Interreg CENTRAL EUROPE
European Union European Regional Development Fund

BOOSTEE-CE

DELIVERABLE D.T2.1.2

Catalogue of best practices

Version 1
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D.T2.1.2: Deliverable

A.T2.1 Development of the Online Energy Platform – One Place

Catalogue of best practices

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Vsebina

1. EXECUTIVE SUMMARY

This catalogue is compiled for the project BOOSTEE-CE: Boosting energy efficiency in Central European cities through smart energy management. The aim of the project is to enhance retrofitting of existing public buildings across Central Europe

The catalogue summarizes collected best practices regarding the regional / national financing support and several energy efficiency measures in public buildings of 7 EU Member States involved in the project.

2. INTRODUCTION

Public bodies such as municipalities are also owners and operators of various infrastructures and buildings. In doing so, they assume responsibility in various areas and conflicts of interest may well arise.

Buildings in particular are significant energy consumers and sometimes also cause high costs in the public budget. The largest energy consumption is usually caused by heating. Air conditioning also plays an increasingly important role as global warming continues. In addition, there is also the electricity requirement for lighting, IT and other small consumers.
From a technical point of view, there are many ways to reduce energy consumption and running energy costs and to use CO2-neutral, renewable energy sources, thus also protecting the climate. But very often the question of financing the measures also arises, especially measures for thermal building refurbishment often have a high capital requirement and long payback periods.

What measures can be taken to increase energy efficiency in buildings?

Particularly in older buildings, the heating requirements are usually very high. Here, thermal refurbishment with appropriate thermal insulation helps to reduce consumption and costs. This also contributes to securing the value of the building and also increases the comfort of use by better heat distribution in the room due to higher surface temperatures. Better thermal insulation not only reduces the heat demand, but also protects against overheating in summer. When avoiding cooling loads, the arrangement of windows and appropriate shading should also be considered. These measures are usually the most expensive with the longest payback periods.

When generating and distributing heat, special attention should be paid to the use of renewable energy sources. Biomass, district heating or heat pumps are suitable here, sometimes in combination with solar energy. Also energy production from photovoltaics is possible. On the one hand, correct dimensioning of the systems, in conjunction with low-temperature heat distribution systems, is important, and on the other hand, good regulation and also the awareness of the users to adapt the heating system to the actual demand is needed. This concerns the correct room temperatures and heating times, or reduction of the room temperature outside the times of use. Modern smart meters and monitoring systems also help to analyse consumption accordingly and, if necessary, to react or take countermeasures.

In the lighting sector, modern LED lighting systems can save a great deal of electricity compared to classic fluorescent lamps or other light sources. Motion detectors or light control systems are also suitable for adjusting the lighting to the requirements and saving energy and costs.
For IT-systems and many other electricity consumers, it is important to switch them off outside the period of use, to reduce stand-by losses and to purchase modern energy-efficient equipment for new or replacement investments.

A variety of financing options are also available for investments, which facilitate or enable the implementation of the measures.

3. EXISTING FUNDS AND ASSISTANCE IN CE COUNTRIES ON NATIONAL LEVEL

This chapter is taken from deliverable D.T4.1.2: Transnational Energy Efficiency Financing Strategy. The content is referring to the financial support for performing EE measures by seven countries involved in this project.

3.1. Austria

3.1.1. Funding leveraged by ESIF and National Funding

On behalf of the Federal Ministry for Sustainability and Tourism, KPC – Kommunalkredit Public Consulting handles grants in the fields of energy, climate and environment. The motto is "Consulting. Funding. Protecting the environment".

KPC sees itself as a specialist for climate and environmental protection projects in the fields of renewable energy, energy efficiency, mobility management, urban water management, protection water management and remediation of contaminated sites.

Both National and European subsidies (EFRE, ELER) are awarded, depending of the type of project.

Via the portal www.umweltfoerderung.at, interested parties can select the areas of companies, municipalities or private individuals; on the next level they can call up the desired areas, ranging from renewable energies to energy efficiency, electricity, heat, buildings, light, mobility, model regions, R&D, water/wastewater, waste and resource management.

