



## Demand Side Management Tools



D.T3.3.1 Template for reporting Pilot Actions Results

PP2/EAV

**CE51 TOGETHER**



## Executive summary

This template is delivered for reporting pilot actions with technical description and documentation about the combination/selection and application of the integrated measures applied in pilot buildings. Partners are required to include a presentation of their Pilot Action, providing with an overview of the implemented activities and results achieved. Each partner has to produce this report using information and content collected at local level with the support of the managers/users/negotiating panels of the involved buildings.

It is not requested to include detailed information for each single building involved (a part some specific information about the energy consumption) as detailed information have been already provided in the PILOT CONCEPT DESIGNS. Exemplification, reference to specific context are welcome.

Note for the authors: please provide information in all the requested text boxes. You have to consider that the provided information will serve to prepare other project documents/deliverables such as the final e-book. For that reason, it is important to write clearly to create the conditions that everyone can understand and get the added value you want to share with the “external” audience.

Several content of the current template will be transferred and used for preparing the PILOT FACTSHEET compulsory for the CE programme

**DEADLINE FOR SUBMITTING THE FILLED TEMPLATE TO THE  
LEAD PARTNER: 20 JANUARY 2019**



**1. Summary description of the pilot action (including investment, if applicable) explaining its experimental nature and demonstration character.** Overview of the Pilot Actions implemented, general introduction. Write max 2 pages that introduce your local activities, the target group engagement, results. Please give evidence of the approaches implemented in the different buildings in particular if they are not belonging to the same category (educational, institutional, others) include some pictures in the “GALLERY”

Local activities in Czech pilot clusters were based on energy efficient activities in educational buildings. Due to fact that Czech associated partner - Vysočina Region owns all high school in region and due to fact that work with students is much better then with adult as they are more open to new ideas and approaches EAV as a project partner decided to work with students of high schools and gymnasiums.

EAV (based on application form) apply an approach of mixed monitoring system (manual and automatic). 5 buildings were equipped by smart metering system (automatic data collection) and 5 buildings use manual data collection - janitors manually collect consumption data on weekly basis. Following energy is monitored in Czech pilot cluster buildings:

- Electricity
- Gas
- Heat

The first part of pilot actions was to analyse technical equipment of the building (heating, cooling, lighting, etc.) to make a list of requirements for smart meters installation. These activities were carried out in cooperation with janitors and caretakers. In buildings without SM system the procedure of manual data collection has been arranged.

The second part was installation of smart meters itself and start trial operation of smart meters. To verify the consumption data with real data, janitor collect the consumption data manually too.

Subsequently EAV started with raising awareness campaign in pilot buildings. In duration of pilot actions students was introduced in energy efficiency issues and gained their knowledge and habits in the field of energy efficiency and waste management. The involvement of pupils was supported by educational stories (mainly the Planet defenders' interactive game, which is commonly used in English language as a combination of English language and physics teaching), posters, labels, notice boards etc. Another important action was exchange of experience between students from different pilot schools, where they meet each other. For students of pilot buildings was organised study visits in cooperation with Chamber of Commerce of Vysočina region, which cover costs for these study visits.

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ideas and approaches, EAV as a project partner decided to work with students of high schools and gymnasiums.

During implementation of our pilots' students were not the only target group, we have focused on. We worked with different employees of school buildings:

- We had many meetings with school principals who shared their issues and problems in relation to the building and thanks to our direct contact with owner of buildings (associated partner of the project) we could interpret these issues right to the owner. i.e. necessity of energy retrofitting of the building
- Our cooperation with school caretakers were very close too. Due to fact that they know their building very well, we needed them during installation of smart metering. We were in touch on daily basis.
- Teachers from pilot schools took TOGETHER study materials and helped us with enforcement of energy efficient habits.

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During implementation of pilot actions EAV used the Energy audit kit (purchased in WPT2) as a practical example for students. They taught how to work with thermocamera, multifunctional meters, laser distance meter, IR thermometer, and clamp multimeter, but we let them work with other meters with which we work on daily basis too - CO2 meter, Humidity meter, Lux meter etc.

Pilot implementation approach was different in different schools based on their interest i.e. in Gymnasium there are very enthusiastic students, there is a team of students who worked on EE activities, they worked with all above mentioned devices fulfilling practical exercises. On the other side in schools were students work with heavy machines and not spend much time in classrooms the approach must be more systematic (i.e. checking of turning off machines which are not used in current time), students and sometimes even teachers are not open to practical examples and exercises, they just „fulfil their duties. “

The pilot action activities were disseminated to Kindergartens using educational story for children (troll workbook) in combination with EAV Hedgehog mascot, which helps children in non-speak way to understand what was explained.

