

# OUTPUT FACT SHEET

## D.T3.3.7 Report on PA6 by PAKS in 11 buildings

Project index number and acronym	CE51 TOGETHER
Lead partner	Province of Treviso
Output number and title	D.T3.3.7
Investment number and title (if applicable)	I5 - Investment in an energy monitoring system for pilot actions in 11 public buildings in Paks (PA6)
Responsible partner (PP name and number)	Municipality of Paks, PP09
Project website	<a href="https://www.interreg-central.eu/Content.Node/TOGETHER.html">https://www.interreg-central.eu/Content.Node/TOGETHER.html</a>
Delivery date	30.11.2018

Summary description of the pilot action (including investment, if applicable) explaining its experimental nature and demonstration character

The pilot action is composed of two main parts:

1. Defining the energy performance and lavish points, leakages, malfunctions and wrongly planned or operated parts of the pilot buildings;
2. Designing and launching actions to make up these problems and reduce energy consumption also in general by eco-conscious behavior.

Both the first part and the second part consisted two different actions. To define the energy characteristics of the involved buildings, their energy flows had to be measured and compared in time and with other similar buildings. For this measurement the smart metering system was installed with an Energy Management Software. This investment was completed in all 11 pilot buildings of Paks in Sept 2017. Data is collected different ways depending on the energy source. In case of electricity, control meters have been installed right next to the billing meters, which are owned by the DSO and used for the official measurement of the consumption and issue the invoices in this basis. The control meters are smart meters with data transmission functions, they send the data to the server where the EMS software is running. The EMS analyses the consumption and creates reports upon requests. The consumption values and the consumption curves can be checked online and they are also projected by dashboards on the tablets installed at the 11 pilot buildings of the municipality. Gas is measured in slightly different way, as the gas meters were already available to transmit the signals, but the data was only collected by the DSO. In the frame of TOGETHER Paks has equipped these meters with wireless transmitters, which forward the consumption data to the server and the process from this point is the same as described at the electricity meters. Heat consumption is also measured at 4 buildings out of the 11 pilot sites. Heat consumption meters with wireless transmitters have been installed and providing consumption data for the server. Examples for the hardware used: district heating: Kamstrup 602, Kamstrup MC403; gas: MC602 transmitter + antenna added to existing DSO meter; electricity: ITRON ACE6000, Landis+Gyr E550, ACTARIS C114UR1D, ACTARIS SL7000, ITRON ACE3000, MC602 transmitters, OMNIPower 100/5 + antenna. The software was developed for energy management directly for the Municipality of Paks, already before the TOGETHER project. It was measuring the consumption of some public buildings, which are not involved into TOGETHER. The new meters of the current project have been integrated into this EMS, which is based on SAIA WEB system. The software measures heat consumption, gas consumption, electricity consumption and also water. It creates reports for periods defined by the users and also analyses the consumption in order to provide the possibility to decide what electric capacity and gas capacity is necessary at the measured buildings. Data is transmitted by wireless transmitters. Optical data reading is also possible. Dashboards are located in each measured buildings, usually at the entrance in order to reach the maximum possible number of persons in the building. The dashboards show the current consumption measured by the meters of the buildings (It differs from building to building: electricity is measured in all buildings, but at some buildings gas or heat consumption is also measured.). Curves of different time periods can be also visualized. The dashboards are not interactive.

Once the baseline consumption data was available, we had to define where are the lavish usage points and inefficient parts of the buildings. Therefore official energy certifications have been conducted at each pilot buildings, defining the current energy category of the building, the suggested interventions (such as insulation of the building, installing solar panels on the roof) and the achievable energy category of the building.

To analyse the suggested refurbishment activities' feasibility, 3D modelling was used with a special software (ArchiCAD). The investment needs were visualized this way for the decision makers.

The identification of the necessary investments - that will be able to gain the highest cuts on energy consumption - have been followed by the demand side management actions. These actions compose the essence of the project: to show people that investments are not enough (and sometimes not possible due to financial or legal reasons) to reduce energy consumption, the participation of all building users are inevitably important and required. Therefore Municipality of Paks organized bilateral discussions with the building managers, printed 2800 stickers for switches and taps, 60 posters in 3 versions for awareness raising, 5000 pieces of A5 leaflets with energy saving possibilities for building users, and several A3 posters that describe the functioning of smart metering and energy management. Besides, company newsletters were planned and the project's findings have been integrated into the education of the Energetic Secondary School.