https://www.umweltfoerderung.at/

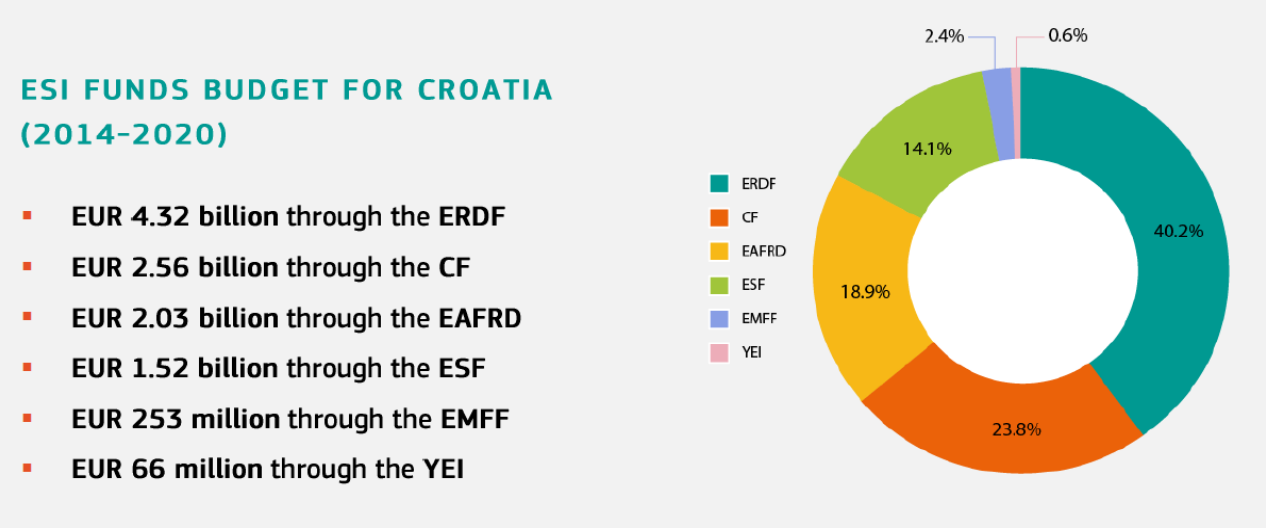
3.1.2. Overview of programmes supporting energy efficiency in Austria

Programme name	Period of Recruitment	Total Budget	Managing Authority
UFI – Umweltförderung im Inland (climate, energy and environmental subsidies like: renewable energy, energy efficiency, mobility management, urban water management, protection water management and remediation of contaminated sites)	submission is possible on an ongoing basis.	Different budgets for different topics, most of them are available the whole year.	KPC – Kommunalkredit Public Consulting https://www.umweltfoerderung.at/
Ökostromgesetz – Green Electricity Law	call for proposals at the beginning of the year. First come – first served principle	Limited budged for PV, wind, biomass/ biogas, small hydro power and energy storage	OeMAG www.oem-ag.at