The fulfilling of pilot activities was based on close cooperation with teachers and schoolmasters, who worked with students on evaluating of monitored data and appropriate feedback. In buildings with smart metering system there are public displays, where students can see the consumptions and in schools with manual data consumption, students were familiar with consumptions on monthly basis.

As after pilot actions requirement of pilot building representatives is the interest in water consumptions and related savings. There were introduced a water saving activities and EE habits, but without possibility of verification of lowering water consumption.

## 2. Indicate the NUTS (Nomenclature des unités territoriales statistiques) regions concerned by the pilot action

Pilot actions has been organised in CZ063 Vysočina region (NUTS 3) in following buildings:

- 1 Gymnázium Jihlava
- 2 Gymnázium Žďár nad Sázavou
- 3 OZS Jihlava, Husova
- 4 OZS Jihlava, náměstí Svobody
- 5 OZS Jihlava, Karolíny Světlé
- 6 SŠPTA Jihlava, tř. Legionářů
- 7 SŠPTA Jihlava, Polenská
- 8 SŠPTA Jihlava, Školní
- 9 VOŠ a SPŠ Žďár nad Sázavou, Studentská
- 10 VOŠ a SPŠ Žďár nad Sázavou, Strojírenská

## 3. Sustainability of the pilot action results and transferability to other territories and stakeholders. Max 2000 spaces

All the activities of pilot actions were based on effort to change the habits of students who are open to new ideas and approaches. They can transfer the habits to their homes, where they can teach something new to their parents and siblings. This is sustainability and transferability of soft measures (practises) used within pilot actions duration. Regarding sustainability of investment measures, based on experience from installation of smart meters EAV has an overview about energy and indoor quality environment monitoring market, so they can help to associated partner choose proper solution for dissemination and replication the pilot activities from the investment point of view.

Associated partner considers the possibility of deploying smart meters in most of their buildings (AP owns more than 700 buildings) thanks to experience with cheap smart metering based on Internet of things technology. Based on TOGETHER project cooperation agreement between EAV and associated partner, AP will set up follow up activities based on outputs of TOGETHER project which support them in activities leading to Energy management certification (ISO 50 001). Nevertheless, in all buildings owns by associated partner there is running the manual consumption data collection. Data are gathered in common system developed by IT department of AP for further use.

#### **4. Lessons learned and added value of transnational cooperation of the pilot action implementation Max 1000 spaces**

It is great to cooperate with other partners, who has different point of view, not only because of different nationality but because of different position in the sense of negotiation power or “company size”. Bigger partners think and performs activities on a larger scale, which can smaller partners follow and transfer. Based on cooperation of different partners with different knowledge and expertise, it was possible to create and disseminate big amount of different high-quality materials helping with investment and non-investment energy efficiency measures.

Another point of view is that different people in different buildings has different opinions and this project does not have to be meant as a benefit and opportunity. We met people with absolute lack of interest who consider project activities as additional duties and nonsense commands.

#### **5. Describe the Strength, Weakness, Opportunities and Threats that you have registered when implementing the pilot activities. Write max 1 page**

##### **Strengths of implementing pilot activities:**

Pilot activities helps the building occupants to gain new knowledge and acquire new habits which leads to save energy and money. Thanks to this, building owners save energy and money, which motivates them to multiplication the activities and provide them money for EE investments. Building occupants can transfer these new habits to their home and save their own money too. This is big additional value and concretely in Czech pilot cluster has associated partner many buildings where the activities can be transferred.

##### **Weakness of implementing pilot activities**

The biggest weakness is procurement costs for smart metering system which payback time is debatable. From this reason EAV chose manual data consumption in 5 buildings, where the monitored data are not so concrete and not allow to elaborate deeper analysis, nevertheless as a low-cost approach leading to energy savings which is easy to multiply it is a great pilot.

##### **Opportunities of implementing pilot activities**

Thanks to money savings there are opportunities to invest the money in energy retrofitting of buildings (heating system, thermal insulation, regulation, etc.) Due to fact that smart metering system is installed within the pilot actions, there is opportunity to complement the smart metering systems by monitoring of quality of indoor environment and outdoor conditions. This approach combines equithermal regulation of heating and ensure high quality indoor environments while increase efficient use of energy.