The measurement of the results of these activities are ongoing, and will be used in the documents of WP T4 of the project, especially at the D.T4.3.2 Local reinvestment plans connected to pilot buildings, that will provide guidelines how to reinvest at least 20% of the savings achieved by the energy efficiency actions of the pilot buildings.

**NUTS region(s) concerned by the pilot action (relevant NUTS level)**

Building	NUTS 3	Address (Street, house number, postal code, city, country)	GPS coordinates
ENERGETIC SECONDARY SCHOOL AND DORMITORY (ENERGETIKAI SZAKGIMNÁZIUM ÉS KOLLÉGIUM)	HU233 - Tolna	Paks, Dózsa Gy. út 95.	46°37'16.9"N 18°51'14.6"E
Kindergarten, Kápolna str. KINDERGARTEN (KÁPOLNA UTCAI BÖLCSŐDE)	HU233 - Tolna	Paks, Kápolna u.4-6	46°37'20.7"N 18°51'16.8"E
SWIMMING POOL (VÁROSI TANUSZODA)	HU233 - Tolna	Paks, Táncsics M. u. HRSZ.: 3523/6	46°37'19"N 18°51'23"E
MEDICAL CENTRE BALNEOLOGY (PAKS GYÓGYÁSZATI KÖZPONT BALNEO)	HU233 - Tolna	Paks, Táncsics M. u. 13	46°37'10.3" 18°51'24.0"E
MEDICAL CENTRE SURGERY (PAKS GYÓGYÁSZATI KÖZPONT RENDELŐ)	HU233 - Tolna	Paks, Táncsics M. u. 13 (same address)	46°37'10.3" 18°51'24.0"E
TOWN HALL (ÖNKORMÁNYZATI ÉPÜLET)	HU233 - Tolna	Paks, Dózsa Gy. út 55-61	46°37'25.9"N 18°51'28.6"E
OFFICE FOR GOVERNMENT ISSUED DOCUMENTS (OKMÁNYIRODA)	HU233 - Tolna	Paks, Dózsa Gy. út 51-53.	46°37'26.9"N 18°51'31.5"E
POLICE OFFICE (VÁROSI RENDŐRKAPITÁNYSÁG)	HU233 - Tolna	Paks, Dózsa 52-54 Hrsz/cím:396	46°37'24.6"N 18°51'29.6"E
SPORT CENTER (PSE SPORTPÁLYA)	HU233 - Tolna	Paks, Fehérvári út 29.	46°37'57.9"N 18°51'07.1"E
CSENGEY DÉNES CULTURAL CENTRE (CSENGEY DÉNES KULTÚRÁLIS KÖZPONT)	HU233 - Tolna	Paks, Gagarin u. 2.	46°36'56.2"N 18°50'32.4"E
DEÁK HÁZ CULTURAL CENTRE (DEÁK HÁZ)	HU233 - Tolna	Paks, Deák F. u. 4.	46°37'41.0"N 18°52'03.5"E

### Investment costs (EUR), if applicable

The contract has defined the following items:

1. Procuring and installing smart meters, tablets and necessary permissions, deadline: 30 Sept 2017, amount: 9.926.651 HUF + VAT = 40.459,73 EUR (VAT: 27%, exchange rate for reporting: 311,59 HUF/EUR)
2. Support activities, deadline 31 May 2018, amount: 1.400.000 HUF + VAT = ca. 5.706,22 EUR (depending on exchange rate)
3. Support activities, deadline 31 May 2019, amount: 839.820 HUF + VAT = ca. 3.423 EUR (depending on exchange rate)

Total amount: 49.588,95 EUR  
ERDF (85%): 42.150,60 EUR

### Expected impact and benefits of the pilot action for the concerned territory and target groups and leverage of additional funds (if applicable)

The benefits will bring economic gains for the building maintainers, and raise the living standards of the building users: Statistics show that by smart metering 5-15% of the energy consumption can be saved in buildings. The building users are informed about the consumption levels and patterns and also about the optimal level of energy consumption. After comparing the two levels, they are motivated to reduce their consumption. This reduction will result in energy cost savings and it will contribute to the achievement of the climate protection goals of the EU.