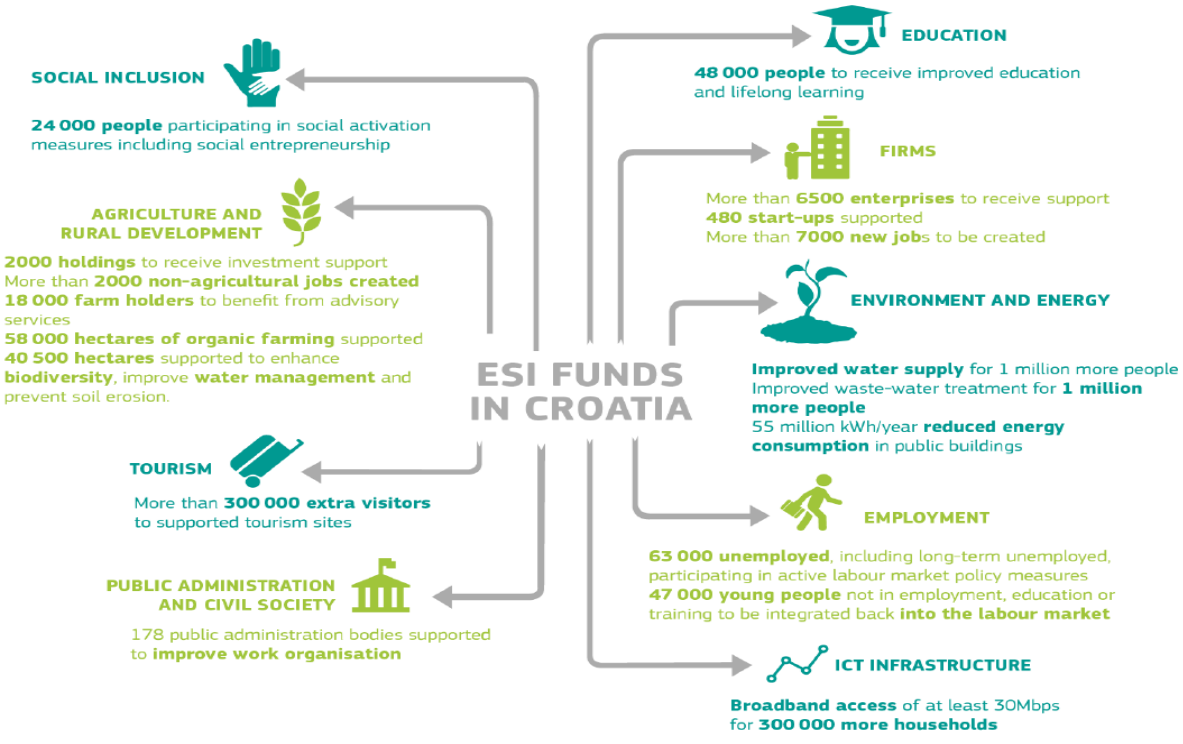
3.2. Croatia

3.2.1. Funding leveraged by ESIF in Croatia

Through four national programmes, Croatia has been allocated EUR 10.74 billion from ESI Funds over the period 2014-2020. With a national contribution of EUR 1.9 billion, Croatia has a total budget of EUR 12.67 billion to be invested in various areas, from research and innovation to employment, education and training, social inclusion, public administration and civil society as well as infrastructure and environmental protection.



All funds are designed to support Croatia's socio-economic development. The expected results (targets) give an overall view of where Croatia should be on key parameters by 2020



The list of programmes available in Croatia:

National

Competitiveness and Cohesion - HR - ERDF/CF, Efficient Human Resources - HR - ESF/YEI, Croatia - National Rural Development, Maritime and Fisheries - Croatia

Cross-border

Interreg V-A - Hungary-Croatia, Interreg V-A - Slovenia-Croatia, Interreg V-A - Italy-Croatia,

Transnational

Interreg V-B – Danube, Interreg V-B - Central Europe, Interreg V-B – Mediterranean, Interreg V-B - Adriatic-Ionian,

Interregional

Interreg Europe, Interact, Urbact, ESPON

IPA-CBC

IPA CBC Croatia – Serbia, IPA CBC Croatia – Bosnia and Herzegovina - Montenegro

The strong focus on smart and sustainable development in Operational Programmes for 2014-2020 paved the way for more intensive engagement on 13 concepts such as smart cities, social innovations, green cities, green energy, green mobility, green economy, green tourism and others. The importance of these themes is widely acknowledged in Croatia as relevant for the development of sustainable local communities and cities, with meaningful contributions aiming at raising quality of life. A positive fact is that all these concepts and new themes are given due attention both in the main regional development document – the National Strategy for Regional Development 2020 - as well as in county development strategies and strategies for the development of urban areas eligible for the ITI instrument.

Along with the very strong financial and investment impact, through participation in cohesion policy Croatia has had the chance to significantly change the structure of its public investments and, consequently, increase their effects on the country's long-term competitiveness. This is clear if we consider the sectoral distribution of ESI funds. The most abundant allocations are in the area of environmental protection which mostly covers large infrastructure projects in water and waste treatment facilities. The support for the competitiveness of small and middle-sized enterprises (SMEs) is the second most significant funding area. Research, development and innovation (RDI) has also been allocated significant funds earmarked for various types of support, ranging from investments into public and private RDI facilities to support for the development of new products and services. Other areas with significant investment increases are energy efficiency and other activities supporting the transition to a low-carbon economy.

3.2.2. National Funding in Croatia

Environmental Protection and Energy Efficiency Fund

Within the Priority axis 4, the main priorities of financing will be aimed at promoting the measures for renewable energy sources and energy efficiency in the sectors with the highest share in energy consumption, meaning in the: industry, transport, service activities, agriculture, and households.

Priorities:

- Increasing energy efficiency and use of RES in manufacturing industries

- Increasing energy efficiency and use of RES in the private service sector (tourism, trade)
- Reducing energy consumption in the public sector buildings
- Reducing energy consumption in residential buildings (multi-apartment buildings and family houses)
- Increasing the efficiency of the district heating system
- Increasing energy efficiency of public lighting
- Smart Grids pilot-project – distribution system which operates at low and medium voltages

Croatian Bank for Reconstruction and Development

The financial instrument "ESIF Energy Efficiency Loans for Entrepreneurs" is the third financial instrument within the framework of the Specific objective 4 "Supporting the transition to the economy with low CO2 emission levels in all sectors", beside the financial instruments "ESIF Loans for Energy Efficiency for Public Buildings" and "ESIF Loans for Public Lighting" also placed by Croatian Bank for Reconstruction and Development, and are intended for public sector borrowers. Pursuant to the Agreement, EUR 68 million, i.e. HRK 511 million, are available to micro, small, medium and large private entrepreneurs with registered activities in the manufacturing industry and service sectors (tourism and trade).

