

DELIVERABLE T3.1.8

**D.T3.1.8 – Improving energy management (PA7)
in a public school of Velenje (SI)**

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A.T3.1 Implementation of pilot actions for EE improvement

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1. Introduction and aims

This deliverable is a kind of investment report that contains information and data about devices and technology implemented in the pilot action buildings.

Analysis of selected measures aimed at improving energy efficiency implemented in pilot actions is aimed at defining the possibilities of how to better manage/monitor energy and use/consume it rationally.

This document is also about the testing of the OnePlace platform as a design tool supporting the acquisition and dissemination of knowledge on the improvement of energy efficiency in buildings.

The aim of the document is to present investment activities and goals to be achieved as part of the tasks undertaken for each pilot action.

2. Identification of problem areas

Each project or investment should be preceded by an inventory, analysis of the current state and identification of the biggest problems in the building, which cause its energy and ecological inefficiency. These aspects also affect the financial issue and are a consequence of higher operating costs for facility users.

The pilot building was chosen, as is one of the largest public building in the city and a large consumer of energy. It is on the municipal priority list for energy restoration. It would need many investment funds for its energy rehabilitation. The BOOSTEE-CE project enabled the Municipality Velenje to gain the information about energy status of the building and to identify the most important problems.

Main problems are focused on:

- High energy consumption due to building large dimensions and old systems
- A lot of investments funds for energy recovery needed
- No educated staff (e.g. energy manager in the building), lack of proper control and energy management
- Lack of knowledge and energy awareness among managers and users of the building.

In the beginning of the pilot action, meetings and discussions were held with school management where they have highlighted their needs to improve energy efficiency. In April 2018, a study was completed, which defined the initial state of the building, envisaged were soft organizational measures and the installation of smart meters. It was expected to achieve improvement in the energy status of the building and financial benefits in the form of annual savings.

Each investment is the result of the assumptions made therefore the pilot action has defined its own goals, which it will achieve in the perspective of the duration of the BOOSTEE-CE project. The objectives also point to existing problems that need to be minimized or eliminated entirely. The goals in this pilot action are listed below:

1. Improvement of the energy performance, better management of energy consumption
2. Monitoring, planning and control of energy and water consumption costs
3. Increasing the comfort of the building use
4. Easier maintenance of the facilities

5. Promoting and disseminating knowledge about energy, efficiency measures in the building
6. Financial savings

3. Research on EE measures for the PA

Well-defined goals have allowed the right choice of measures and devices to improve energy efficiency. Analysis and review of available technologies that were used to implement the pilot action will allow for better understanding of what was done how and why.

Within the pilot action, Municipality Velenje with help of selected external experts, installed the smart meters in the Music Scholl Fran Korun Koželjski Velenje. The pilot action was implemented measures: installation of monitoring system - installation of smart meters and education of building managers. The second issue is equally important, as energy monitoring should coincide with rational and conscious energy consumption. The implementation of the central monitoring system consisted of installation of heating meters on three different parts of the building and installation of electricity meters on two main distribution boxes. Parallel activities are education head staff of school and maintenance team, motivating them to analyze energy consumption on a daily basis and reduce energy consumption through various organizational measures. In addition, the activities were also focused on raising awareness among the building's employees and users regarding RUE.

Noticeable energy and cost savings are expected as a direct result of the investment made in the framework and the financial aid of project BOOSTEE-CE, which accounts for a total of 14.823,00 €. The data gathered by the smart meters will be used by an energy management system that keeps track of the consumption, therefore the detailed energy flows help us to determine malfunctions, to reveal over-consumption periods and make recommendations to decrease energy use, to ease the operation of the building and most importantly to increase comfort. In the end, the Municipality of Velenje will have to pay less and emission will decrease because of this investment.

Figures below present intelligent energy meters installed.