The smart metering system makes it possible for Paks to analyze its energy consumption in the involved public buildings, and define energy reduction measures. The municipality has also delivered some energy certifications for all of these buildings, and the certifications include a chapter on the recommended energy efficiency interventions, as an obligatory part. The results of these interventions can be monitored by the Municipality by the smart meters (reduction in heat consumption due to new insulations or replacement for doors and windows, reduction in electricity consumption due to the rationalization of use of lighting and replacing old luminaires to LED).

TOGETHER also suggests tools for these activities - such as competitions, online and offline awareness raising campaigns, remuneration, etc. By reducing their heat, gas and electricity consumption, these buildings contribute to the decreasing of the GHG emissions and contribute to the climate protection goals of Hungary and the EU.

The pilot also serves as an awareness-raising tool, as the tablets at the entrances show the energy consumption characteristics to all interested building users and for visitors. As these buildings are visited by plenty of people (Town Hall, cultural center, swimming pool, medical facilities), the investment makes it possible to reach the majority of the population of Paks and also the surrounding settlements.

Besides, the smart metering data together with the certifications provide guidelines and reliable baseline values for future refurbishment projects - funded by Settlement and Territorial Development Operational Programme (actions 3.2.1, 3.2.2), Environment and Energy Efficiency Operational Programme (priority 5) or other EU funds.

Benefits therefore can be summed up as follows: The possibilities of identifying energy leakage points and also malfunctions, setting the priorities for energy refurbishments and promoting the savings for the inhabitants will support Paks and other settlements in ranking their energy investments to achieve the highest possible positive impact and to inform the building users and visitors about energy saving actions who will become multipliers of this eco-conscious thinking.

### Sustainability of the pilot action results and transferability to other territories and stakeholders.

On one hand the maintenance of the smart metering system is ensured. It is composed of the meters (electricity, heat), communication units of the meters, tablets and the energy management system (EMS). The EMS is owned by the external expert and provided for the Municipality of Paks until at least 31 May 2024. All other listed parts of the smart metering system are owned by Paks and are activated in its bookkeeping. Paks guarantees that after the follow up period it will maintain the system by either signing further contracts for the use of the EMS or develop another EMS. The support will be provided by the expert until 31 May 2024 as per contract. This provides the possibility to measure the affects of energy refurbishments, set new targets and visualize the results of demand side management tools. The approval of the Reinvestment plan defines actions and amounts for these refurbishments.

On the other hand, the awareness raising actions of the municipality will be continued: stickers are put to the switches and taps, posters are hanged on the walls of the pilot buildings, the info videos of the project about energy management and smart metering are available on the web and were embedded into the educational program of the Energetic School. The establishment of and information point at the Town Hall will provide continuous support for energy efficiency actions on consumer side and provide information on possible tools. The direct feedback system i.e tablets showing the consumption statistics from the EMS will be maintained in the buildings and showed for visitors, delegations and other decision makers to understand the necessity of permanent energy monitoring. energy saving tips have also been printed in thousands of copies and will be further disseminated to new workers and building users. Besides, Municipality of Paks plans to continue the cooperation with the Energetic Secondary School in shaping energy efficiency programmes for the future periods.

### Lessons learned and value added of transnational cooperation of the pilot action implementation (including investment, if applicable)

Lessons learnt are rather connected to the demand side management part of the pilot and not the investments. The specification for the smart metering could be defined quite easily, as the types of energy used by the involved 11 buildings could be identified, existing meters were listed and the recommended metering points could be defined with the involvement of the technical expert. The types of meters and communication units could be also selected by the expert on the basis of its experiences and knowledge, and the operation of the system started soundly in Oct 2017. The data collection and evaluation is managed by an EMS without problems.

The challenge was rather on human side: how to involve the building users into demand side management actions. This task might be much easier at schools, where the target group is composed of pupils and not office workers, who cannot really be motivated. Children are willing to try new activities and they contribute to the protection of their environment by pleasure. Also, they consider these actions as a game, so they are motivated to join. On the other hand, office workers are usually overloaded with administrative works, spending their days in their working place without motivations to take part in any additional activities - especially if remuneration is not connected, they won't directly benefit from the savings. Many discussions had to be organized to convince building managers about the benefits of such pilots and find those persons who are opened for such experiences and can also function as opinion leaders. We found these persons at the Energetic Secondary School, where the education itself already contains some elements of energy efficiency. They could help us to get closer to the building users of other involved buildings, and define attractive messages and tools for DSM.

