4.5.4 Peer Review Reports

Peer Review Report from visit of Gorlice

Project output 4.5.4. Peer Review Report
by AGH (PP11)

Application Form Requirements:

4.5.4	Peer Review Reports	Following each peer review visit, a comprehensive report is drafted that outlines the learning potentials from the pilot investment and feasibility assessment analysed and gives recommendations for improvement.	4 peer review reports

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Peer Review Report from visit of Gorlice

1. Description of the investment

Assumption of pilot project: Creation of the energy management system to optimize energy consumption and reduce operating costs and achieving educational goals.

Pilot project involves:

- modernization of electric system
- adjustment of heating system
- creating the management system of heat and electricity
- creating energy management laboratory (educational/lab stands)

The issue of energy saving and its management is of utmost importance for the great majority of facilities built with the use of old technologies and obsolete systems which make the buildings very energy-consuming. It is evident that there were no energy management systems. From the beginning of the project, the authorities of the County knew that the situation should not be changed only through e.g. replacing the systems, installing modern, energy-saving lighting or sensors, but through combining various forms of energy consumption into one system. Not only it can help to reduce costs, but also educate by showing how making specific decisions may affect the energy use.

Inspiration for the pilot investment was energy management system in AGH-UST Laboratory of Renewable Energy Sources and Energy Saving in Miękinia, where one of the LSG meetings took place. The system (building management system, BMS) in Laboratory contains modern facilities equipped of renewable energy sources which provide the building with heat and energy, and have also teaching and educational meaning. The BMS measures and control a 3 heating circuits: dhw and panel radiators circuit with 2 heat pumps and 1 solar collector field; floor heating circuit with 1 heat pumps and 1 solar collector field; air heating circuit with 1 heat pumps and 1 solar collector field. The investment would have followed the idea of AGH-UST Laboratory system and rebuild it. It would allowed to measure and then manage the energy produced and teach by demonstrate all these issues.

Result of debates with local stakeholders pointed out that the Ignacy Łukasiewicz School Complex no. 1 in Gorlice as the facility in which the investment would be implemented. This place was selected for a number of reasons, which included i.a.:

- ✓ the school educates 800 students in several specializations: electricians, electronic engineers, mechatronic engineers, power engineers, IT specialists, equipment and renewable energy system engineers (the implementation of the investment and its effects will be the best source of practical education for the students)
- ✓ the school facilities are over 60 years old
- ✓ there is a big chance to get return on investment due to facts that:
  - the capacity of the building is large
  - high contracted power provides great potential
  - the school's unity bills for electricity are high

- two service entrances in the facility allow to perform cost analysis including either a summary or balance sheet settlement of electricity

✓ the school has got a modernized and an up-to-date thermal power station allowing to monitor and present measurement data ready to use within the energy management system

✓ a high number of students will benefit from the investment.

Technical specification of the investment:

- fireman's switch modernized
- no additive power value is required because of the implemented electrical system repair
- the building's main switchgear is installed on the ground floor in the switchgear room; power supply circuits for other building switchgears is led out from the main switchgear
- it is possible to measure consumed power in particular areas of the building (i.e. a teaching area, an administrative and technical area as well as a common area)
- watt-hour meters are equipped with pulse outputs connected up by means of UTP 5e cable to a controlling and metering system, which is located in a boiler room (additionally a capacitor bank is enclosed; capacitor bank value is 2,5÷15kvar)
- in the building switchgears there are protection circuits for general purpose sockets, computer sockets, a lighting and an emergency lighting as well as technology; the switchgears contain overvoltage protective devices, type C
- the power for the building switchgears is supplied from the main RG switchgear; the school shop's switchgear is also powered by the RG switchgear
- the circuits, which are needed to supply energy to the lighting and single-phase sockets located in the school shop, are led out from the switchgear; an energy submeter is installed in the RG switchgear; the circuits responsible for supplying energy to the lighting and sockets (located in the boiler room) as well as an electronic box are led out from the boiler room's switchgear
- there are seven special switchgears which have protection circuits for computer sockets, which are located in computer rooms and a library
- the switchgears can be switched off with safety cut-out switches (so called mushroom emergency stops); there are two such switches in each room; power for building switchgears is supplied from the main RG switchgear
- all second floor rooms (apart from the corridor) are lighted with ceiling-mounted or pendant luminaires; the pendant luminaires, which are in theory and practice classrooms, are mounted at a height of 2,7m
- particular building switchgears supply energy to the general lighting; the lighting is switched on locally; the lighting installation is mounted under plaster; the wires and branch wires are connected in under-plaster wire boxes
- switching the lighting on is possible after inserting an access card
- the functioning of the system is based on using access cards as a key; reading of the card takes place after inserting the card into a special reader mounted on a switch (eg. SP WANO Solutions); after inserting a programmed card, the electricity switches on in a particular circuit, which is connected to the switch; the electricity in a room may be switched on only with the use of a MIFARE card; the switch has got an in-built 16A transmitter, which requires 230VAC voltage to work; the project predicts the purchase of 60 MIFARE cards
- for the vision and sound transmission the HDMI and VGA cables are used; a 230V socket, a HDMI socket and a VGA socket are mounted in the ceiling about 4,2 m