3.2.3. Overview of programmes supporting energy efficiency in Croatia

Programme name	Period of Recruitment	Total Budget	Managing Authority	More information (link)
Competitiveness and Cohesion OP	2014-2020	Cohesion Fund (CF): 2.509.755.644 € Regional Development Fund (ERDF): 4.321.499.588 €	Ministry of Regional development and EU Funds	https://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/croatia/2014hr16m1op001
IPA CBC Croatia - Serbia	2014-2020	Total OP budget: 40.344.930 € Total EU contribution: 34.293.188 €	Agency for Regional Development of the Republic of Croatia - Directorate for Managing Cooperation Programmes and Regional Development	https://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/croatia/2014tc16i5cb003
IPA CBC Croatia - Bosnia and Herzegovina - Montenegro	2014-2020	Total OP budget: 67.241.552 € Total EU contribution: 57.155.316 €	Agency for Regional Development of the Republic of Croatia - Directorate for Managing Cooperation Programmes and Regional Development	https://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/croatia/2014tc16i5cb004

3.3. Czech Republic

3.3.1. Funding leveraged by ESIF in the Czech Republic

Operational Programme Environment 2014-2020

The 2014-2020 Operational Programme Environment (OPE) has been built on its predecessor, 2007-2013 OPE. 2.506 billion EUR are ready from the Cohesion Fund and the European Regional Development Fund and have been earmarked for applicants.

The Operational Programme aims to protect and ensure the quality of the living environment of the Czech population, promoting the efficient use of resources, eliminating the negative impacts of human activities on the environment and climate change mitigation.

The Priority Axis 5 focuses on energy savings like building refurbishments, change of the heat source, renewable energy sources, better indoor climate and finally buildings with low energy consumption (lower than 15 kWh/m2.a).

The Priority Axis 5 allocated 495 636 080 EUR for the financing the energy savings.

The Managing Authority is the Ministry of Environment, the intermediary body the State Environmental Fund of the CR.

Integrated Regional Operational Programme

The Integrated Regional Operational Programme (IROP) 2014-20 was established by the Ministry of Regional Development in line with the Czech Republic's Regional Development Strategy for 2014-20.

IROP aims to achieve balanced territorial development, improve infrastructure, improve public services and public administration, and ensure sustainable development in municipalities, cities and regions. The aim of IROP is to strengthen the regional competitiveness and quality of life of all Czech citizens. The IROP financial allocation is 5.4 billion EUR. The support is directed to all regions of the Czech Republic except the capital city of Prague.

The IROP includes a component on energy efficiency and smart energy management for public and residential multifamily buildings. The aim is to reduce energy consumption by improving thermal performance of buildings, replacement heating and hot water equipment, and trigger the transition to low-carbon energy sources. The total budget allocated is EUR 625.2 million [CZK 16.9 billion] (for all components including energy efficiency). The government expects to reach 7.5 PJ in total final energy consumption savings

Operational Programme Enterprise and Innovations for Competitiveness 2014-2020

Operational Programme Enterprise and Innovations for Competitiveness (OPEIC) 2014 – 2020 was established by the Ministry of industry and trade. The financial support is set on 4.8 billion EUR. The priority axis 3 focuses on the energy effectivity and 1.3 billion were allocated in 2013.

OPEIC priority axis 3 aims at renewable energy sources, smart grids, energy savings, low carbon technologies, energy effectivity and local district heating.

3.3.2. National funding in the Czech Republic

National Programme Environment

The National Programme Environment supports projects and activities contributing to environmental protection in the Czech Republic. The Programme is designed as a complement to other grant titles, especially to the Operational Programme Environment and the New Green Savings Programme.

The aim of the programme is to support projects that focus on the efficient and gentle use of natural resources, remedying the negative impacts of human activities on the environment, mitigating and adapting to the impacts of climate change, and effective prevention through environmental education, education and awareness.

Calls are announced continuously and the amount of money for each call is approximately 1-10 mil. EUR.

New Green Savings Programme

The New Green Savings Programme of the Ministry of the Environment is administered by the State Environmental Fund of the Czech Republic and is one of the most effective programmes in the Czech Republic focused on energy savings in family houses and apartment buildings.

It supports the reduction of the energy intensity of residential buildings (complex or partial thermal insulation), construction of houses with very low energy intensity, environmentally friendly and efficient use of energy sources and renewable sources of energy (RES).

Depending on the real energy savings, you can save up to 50% of the total eligible expenses. Approximately 0.8 billion EUR were allocated for the savings in houses.

EFEKT 2017-2021

EFEKT supports municipalities to increase energy efficiency with the reconstruction of public lights, reconstruction of heat sources, energy savings by EPC and all types of energy consultancy and preparation of energy strategies.