### Threats of implementing pilot activities

To fulfil pilot activities according to partner ideas on a sufficient scale require big negotiation power and great interest of involved groups. It is very difficult to reach some change, if there is no will to follow the project idea from the side of building occupants/representatives and/or building owners. It is a lot work to do and it is necessary to gain the interest of building users and motivate them to cooperate on EE activities.

**Before pilot implementation**  
Implementation of the pilot activities and implementation of the energy audit

**September 2017- December 2018**  
Implementation of the pilot and use of the smart meters. The baseline is calculated on the basis of the historical data (if available) or on the basis of the energy audit

**January 2019**  
Reporting and data elaboration

**February - April 2019**  
Elaboration for the Political level (reinvestment plan And action plan

**Follow up:** PPs and APS continue to use the smart meters even after the closure of the monitored period

**7. Total energy saved (in kWh) within the monitoring period, which is one year (please considered your pilot buildings altogether)**

Electric consumption 22 342

Thermal consumption 773 145

**8. What the baseline refers to? (audit, historical data etc? You have to indicate what type of data was used. Please, give a short description about the type of data used**

As a baseline historical consumption data from invoices has been used. In our opinion this is the most accurate source of data for consumption comparison. Data from audits, or other documents can be distorted by calculation.

Electricity							
	total heated floor area	baseline consumption	baseline period	consumption after pilot	monitored period after pilot	saved energy	kWh/m2 after pilot
	m2	kWh	start date, end date	kWh	start date, end date		
building 1	7 534	105 476	1.1.,31.12.2015, 2016, 2017 (avg)	99 420	1.1, 31.12.2018	6 056	13,19
building 2	3 851	90 193	1.1.,31.12.2015, 2016, 2017 (avg)	92 064	1.1, 31.12.2018	-1 871	23,90
building 3	5 363	67 754	1.1.,31.12.2015, 2016, 2017 (avg)	65 339	1.1, 31.12.2018	2 415	12,18
building 4	12 612	218 091	1.1.,31.12.2015, 2016, 2017 (avg)	217 868	1.1, 31.12.2018	223	17,27
building 5	3 668	53 896	1.1.,31.12.2015, 2016, 2017 (avg)	52 362	1.1, 31.12.2018	1 534	14,27
building 6	3 995	65 347	1.1.,31.12.2015, 2016, 2017 (avg)	75 694	1.1, 31.12.2018	-10 347	18,94
building 7	705	134 175	1.1.,31.12.2015, 2016, 2017 (avg)	131 565	1.1, 31.12.2018	2 610	186,61
building 8	2 337	137 640	1.1.,31.12.2015, 2016, 2017 (avg)	129 334	1.1, 31.12.2018	8 306	55,34
building 9	9 696	336 316	1.1.,31.12.2015, 2016, 2017 (avg)	333 868	1.1, 31.12.2018	2 448	34,43
building 10	5 491	158 401	1.1.,31.12.2015, 2016, 2017 (avg)	147 433	1.1, 31.12.2018	10 968	26,85

Gas							
	total heated floor area	baseline consumption	baseline period	consumption after pilot	monitored period after pilot	saved energy	kWh/m2 after pilot
	m2	kWh	start date, end date	kWh	start date, end date		
building 1	7 534	702 864	1.1.,31.12.2015, 2016, 2017 (avg)	606 144	1.1, 31.12.2018	96 719	80
building 3	5 363	375 618	1.1.,31.12.2015, 2016, 2017 (avg)	346 202	1.1, 31.12.2018	29 416	65
building 4	12 612	1 135 674	1.1.,31.12.2015, 2016, 2017 (avg)	1 088 101	1.1, 31.12.2018	47 573	86
building 5	3 668	326 256	1.1.,31.12.2015, 2016, 2017 (avg)	266 759	1.1, 31.12.2018	59 496	73
building 6	3 995	760 907	1.1.,31.12.2015, 2016, 2017 (avg)	705 569	1.1, 31.12.2018	55 338	177
building 7	705	220 000	audit	108 430	1.1, 31.12.2018	111 570	154
building 8	2 337	415 938	1.1.,31.12.2015, 2016, 2017 (avg)	372 246	1.1, 31.12.2018	43 692	159

Heat							
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	total heat ed floor area	baseline consumpti on	baseline period	consumpti on after pilot	monitored period after pilot	saved energy	kWh/ m2 after pilot
	m2	kWh	start date, end date	kWh	start date, end date		
building 2	3 851	243 981	1.1.,31.12.20 15, 2016, 2017 (avg)	235 161	1.1, 31.12.2018	8 821	61,06
building 9	9 696	1 720 926	1.1.,31.12.20 15, 2016, 2017 (avg)	1 457 098	1.1, 31.12.2018	263 828	150,28
building 10	5 491	1 227 963	1.1.,31.12.20 15, 2016, 2017 (avg)	1 171 272	1.1, 31.12.2018	56 691	213,31

**9. Do you have some issues with gathering the consumption data? Have you lost some data? (for various reasons such as the router stopped working, the wrong predefined constants in concentrator, same basic arithmetic issues that programmers did wrong by mistake, etc) How did you solve it?**

Yes, there were some data loss during the monitored year from different reasons - signal loss, battery defect, reconstruction of building, when energy was disconnected.