away from a wall (screen); next to a teacher's desk there is HDMI and VGA connector sockets

- the energy for the building is supplied by the TN-C network; the PEN conductor separation into PE and N conductors is performed on the earthed terminal – the locker of the fireman's switch; fuse links, which are built-in in the RG switchgear, are responsible for automatic disconnection of the power supply; residual-current devices (the rated residual operating current is 30mA) serve as an additional protection against direct contact
- switching and lighting overvoltage protection is given by arresters class I (B) and II (C) installed in the RG switchgear; additionally, in other switchgears there are arresters class II (C); arresters class III (D) for sockets which supply power to electric appliances and equipment sensitive to overvoltage are used
- as far as central heating is concerned, the controlling and metering system is installed (the system is responsible for controlling the heating system of a building as well as metering and balancing both heat and electric energy)
- the system serves an educational purpose as well as, allowing the students to monitor work parameters, energy balance and heat balance via the Internet
- in order to achieve the above-mentioned objectives the existing heating system was slightly modernized and some parts of the central heating control system were replaced
- the entirety of processes related to appropriate functioning of the heat distribution system are managed by the automatic control system based on the DigiENERGY system; apart from controlling, it meters and balances both heat and electric energy
- everything is configurable and monitored via the Internet; the DigiENERGY controllers make it possible to monitor all measured parameters and to track produced and consumed energy in all heating system circuits and in 4 electrical system circuits; the DEKAMATIK M1 and M2 equipment, which were delivered with the boilers, is kept to control the gas boilers.

2. Way of implementation and occurring problems

The investment implementation lasts from 28/10/2013 till 31/12/2013.
The investment was implemented in secondary school run by Administrative District of Gorlice (Complex of Schools no. 1 in Gorlice, ul. Wyszyńskiego 18, 38-300 Gorlice, http://www.lukasiewicz.gorlice.pl/), Małopolska Voivodeship, Poland after a broad consultation process concerning LSG and all potential stakeholders of the investment. Direct beneficiary of the pilot action is the District of Gorlice, the owner of Complex of Schools no.1, where the investment was established. All procedures of the investment implementation were done according to the Public Procurement Law.
Costs related to investment (note: if overall costs are higher than contribution from CE, the remaining funds should be also mentioned): ca. 100 000 € - the cost is under validation (6th certification of expenditures and progress report: 01.11.2013 – 30.04.2014)
Within the mentioned costs following activities are carried out:

a. infrastructure works: modernization of the wiring – ca. 55 000 €
b. IT equipment to manage the energy: 1 central control panel in the Internet – ca. 40 000 €
c. purchase of goods: new electric meters, energy saving lighting, different types of sensors – ca. 5 000 €

It is initially assumed that the object’s energy demand will decrease up to 40%. The more precise assumption based on the real data collected during the whole heating season may help to compare the results.
The promising initial outcomes of the investments influence the District of Gorlice to plan to apply the energy management system and RES use in several buildings of its organizational units.
The final concept and first learning of the investment are discussed with transnational partners and international experts in workshops within VIS NOVA's Public Conferences. To fulfil the project goals the pilot investment was peer reviewed by project partners and participating experts of partner regions.
There were no occurring problems during the implementation process notified.

The implementation of energy saving management system has been integrated as a one of priority instruments in the district Energy Efficiency Plan of the region. Even if the investment is not a technical innovation and was known and established in other locations before, it may have a significant impact on the inhabitants of the region (eg. by education made by children to their parents after dealing with that system in a school) and visitors from others region and change their way of thinking about energy to more sustainable.