EFEKT focuses on the implementation of energy-saving measures, on increasing the efficiency of energy use and reducing energy intensity. EFEKT announces the Ministry of Industry and Trade with the intention to participate in the implementation of the State Energy Policy. 30 mil. EUR were allocated for this programme.

The EFEKT programme is a complementary programme to the operational and national energy programmes to increase energy savings.

Technology Agency of the Czech Republic - Theta

The Technology Agency of the Czech Republic is an organizational unit of the state that was founded in 2009 for the support of research, experimental development and innovation. The Technology Agency of the Czech Republic simplifies the state support of applied research and experimental development which has been fragmented and implemented by many bodies before the reform. One of the programmes is called THETA and focuses on the modernization of the energy sector, including public interest research and energy strategies. Already two calls were successfully carried out and at present the third call is in preparation. For each call there is an allocated budget of approximately 30 mil. EUR.

3.3.3. Overview of programmes supporting energy efficiency in the Czech Republic

Programme Name	Period of Recruitment	Total Budget	Managing Authority
OP Environment 2014-2020	2014-2020	2.506 billion EUR	Ministry of Environment https://www.opzp.cz/
IROP 2014-2020	2014-2020	5.4 billion EUR	Ministry of Regional Development http://www.irop.mmr.cz/cs/
OPEIC 2014-2020	2014-2020	4.8 billion EUR	Ministry of Industry and Trade, https://www.mpo.cz/cz/podnikani/dotace-a-podpora-podnikani/oppik-2014-2020/
National Programme Environment	2018-2020	0.3 billion EUR	Ministry of Environment https://www.narodniprogramzp.cz/
New Green Savings Programme	2015-2021	1.1 billion EUR	Ministry of Environment https://www.novazelenausporam.cz/
EFEKT 2017-2021	2017-2021	30 mil. EUR	Ministry of industry and trade https://www.mpo-efekt.cz/cz/programy-podpory/54039
Technology Agency of the Czech Republic - Theta	2018-2025	160 mil. EUR	Technology Agency of the Czech Republic - Theta https://www.tacr.cz/program/program-theta/

3.4. Hungary

3.4.1. Funding leveraged by ESIF in Hungary

For Tolna County, three operational programmes are available to finance energy investments:

Territorial and Settlement Development Operational Programme

(different elements of energy investments could be financed at municipalities from TSDOP):

Priority 3. Conversion to low carbon emission economy especially in urban areas

Measure 2. Energetic refurbishments of municipality owned buildings, institutions and use of renewable energy sources as parts of those

Sub-measures: 321, 322.

The total available amount of the grant for 2014-2020 was 3,970,875,055.00 € (Total EU contribution from ERDF and ESF: 3,389,963,001.00 €)

Maximum rate of co-financing is 100% of eligible costs, the maximum grant requested varies by Hungarian counties.

Eligible activities of the projects are energy efficiency investments of municipality buildings and deployment of decentralised solutions of energy generation based on renewable energy sources and solutions of effectively operating the municipality buildings (heat pumps, solar panels, photovoltaic panels, upgrading of lightning infrastructure, ventilation of buildings, doors and windows, etc.), with related planning, project management and public procurement activities.

The evaluation criteria consider:

1) eligibility of the applicant,
2) amount of grant requested,
3) eligibility of planned activities,
4) time plan of the planned investment,
5) coherence of the proposal,

Proposals can be submitted in defined submission periods (defined in calls for proposals).

Environment and Energy Efficiency Operational Programme

(elements of smarts grids could be financed at state owned and public authorities from EEEOP)

Priority 5. Increasing energy efficiency, use of renewable energy sources (co-financed by Cohesion Fund)

Measure 2. Increasing energy efficiency and increasing use of renewable energy resources

Sub-measure 2. Energy efficiency refurbishment of buildings coupled with using renewable energy resources

Sub-measure 4. Programmes for raising awareness

The total available amount of grant for 2014-2020 was 3,784,832,361.00 € (Total EU contribution from Cohesion Fund and ERDF: 3,217,105,883.00 €). Maximum rate of co-financing: 100% of eligible costs, maximum grant requested: 1.000.000 HUF (3.225.806 EUR).

Eligible items are energy efficiency investments of public buildings, with related planning, project management and public procurement activities.

The relevant project indicators are:

1) further renewable energy generating capacity established,
2) amount of energy coming from renewable sources generated,
3) decrease in the emission of greenhouse gases,
4) decrease in the primary energy consumption of public buildings,
5) decrease in the use of primer energy consumption as a result of energy efficiency investments

The evaluation criteria are focusing on:

1) eligibility of the applicant,
2) amount of grant requested,
3) eligibility of planned activities,
4) time plan of the planned investment,
5) coherence of the proposal,

Proposals can be submitted in defined submission periods (defined in calls for proposals).