We have therefore learnt that in such projects partners should involve children, or elaborate a motivation (financial or emotional) for the users. Besides, involving some opinion leaders - not from the top management, but from the ordinary workers is crucial.

Transnational cooperation gave us the possibility to study these solutions at other partners, who live in different cultures, work among different administrative rules and have usually different living standards.

**Contribution to/ compliance with:**

- relevant regulatory requirements
- sustainable development - environmental effects. In case of risk of negative effects, mitigation measures introduced
- horizontal principles, such as equal opportunities and non-discrimination

Environmental, construction permits were not necessary. Only agreements had to be made with the users of the involved buildings, that they allow Paks to install the meters. These agreements were managed. As control meters are used in all cases, DSO permissions were also not necessary.

However, the smart metering system supports the definition of the energy performance of involved buildings, and makes it possible to analyse the results of the energy efficiency actions recommended by the energy audits. The affected regulations are the following in this sense: The first regulation 7/2006 (V.24.) TNM decree, according to EPBD 2002/91/EC directive came into force in 2006. (Hungary joined to the EU in 2004). This decree contains 3 levels of threshold values for the heating season and 1 for the summer period. Application of the measures specified by 176/2008. (VI. 30.) - this decree defines the details of energy certifications, therefore its fulfilment can be supported by the pilot: During the energy certification of buildings, specific energy consumption measures have to be set, which process will be supported by the smart metering system.

The following regulations also show connections to the pilot: Gov. decree. The 40/2012. (VIII. 13.) BM decree meant to make the first step to fulfill the requirements set by EPBD recast 2010/31/EU. However does not include tightening on major requirements only set requirements on comfort and renewables. The 105/2012. (V. 30.) Gov. decree meant to specify the changes regarding the application of the measures. Having regard to Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings, Decree No 20/2014 of 7 March 2014 of the Minister for the Interior amending Decree No 7/2006 of 24 May 2006 of the Minister without Portfolio determining the energy performance characteristics of buildings (the 'Energy Performance Characteristics Decree') provides that, from 1 January 2015, the values corresponding to cost-optimal energy efficiency levels are applicable in the case of support granted under domestic or EU tenders or from the central budget for the improvement of the energy performance of buildings falling within the scope of the Energy Performance Characteristics Decree. Requirements of EED 2012/27/EU regarding cost effectiveness are introduced by 20/2014. (III. 7.) BM decree by specifying the cost-optimal threshold values.

Sustainable development: the pilot actions combined with the investment contribute to: stimulating market transformation towards more efficient buildings; mobilising public & private investments, rationalizing public expenditure; participants will be stimulated to adopt more efficient behaviour that can be replicated in other contexts (e.g. at home).

Equal opportunity: The tablets are installed at the entrances of the pilot buildings, which are easily accessible by people with disabilities as well, therefore the visualization of the consumption data is provided for everyone without and obstacles. It is also possible to import data to excel sheets and make it understandable for anyone else, who cannot visit the locations of the displays. Besides, the EMS is available online. Children are also involved into the understanding of the consumption patterns and their effects on environment at the Energetic School.

Equality between men and women: The building users of the pilot buildings are mostly office workers of municipal buildings, medical buildings and cultural buildings. The rate of women among these employees always exceed 50%. Besides, all communication activities are based on understanding/targeting differences in patterns of consumption by women and men (e.g. awareness raising activities, design of key messages etc.) as they consider not to use any discriminative messages based on the genders.

Environment: Smart meters help to understand the extent of energy consumed at the pilot buildings. Their combination with demand side management tools, the overall electric and heat energy use of these buildings can be decreased remarkably, which have a measurable affect on climate protection. Therefore the main target of the pilot is environment protection.

References to relevant deliverables (e.g. pilot action report, studies), investment factsheet and web-links

If applicable, additional documentation, pictures or images to be provided as annexes

References to the relevant deliverables:

- D.T3.1.1 preparatory analysis of the technical and management requirements for installing smart meters
- D.T3.1.3 Energy Audit Report
- D.T3.1.5 Report on modelling the energy efficiency refurbishments of selected pilot buildings owned by Paks
- D.T3.2.6 PA6 design for 11 buildings in Paks (HU)
- D.T4.2.1 Transnational Strategy Framework
- D.T4.2.2 Set of policy recommendations
- D.T4.3.2 Local reinvestment plans connected to pilot buildings
- D.C.4.7 infographic tutorial containing guidelines on how to read and use smart metering systems