For preventive reasons we let the caretakers to keep watching energy consumption manually even after trial operation. So, we do not have as detailed data as we have with smart metering, but we have almost manually read data.

**10. How have you solved this problem? what are the advices and suggestions that you might stress out so the others that will replicate similar investments could use them?**

Due to low budget which EAV had, we decided to use new system in Czech Republic using Internet of Things. Due to this fact, there were some issues we must faced to, because the system is not much tested and verified, nevertheless all minor issues described above were solved i.e. Stronger antenna, battery exchange. All the data are gathered manually too.

**11. Describe the investment costs and indicate what are they**

**OPEX - Operating Expense costs that are the ongoing costs for running the system**

**CAPEX - Capital expenditure costs of developing or providing non-consumable parts for the product or system.**

Investment costs consists of hardware costs (transceivers, public displays, assembly material, cables...), communication charges, cloud server fees, service charges. Based on this the investment costs are both OPEX and CAPEX.

## 12. Total energy metered from the installation (fully working) to December 2018

Totally it was measured by smart metering 7 701 928,78 kWh.

## 13. How many Building Alliances were signed?

Please provide information about the involved pilot buildings/institutions that agreed to officially sign a building alliance and give an overview of their terms of reference (e.g. energy reduction goal, % of division of the energy savings etc)

Building alliance itself was not signed. Associated partner signed TOGETHER project cooperation agreement with PP2/EAV, where is agreed the cooperation on project activities and setting up of follow up activities after project closure with aim to raise energy efficiency of public buildings, nevertheless concrete goals was not agreed.

Has been the building alliance internally disseminated and shared with all the buildings players (e.g. teachers, students, janitors etc)

Building alliance was not signed, nevertheless all activities has been discussed and implemented in cooperation with pilot building users so they are familiar with current activities and situation.

How have you informed all the interested buildings players about the alliance and its aims and conditions?

Building alliance was not agreed, so there were no information to share with interested building players.

## 14. Describe the unexpected positive events/situations that you have registered during the implementation of the pilot activities.

**What changes in user behaviour can be experienced and how it was measured?**

**Please provide information and give examples/specific references**

Big interest and success had the tips posters for building users mainly with water saving. The posters are placed in concrete place (WC) in the building so students can read the tips while wash their hands. Water saving was most interesting for students, nevertheless within pilot action the water consumption was unfortunately not monitored.

Raising awareness campaign really helps to enforce students to focus on proper turning on/off lights in rooms when they come and leave. Another example is nature ventilation, when EAV provide CO<sub>2</sub>/temperature/humidity meters in classrooms and inform students which values are according to standards normal, for students it was kind of fun to remind teachers to ventilate the room during a lesson, when values were too high.

## 15. The energy monitoring system installed

Please write this part with a simple language that everyone can understand

write max 2 pages

For the smart meter systems, the following hardware is used:

- Data transceivers for monitoring electricity consumption, heat consumption, gas consumption
- Galvanic isolator for signal reading of electricity
- Dashboards - tablets + holders
- Secondary electricity meter

The data are collected in a cloud service, where all data transceivers send the data via sigfox network (on frequency 868 MHz).

Firstly, the data are collected in Sigfox cloud storage, where are collected all the data in form of messages. Each message is sent 2 times via different servers to ensure delivery of the message. From this cloud are the data regularly resent to our SCADA system where the concrete message is translated (decoded) and stored in external server. We are able to visualise the data in different time intervals. All the data are accessible via internet browser without need of installation a specific SW. After login it is possible to visualise data or export the data for any external processing. The communication between data transceivers and cloud storage is via Sigfox and between cloud storage and our SCADA system via internet. The measured data is collected in the cloud storage which is external and the SCADA system operates in supplier server. Vysočina Region as Associated partner access the data to copy them to their own servers. Smart meters monitor the following data:

- electricity consumption
- heat consumption
- gas consumption

## 16. Describe how the dashboard/data visualisation is operated and what is the feedback that receive the buildings' visitors

Whom is addressed the dashboard to? habitual visitors or occasional visitors? Please describe the target. Provide information Do it in max 1 page and include some pictures in the "GALLERY"

The dashboards consist of tablets and lockable wall holder. The tablets have android operating system and IPS display with wide viewing angles. The dashboards have access to all measured data, which is collected in the building. All collected data can be visualized on the dashboards. The dashboards are

located mainly in the hall of the building, so all personnel and visitors can see them. Dashboards shows following data:

- electricity consumption,
- heat consumption,
- gas consumption.