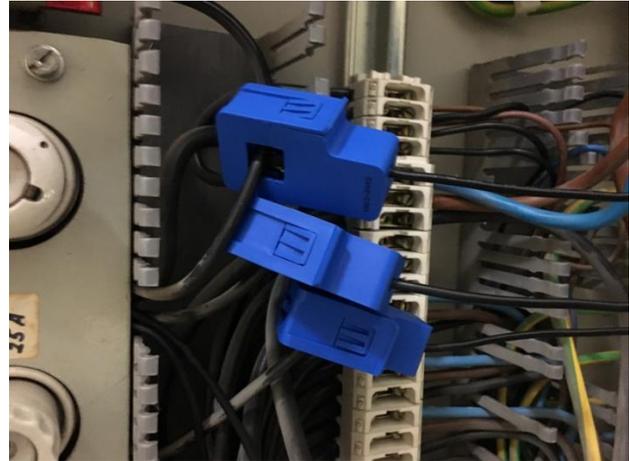


Figure 1: Investment activities photos for the PA7. Source: ADESCO d.o.o



Figure 2: Central monitoring system. Source: ADESCO d.o.o

We analyzed energy usage from month that we implemented central monitoring system until the end of the year September - December 2018. Our reference period was 2017. Results are shown below on monthly basis for better review. Savings are shown as total for heating and electricity. Overall savings are around 51,3 MWh so far.

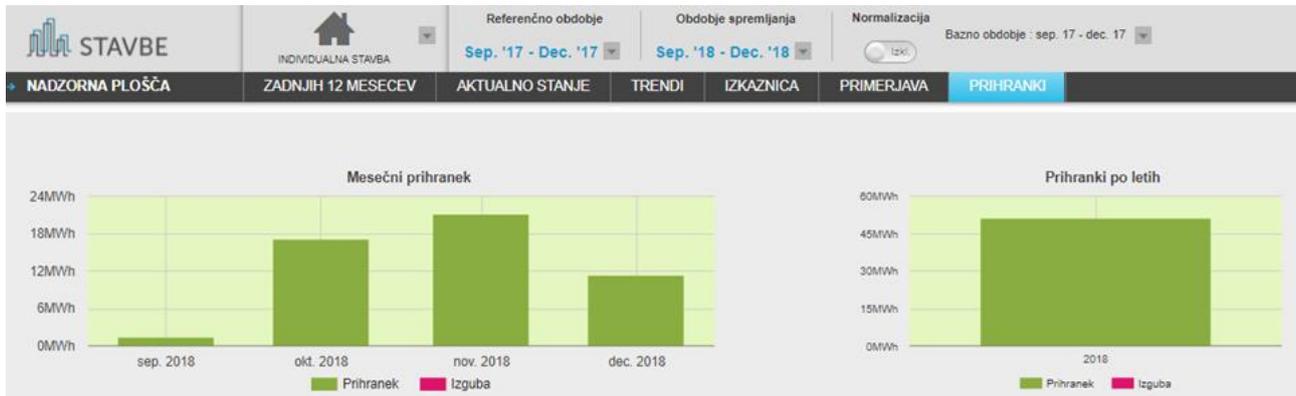


Figure 3: Central monitoring system. Results. Source: Adesco d.o.o.

As shown below trends of energy consumption (gray line on the graph) in the last part of the year is below average. This means that we are saving energy in this building.