Economic Development and Innovation Operational Programme

Some elements of energy investments could be financed at small and medium enterprises from EDIOP, therefore this source is only a complementary option in case if the applicant is an SME.

3.4.2. National funding in Hungary

In general, local governments in Hungary do not launch financing programmes due to the lack of their financial – and often also human – capacities. However, there are some exemptions mainly at municipalities with a higher income level, that is a result of the local industrial tax of larger local companies with seats in the settlement.

The Future Energy Regional Development Foundation (JETA) at Paks is a good example from Tolna County, which is supported by MVM Group, the state-owned dominant electricity wholesale trader in Hungary. MVM operates Hungary's only nuclear power plant (2000 MW installed capacity) at Paks. The power plant has been engaged in a broader range of environmental support activities for decades. This includes municipal and regional development, as well as assisting the work of various information or multi-purpose municipal associations, as well as health, education, cultural, ecclesiastical and sports support, and NGOs.

The affected geographical area consists of 47 settlements comprising Kalocsa, Paks and Tolna districts and the northern part of Szekszárd district. MVM Paks Nuclear Power Plant Ltd. provided the Foundation with a grant of 500 million HUF annually, as stated in the Articles of Association, but this commitment was terminated in 2014. In 2015 and 2016, the Foundation successfully applied to the Prime Minister's Office for

the distribution of regional development subsidies in the beneficiary settlements through a tendering system. In order to carry out this activity, the Foundation received 750 million HUF in 2015 and 1 billion HUF in 2016. The beneficiaries of the grants may be the local governments of the settlements concerned, their associations and institutions operating in their administrative territory.

Eligible settlements: Bátya, Drágszél, Dunapataj, Dunaszentbenedek, Dunatetétlen, Dusnok, Fajsz, Foktő, Géderlak, Hajós, Harta, Homokmégy, Kalocsa, Miske, Ordas, Öregcsertő, Solt, Szakmár, Uszód, Újtelek, Újsolt, Bikács, Bölcske, Dunaföldvár, Dunaszentgyörgy, Gerjen, Györköny, Kajdacs, Madocsa, Nagydorog, Németkér, Paks, Pálfa, Pusztahencse, Sárszentlőrinc Tengelic, Harc, Kistormás, Kölesd, Medina, Sióagárd, Szedres, Szekszárd, Bogyiszló, Fadd, Fácánkert, and Tolna.

3.4.3. Overview of programmes supporting energy efficiency in Hungary

Programme Name	Period of Recruitment	Total Budget	Managing Authority
Territorial and Settlement Development OP	2014-2020 Calls are launched on diverse dates.	3.970.875.055 €	Hungarian State Treasury https://www.palyazat.gov.hu/doc/4384
Environment and Energy Efficiency OP	2014-2020 Calls are launched on diverse dates.	3.784.832.361 €	Ministry for Innovation and Technology https://www.palyazat.gov.hu/doc/4382

3.5. Italy

3.5.1. Funding leveraged by ESIF in Italy (Emilia-Romagna)

Emilia-Romagna Energy Fund Energy Fund - Multyscope Regional Fund of public financing

The Multiscope Regional Fund of public financing was set up with the Regional Act. n.791/2016 and 1537/2016.

It is a Financial Instrument, according to the previous art. 37 of the EU Reg. n.1303/2013, set up with public resources on the ROP ERDF of ERR 2014 – 2020 and in particular:

- Axis 3 - Competitiveness and attractiveness of the production system;

  -3.5.1 Starter Fund

- Axis 4 - Promotion of low carbon economy in the territories and the production system.

  -4.2.1 Energy Fund

The Fund is a revolving fund of soft loan financing, privately funded for the purpose of providing loans at a reduced rate.

Financial capacity

The Fund consists of a total initial public budget of about € 47,000,000.00 on the ROP ERDF of ERR for 2014 -2020 programming period divided into two sub-funds:

- Starter Fund of about € 11,000,000
- Energy Fund of about € 36,000,000

Beneficiaries

SMEs and large companies registered in the Register of Companies operating ONLY in the sections of the economic activity (ISTAT ATECO 2007 - B, C, D, E, F, G, H, I, J, L, M, N, R, S) with local units in which the investment project is implemented are located in Emilia-Romagna Region active at the time of submission of the application provided they are not "Undertaking in difficulty" complying with the European Guidelines on State aid for rescuing and restructuring non-financial firms in difficulty (2014 / C 249/01)

The instrument

The Fund provides new unsecured-loans at reduced rates with mixed provision resulting partly from the public share (70%) and partly from the private share (30%) for each admissible project.