3. Evaluation of investments

3.1. Technical aspects of investment

Pilot investment in Gorlice – Energy Management System in School Complex nr 1 in Gorlice effectively uses existing equipment of the school: 2 gas boilers with control devices DEKAMATIK M1 and M2 as well as internal infrastructure of the school. Only absolutely essential equipment was purchased in order to enable system to function, which determined the effectiveness use of European funds. The Energy Management System saves energy, collects data and educates students by visualization of energy demand. It is especially interesting for technologically oriented students, which can learn about energy management principles. Additionally, the system gives ability to change temperature in school building and sport hall remotely, via Internet. The responsible person (the director) is aware of actual situation and needs of students and can respond quickly.

System has positive impact on environment, because it allows to reduce heat and electric energy consumption via i.e. energy-optimized lightning in classrooms and in the same way reduces emission of CO_2. This is not a technological innovation as it is an approved technical solution and it is already used in buildings i.e. in Germany. It was also noticed that a thermal insulation system was installed after the heat supply modernization, which may caused oversizing of the peak energy supply and some inefficiency in heat supplier work.

3.2. Assessment of suitability as a good practice

The direct effect of the pilot investment should be the decrease of energy demand, and consequently, savings. It will be possible for the school and the County to spend the money on similar investments in different projects, which also aim at energy saving. The greatest influence of the pilot investment comes from the fact that it gives an example to follow. The success of the investment has a great potential and significance for both the public and private sectors – the investment will be a recommendation in itself and an incentive to use similar technologies, installations and systems on a narrow scale. Not only does it concern the Gorlice County, but also the partner regions and other Polish counties.

Installing the energy management system in school is very advisable. It helps to reduce costs and protect the environment by energy-optimized lightning in classrooms as well as the actual thermal energy management. It may be very helpful tool for education linked with changing the human energy behaviour.

The idea of multiplying the energy management system in schools is not complicated. The disadvantage of the solution may be its cost. However, all of the members of European Union are obliged to reduce energy consumption through energy efficiency investments by 20% to 2020. All actions which are connected with efficient energy use (for example by thermomodernization of public utility buildings) are highly recommended and supported by regional and local action plans and strategies.

The investment in Gorlice was done in old, 60 years old school facilities. This proofs that the energy management system can be installed successfully in existing and old buildings. New and modern buildings may include energy management system from the very beginning. Apart from saving energy, counting data, presenting data, system also is excellent example of practical skills and knowledge for students. System can easily operate in any kind of public utility building, not only in schools.

Energy management system in school building can be easily transferred to other regions without any restriction. The software can measure temperature and power utilization, but it also collects data and presents them in graphs. Data is available in Polish, German and English language. Through data collection and statements good lesson can be learned for other schools and public utility buildings.

3.3. Assessment of the possibility to implement in other regions (the universality of the project)

The investment in Gorlice is nonrestrictive transferable to any region i.e. Germany are already used in many buildings. There are neither technical nor organizational barriers. Only the investment costs discourage investing in Energy Management Systems. The possibility of implementation is realistic as schools in each region have same necessarily of energy demand (time of demand, kind of energy) also depending on the technology used. Money is always a big problem in each region, but that kind of investment should raise awareness for sustainability on energy supply (high effective technology) and possibility of raising energy prices.

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Germany, are financial sponsored by union and government for many years. Also Energy management systems can be sponsored by the “Klimaschutz-plus”-program.

The energy management system may be installed in all types of buildings, the new one and the older one – like in Gorlice (60 years old facility). This kind of system is specially serviceable in technical school where pupils learn about energy and renewable energy sources. System can operate in any kind of public utility building. Data from the given building’s software system can be analyzed in any country, data is given in Polish and German, but also in English, they can be presented in graphs. However, for using the system some training is needed.

4. Learning following from the pilot implementation

The rural district Schwäbisch Hall as education authority of professional schools aspires while every restructuring the energy-optimized realization of heating, air conditioning and lightning. Thereby Energy management systems are partial used and will be increased considered for the future.
For example, Energy-optimized lightning systems, are financial sponsored by union and country for many years. Also Energy management systems can be sponsored by the “Klimaschutz-plus”-program. Some schools also install such systems in regions especially in case of deep renovation and construction of new schools.

Not every from the project’s partners has experience in implementing similar projects or technology yet, even some technical background.

5. Suggestions for improvement: investment planning, technical aspects, methods of implementation

During the peer review it was noticed that a thermal insulation system of the building was installed after the heat supply modernization, which may caused oversizing of the peak energy supply and some inefficiency in heat supplier work (only one heat supplier has to work, both never work in the same time).

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