfurt/M	Palmengarten Frankfurt/M
09:00 – 11:00	**SITE VISIT** Organized guided tour • New part of low energy office building (<100 kWh/sq.m primary energy); • Visiting site in progress of construction to explore technical details - KfW Bank.	
11:30 – 12:00	**CLOSING** of the study visit and first impressions	Frankfurt/M
12:00 – 13:00	**LUNCH** and individual travel to FFM airport	Frankfurt/M

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APPENDIX II Participants Study visit WP3 INTENSE

No	Country	Partner	Participant	Arrival	7	1	2	3	4	Departure	Reg.date	Food
1	DE	Auraplan	Jörg Faltin	Sun, train	X	X	X	X	X			
2		e.u.z.	Dirk Schröder-Brandi Schroeder-Brandi@e-u-z.de	Joining from Springe	-	-	X	X	-	Thu. from Frankfurt	18.05.09	-
3		e.u.z.	Wilfried Walther walther@e-u-z.de	Direkt ab Springe Coming to Kronsberg	-	-	X	X	-	Thu. from Frankfurt	18.05.09	-
4		BEF DE	Matthias Grätz Matthias.graetz@bef-org.de	Sun, train	X	X	X	X	X	Fr, Train		-
5	EE	BEF Estonia	Sandra Oisalu Sandra.oisalu@bef.ee	Mo, 9:15; SK1671 via CPH	-	X	X	X	X	Fr, 14:20; LH direct	29.04.09	-
6		Saku	Kalle Pungas Kalle.pungas@sakuvald.ee	Mo, 9:15; SK1671 via CPH	-	X	X	X	X	Fr. 14:20; LH direct	29.04.09	-
7	LV	BEF Latvia	Irina Aleksejeva Irina.aleksejeva@bef.lv	Mo, 9:15, SK1671 via CPH	-	X	X	X	X	Fr, 17:20; LH188 via TXL	07.05.09	-
8		Cēsis	Viesturs Krastins Viesturs.krastins@dome.cesis.lv	Mo, 9:15, SK 1671 via CPH	-	X	X	X	X	Fr. 17:20; LH188	12.05.09	-
9		Rīga	Juris Golunovs Juris.golunovs@riga.lv	Mo, 9:15, SK 1671 via CPH	-	X	X	X	X	Fr. 19:40; BT 214 from Berlin	11.05.09	-
10	PL	REC Poland	Konrad Kosecki Recpl.kosecki@data.pl	Sun/mo, 02:15 nighttrain	X	X	X	X	X	Fr. 14:10 378 Frankfurt	20.05.09	-
11	CZ	REC CZ	Filip Cejka FCejka@cz.rec.org	So. 23:00 by train	X	X	X	X		Thu. 19:00 by car	19.05.09	-
12		LAG MoCa	Tatana Souckova Ca.sandra.brno@seznam.cz	So. Afternoon via VIE, FRA	X	X	X	X	X	Fri. afternoon via VIE	19.05.09	-
13	SK	REC SK	Michal Tvrdoň rec@changenet.sk	Sun, 14:05 Hannover	X	X	X	X	X	Fr. 21:00 Frankfurt	13.05.09	-
14		Ružomberok	Frantisek Belko belko@cztrk.eu	Sun, 14:05 Hannover	X	X	X	X	X	Fr. 17:00 Frankfurt	25.05.09	-
15	SI	Ptuj	Marko Verdenik Marko.verdenik@gmail.com	Sun	X	X	X	X	X	Friday	18.05.09	-
16	HR	REC HR	Irena Brnada Irena@rec-croatia.hr	Sun, by train from Frankfurt	X	X	X	X	X	Friday	15.05.09	-
17		Samobor	Stefica Lustek Stefica.lustek@samobor.hr	Sun, 16:00 via Frankfurt by Train	X	X	X	X	X	Fr. From Fra – Zagreb	22.05.09	
18		Koprivnica	Maja Istvan-Krapinec Prostorno.okolis@koprivnica.hr	Monday	-	X	X	X	X	Friday	13.05.09	-

19	HU	REC HU	Peter Szuppinger pszuppinger@rec.org	Mo, 12:15 LH1022		X	X	X	X	Fr, LH3446	26.05.09	
20		Veszprém	Tamas Jozsa tjozsa@gov.veszprem.hu	Sun. 21:30 AB 8077 via VIE	X	X	X	X	X	Fr. 19:15 AB8773 Frankfurt	14.05.09	-
21		Veszprém	Istvan Schmidt Schmidt.istvan@gov.veszprem.hu	Sun. 21:30 AB 8077 via VIE	X	X	X	X	X	Fr. 19:15 AB 8773 Frankfurt	14.05.09	-
22	RO	REC RO	Magdalena Burlacu magdaburlacu@recromania.ro	Sun 07:55 LH 3417 FRAU By train to Hanover	X	X	X	X	X	Fr. 20:30 LH 3416 Frankfurt	15.05.09	-
23		Baile Tuşnad	Gereb Istvan Attila primbt@kabelkon.ro	Sun 07:55 LH 3417 FRA By train to Hanover	X	X	X	X	X	Fr. 20:30 LH 3416 Frankfurt	15.05.09	-
24	BL	SOFENA	Zdravko Georgiev zgeorgiev@sofena.com	Sun, 17:30; FB 437 FRA Travel by Train to Hannover	X	X	X	X	X	Fr. 18:40, FB 438	11.05.09	-
29	BL	Sapareva B.	abgesagt	-	-	-	-	-	-	-	-	-
10	LT	BEF Lithuania	abgesagt	-	-	-	-	-	-	-	-	-
11	LT	Elektrėnai	abgesagt	-	-	-	-	-	-	-	-	-
13	PL	Ożarów	abgesagt	-	-	-	-	-	-	-	-	-
18	SI	REC SI	abgesagt	-	-	-	-	-	-	-	-	-