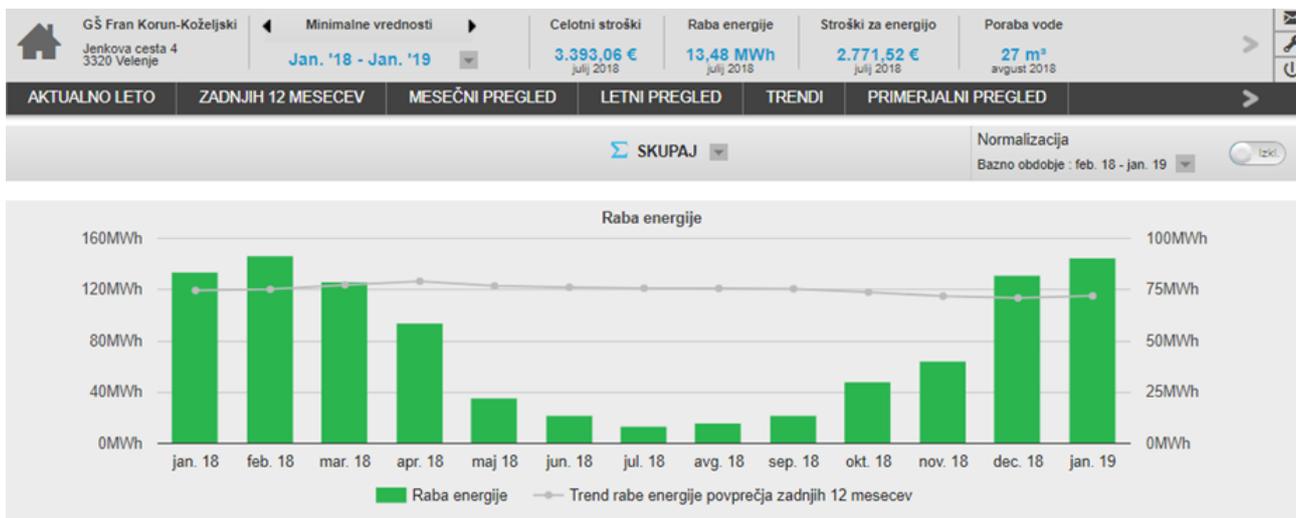


Figure 4: Central monitoring system. Results. Source: Adesco d.o.o.

4. OnePlace platform testing

Implementation of the pilot action consists of two aspects:

- technical, i.e. installation of smart metering for electricity, heating and water, installation of central monitoring system (described in chapter 3);
- social / promotional like education of building managers and OnePlace platform use.

This chapter is devoted to the promotional aspect and describes the testing and structure of the project platform below.

The OnePlace platform consists 4 different modules: Living Energy Marketplace; 3D Energy Management System; Energy Efficient Cities; Financing Energy Efficiency.

The first one is an online database helping to understand all different kinds of energy efficiency measures, electronic devices and offering qualified contractors who can carry out energy efficiency investments.



The second one is a webGIS system which can navigate a map of an urban environment, select a 3D building of interest and retrieve the energy audit and other cadastral/building information. The 3D Energy Management System aims to harmonize the different data sources in one database and visualize them. Next module enables the exchange of experience and good practices between regions for public authorities and other public actors.

The last one is an attractive visual presentation of the transnational strategy outcomes (financial road map), examples of best practices and practical steps to use the national and EU-level resources. This module also tries to capture and present the methods of financing energy efficiency investments that will be transferred to the participating regions' Energy Efficiency Roadmaps.

Web-based platform will help municipalities, and building operators to finance, develop and use such solutions in the future.

The current content of the OnePlace platform has been tested by project partners and selected stakeholders. The chosen method of reviewing was the questionnaire. This choice was considered optimal and the best. It included a short time to gather feedback and comments.

Testing of the platform in Velenje took place during the 3rd Focus Group Meeting (FGM) of the project BOOSTEE-CE organized by the Municipality of Velenje and E-Institute. It was organized on 17th of April 2019 in Velenje. We invited different target groups – municipality employees from different departments, energy experts from regional energy agency and representatives of local business support organization. The Max company demonstrated the online platform OnePlace and the functionalities of the 3DEMS module. We agreed with participants to upgrade the existing 3D model of Velenje with attributes on other public buildings, where these attributes are available.