- Every single funding covers 100% of the project
- The amount of funding must be between a min. of € 25,000 and a max. of € 500,000
- The duration of the amortization period is between a min. of 36 months and a max. of 96 months (including any pre-amortization period of up to 12 months).

The facilitation is determined by:

- an interest rate equal to 0 on the part of the public share of the Fund
- a rate on the private portion resulting from the spread on the EURIBOR 6

Eligible initiatives

- Interventions addressed to improve energy efficiency and to reduce gas emissions causing climate change
- Interventions to produce energy from renewable sources, favouring those in self-consumption, as well as high efficiency cogeneration plants, complying with the EU Directive 2012/27 (EU Parliament and Council)

Eligible costs

a) Works on buildings: expansion and / or restructuring, works functional to the project

b) Purchase and installation, machine adjustments, plants, equipment, hardware

c) Acquisition of software and licenses

d) Technical and targeted consultancy services for the investment project

e) Costs for preparing an energy audit and / or project development design to carry out the intervention submitted in the application

Expenditures must be submitted later than the date of submission of the application, except for preparation costs of technical documents (listed in "e"), which may be dated later than 01/06/2014.

Non repayable grants

The company may, at the time of submitting the application, require a non-repayable grant to be charged on technical costs such as energy audit and / or project, which are necessary for the submission of the investment project.

- This contribution, which covers up to a maximum of 100% of the aforementioned expenditure, taking into account the chosen aid scheme and the ceiling on the same amount of expenditure, will still be eligible for a maximum of 12.5% of the public funding admitted (up to 8.75% of the funding).
- In the grant communication, the manager will indicate the amount of the actually disbursed non-repayable grant, specifying the modalities and the timing for the delivery of it.
- The reimbursement of the expenses will be paid only after the final project finalization, after its verification. In the event of a difference between the intervention granted and the actual intervention, the deferred grant will be remodelled in order to respect the maximum permissible percentages.

Documents to submit for the application phase

- Pre-Banking Resolution
- Budget Estimates
- State aid statement
- Energy audit or project
- If available, the last two full balance sheets

Grant benefit and aid regime

The public share of funding, allocated at zero rate and the non-repayable grant create a public benefit for the beneficiary which will be granted on the basis of the choice made by the requesting party and in accordance with the regulatory constraints under the provisions of the "de minimis" regime according to the EU Regulation 1407/2013.

Preparation of the energy intervention

At the request of the chosen financial aid, an Energy audit will have to be provided, stamped and signed by a qualified technician, and drawn up in accordance with UNI CEI EN 16247 - (parts 1 a 4).

- Definition of ENERGY AUDIT: "A systematic procedure aimed at obtaining an adequate knowledge of the energy consumption profile of a building or group of buildings, one industrial or commercial activity or plant or of public or private services, to identify and quantify cost-effective energy saving opportunities and report the results "
- Where the Energy audit procedure is not applicable, it will be necessary to attach to the request of the aid selected the project of the intervention, stamped and signed by qualified technician, which can be:
- A Feasibility Study / Preliminary Project / Final Project / Executive Project which shall, however, consist of the following elements:

a) Technical report

b) Graphic documents

c) Analysis of project cash flows, where relevant

3.5.2. National funding in Italy

National Energy Efficiency Fund

The National Energy Efficiency Fund, managed by Invitalia, envisaged by Legislative Decree n. 102 of 4 July 2014 for the implementation of the EU directive on energy efficiency, is aimed at supporting the implementation of energy efficiency measures implemented by companies, ESCOs and public administrations on buildings, plants and production processes and integrates the dedicated incentive tools to achieve national energy efficiency targets. It is aimed at:

- enterprises and ESCO in single form or in aggregate / associated form
- public administrations in single form or in aggregate / associated form

What it finances:

- reduction of consumption in industrial processes
- district heating and district cooling networks and systems
- efficiency improvement of public services and infrastructures
- energy upgrading of buildings

Financial allocation: 310.000.000 €, of which:

- 70% for subsidized loans (20% of which reserved for public administrations)
- 30% for guarantees (30% of which reserved for district heating networks)

Form of benefits:

- companies and ESCO:

- guarantee on financing transactions up to 80% of the eligible costs. Guaranteed amount € 150.000 - € 2.500.000. Maximum duration 15 years
- fixed rate mortgage 0.25%, max 70% eligible costs, for amounts between € 250,000 and € 4.000.000. Maximum duration 10 years

- public administrations:

- fixed rate mortgage 0.25%, max 60% eligible costs and up to 80% for public infrastructure including public lighting for amounts between € 150.000 and € 2.000.000. Maximum duration 15 years.