These data can be filtered and visualised in daily, weekly, monthly, yearly consumptions and directly compared with previous data.

### **17. Relevant for D.T3.3.10 about the involvement of the target groups**

Describe the involvement of relevant Target Groups in the implementation of your Pilot Action

Report on the target groups' involvement in Pilot Actions from the negotiation to its assessment

Please write at Detail what, when, who and how

Do it in max 1 page and include some pictures in the "GALLERY"

Pilot actions involved students, teachers, caretakers and other staff of pilot buildings. Besides them, pilot actions activities have been disseminated in 3 Kindergartens. The first one was in Žďár nad Sázavou on 18<sup>th</sup> of April 2018, second one in different Kindergarten in Žďár nad Sázavou too on 27<sup>th</sup> of November 2018 and last one in Nevcehle on 22<sup>nd</sup> of May 2018. There were used a Hedgehog mascot who helped children to understand how to better use energy and how to handle waste. TOGETHER materials have been used and disseminated (i.e. educational stories, promo video TOGETHER)

### **18. Relevant for D.T3.4.1 about the SUPPORTING STRUCTURE**

Describe your LOCAL SUPPORTING STRUCTURE (how it is composed, who are the members etc)

Describe the actions/decisions realised by the Local Supporting Structure that you have organised for supporting the pilot actions.

Please write max 2 page with completed information or in any case an adequate information

Detail what, when, who and how

Local supporting structure in Czech pilot cluster is composed from:

- 3 internal employees of EAV (project manager, communication manager, energy expert)

- 1 external expert and member of Chamber of Commerce
- 1 expert on installed smart metering system (supplier)
- 4 caretakers/janitors from pilot buildings

This local supporting structure ensure dissemination of pilot activities and proper use of smart metering system. There were many bilateral and trilateral meetings, where main issues during implementation were discussed and solved. Expert for smart metering together with caretakers and employees participated on meetings where technical issues were discussed during installation of smart meters. The expert for smart metering participated in other dissemination and communication activities and events (i.e. International workshop about EPC in Jihlava). The external expert as a member of Chamber of Commerce participated on meetings, dissemination events, pilot activities, workshops etc. (i.e. local workshops, Informative event).

#### **19. Expected impact and benefits of the pilot action for the concerned territory and target groups and leverage of additional funds (relevant for INDICATORS)**

The main impact are energy, emissions and money savings for Vysočina Region as owner of the buildings, which can open the possibility of use of additional funds for investments in EE in school buildings Target groups' benefits are based on raising their knowledge and habits, which can be shared to general public.

In pilot buildings there were made significant investments during pilots' implementation and other investments are planned:

- Energy retrofitting of 3 workshop buildings in SŠPTA Jihlava, Školní. Building were completely insulated (roof, walls, windows and doors replacement)
- New lighting system in 3 buildings of Gymnázium Žďár nad Sázavou. The replacement of old lighting system is divided into 3 phases. During summer holiday is replaced lighting system in one building.

Total leverage funds are about 588.000€.

**20. Describe if any of the involved administrations have invested own resources (e.g. for retrofitting the pilot buildings and or for extending the smart meters system in the involved buildings or in other buildings) already during the pilots' implementation. Indicate if any of the involved**



administrations have taken a commitment to invest own resources. Please give numbers, dates and describe shortly the type of levered investment

Vysočina region as an owner invest their own money using subsidies from Operational programmes to insulate one of buildings of SŠPTA Jihlava, which is pilot building and to exchange of lighting system in Gymnázium Žďár nad Sázavou.

**21. Full time employee (relevant for INDICATORS).** Indicate if you have hired new staff for the implementation of the pilot actions and if the contract will be renovated after the end of the project

No employees (part time/full time) has been hired.

## PHOTO GALLERY

(please make sure that people included in the pictures have given you their informed consent giving you consent to publish the pictures)