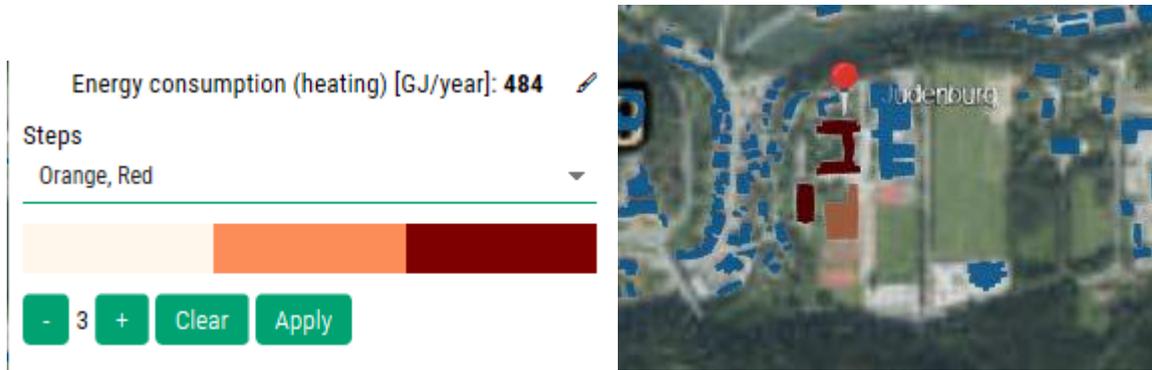


Figure 5: Pilot building in Velenje in the 3D EMS module on the OnePlace platform. Source: OnePlace platform

Focus of the discussion was 3D module – suggestions for the improvement. The participants (eight experts tested the platform) also filled the Feedback on 3D module and the satisfaction survey.

Testing has shown that only 29% of respondents consider displaying the attributes of pilot buildings easy to understand. Most suggested adding more energy-related data. One comment also suggested presenting the data in the form of a table. Considering the language of the attributes displayed, 43% of respondents supported the local language.

3DEMS analysis enabling various types of analyzes through numerical attributes and visualization based on color coding of values of attributes divided into classes, most respondents rated easy (57%) and useful (71%). No suggestions for improving the analysis were given.



Most respondents (86%) would prefer to have additional documents attached to the building, such as a photo from a thermal acquisition or an energy audit document. According to respondents, 3D EMS is more useful for prioritizing intervention areas than for estimating energy efficiency in public buildings and visualizing energy-related data.

57% of respondents see the possibility of using 3D EMS in their daily work, and the majority of respondents would participate in the training if they were organized in Slovenia.

Photovoltaic potential, which is also part of 3D EMS in form of solar maps, is very interesting as there is high demand from the potential investors. Very useful would be to have data available such as roof area, 3D model of the roof, information gable roof / mono-pitched roof.

3D EMS module has a potential to serve as a municipality database for data on consumption of energy and resources. It could visualize the consumption data for all public buildings (monthly consumption would be recommended). 3D EMS module can serve as a support for strategic planning for municipality, energy agencies and local services (district heating, water supply). 3D EMS module is very practical for the visualization of energy related data and can be used for public presentations – to collect initiatives and opinions from citizens.

The satisfaction survey was also distributed with following feedback:

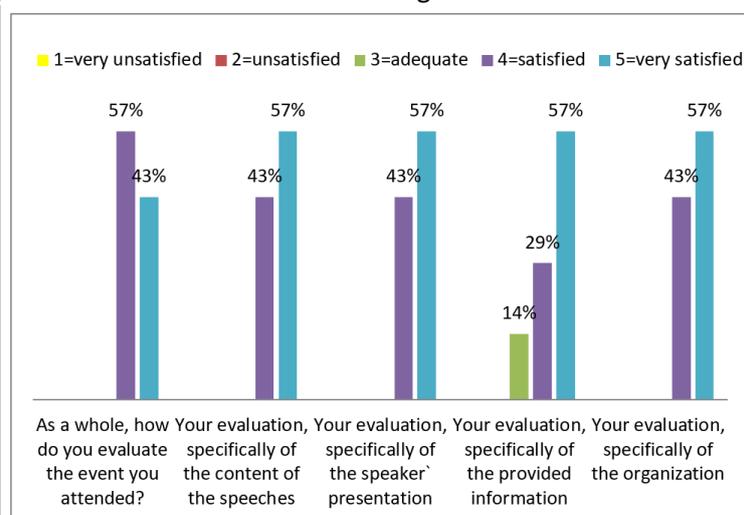


Figure 6: Feedback on 3D module of the online platform OnePlace. Source: Municipality of Velenje

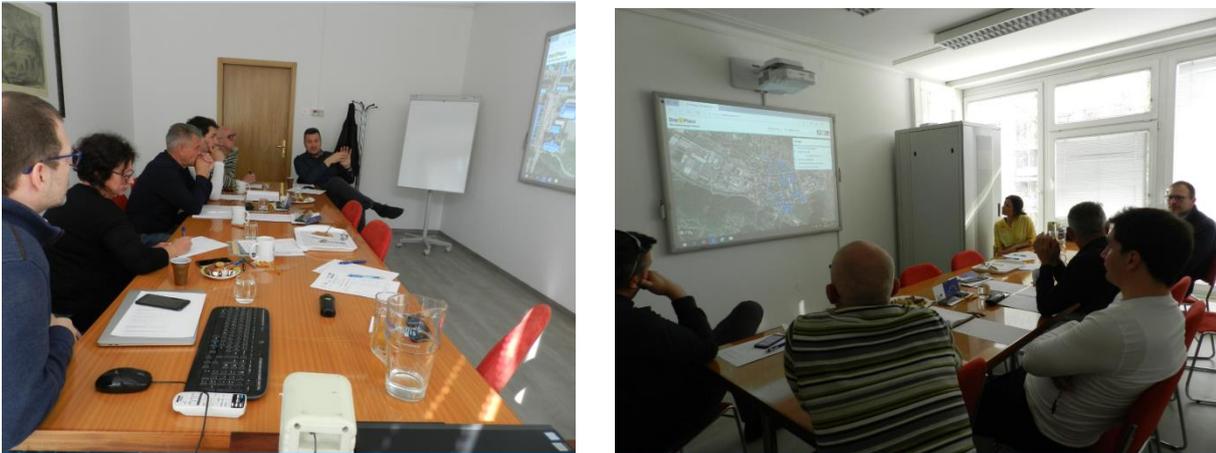


Figure 7: Collecting feedback on 3D module of the online platform OnePlace. Source: Municipality of Velenje

5. Application of OnePlace platform in PA7

The OnePlace platform has also been tested in the conditions of the pilot action in Velenje. As described in the chapter 4, on the FGM we decided to add various attributes for 3D Velenje to make it more functional and useful for energy planners. This needs time as many actors will need to provide extensive energy data of the buildings placed within OnePlace (for Velenje approx. 185). Feedback that was collected after the testing of the OnePlace platform is described in Chapter 4.



Figure 8: 3D building models of the Velenje PA - ca 180 buildings. Source: BOOSTEE-CE



6. Conclusions

The activities described in the pilot action in Velenje represent a good practice. They can serve as a model for carrying out investments aimed at improving energy efficiency consisting of installing smart metering for electricity, heating and water, installation of central monitoring system.

The pilot action in Velenje is distinguished by the use of new / modern technologies and solutions (installed smart meters). The successful investment is also influenced by good cooperation with building managers and external experts during the lifetime of the pilot.

Another characteristic that determines the success of an action is the implementation of organizational measures that affect the reduction of energy consumption, because they can provide energy savings of up to 10% (the power of control) or, in certain cases, even more when properly implemented. Organizational measures do not in themselves require major interventions in the building. By implementing these, the use of energy will decrease, which will directly affect the reduction of CO₂ emissions. Realization that by implementing soft measures for achieve energy efficiency the building managers are controlled by municipality (monitoring the energy usage) and this is the main reason for building managers are acting more responsible.

The ultimate success of this pilot decides to find a different location – **Savinjsko-Šaleška region (SAŠA region)** – to implement the results of the pilot action in Velenje and the lessons learned during its implementation.

The information from this study will be useful and used for documents D.T3.2.1 and D.T3.2.2.