Companies must guarantee the financial coverage of the investment (at least 15% with own means) and aggregate or associated companies can request the facilities in the same way: only guarantee, only financing or guarantee and financing.

Advisory costs are allowed up to 10% of the total eligible costs.

Public administrations must guarantee the financial coverage of the investment not covered by the facilities.

3.5.3. Overview of programmes supporting energy efficiency in Italy (Emilia-Romagna)

Programme name	Period of Recruitment	Total Budget	Managing Authority	More information (link)
Emilia-Romagna Energy Fund	2014-2020	47.000.000	Emilia-Romagna Region	http://www.fondoenergia.unifidi.eu/
National Energy Efficiency Fund	from 20/05/2019	310.000.000	Invitalia	https://www.invitalia.it/cosa-facciamo/rafforziamo-le-imprese/fnee

3.6. Poland

3.6.1. Funding leveraged by ESIF in Poland

EU funds from the Operational Programme Infrastructure and Environment 2014-2020 aimed at improving energy efficiency include the following measures:

1.2 Promoting energy efficiency and the use of renewable energy sources in enterprises

1.3. Supporting energy efficiency in buildings (utility buildings and housing sector)

1.5 Effective heat and cold distribution

1.6. Promoting the use of high-efficiency cogeneration of heat and electricity based on the demand for useful heat (heating and cooling networks, sources of high-efficiency cogeneration)

Financing for energy efficiency is also provided by the Regional Operational Programme of the Lower Silesian Voivodeship 2014-2020. It has dedicated to such investments the priority axis 3 Low-emission economy and especially the sub-axes of 3.2 Energy efficiency in SMEs and 3.3 Energy efficiency in public buildings and the housing sector.

The Mazovia local government with support of MAE has been operating regional financing programme to support the modernisation of energy generation installations in order to improve Energy Efficiency in the Mazovia Region (RPO WM EE, activity 4.2).

Total value of the EUR allocated for the period of 2014 – 2020 amounts for 104 541 043 EUR, in PLN it amounts for 452 002 106. Total value of projects to be realised amounts for 618 652 325 PLN.
In 2019 the value of works performed amounts for 91,51%, so it is highly probable the works will be completed.

Results confirmed so far:

- Additional capacity to generate energy from renewable sources - 3.89 MW
- Number of energy-modernized buildings – 151
- Annual primary energy consumption reduction in public buildings - 32 094 032,66 kWh / year

Mazovia Energy Agency managed the JESSICA Programme till 2018 in cooperation with the Polish BGK bank. FROM managed PPP modernisation programmes financed by the low cost revolving investment programme Jessica. Five programmes were selected with an investment value of 13.4 mln PLN and completed successfully. Administration costs of the programme amounted to 352.122,16 PLN.

3.6.2. National funding in Poland

One of the national institutions financing energy efficiency is the Environmental Protection and Water Management Fund (EPWMF), which is the main source of financing pro-ecological investments in Poland. Its offer includes both domestic and foreign funds (including EU funds). Funds dedicated to activities related to improving energy efficiency are part of programmes dedicated to protecting the atmosphere, including improving air quality and cross-domain.

The National Fund conducts independent financial management, acting on the basis of the Environmental Protection Act and in accordance with the EU principle "the polluter pays." It derives revenues mainly from fees and penalties for using the environment, exploitation and concession fees, energy sector fees, resulting fees from the Act on the recycling of end-of-life vehicles and from sale of assigned greenhouse gas emission units. The National Fund has a rich financial offer tailored to the expectations of a wide range of beneficiaries: local governments, enterprises, public entities, social organizations and individuals.

3.6.3. Overview of programmes supporting energy efficiency in Poland

Programme Name	Period of Recruitment	Total Budget	Managing Authority
„My electricity“	2019 - 2025	PLN 1 billion	Environmental Protection and Water Management Fund http://nfosigw.gov.pl/moj-prad/
Co-financing on the general principles of EPWMF in Wrocław	continuous recruitment	-	Environmental Protection and Water Management Fund https://wfosigw.wroclaw.pl/zloz-wniosek/oa-ochrona-atmosfery/w_62,informacje
Partial repayments of loan capital at Environmental Protection Bank S.A.	Continuous recruitment at the branches of Bank Ochrony Środowisk S.A.	-	Environmental Protection and Water Management Fund and Bank Ochrony Środowiska S.A. https://wfosigw.wroclaw.pl/zloz-wniosek/czesciowe-splaty-kapitalu-kredytow-w-bos/w_223,informacje
Priority Programme for Reducing Low Emissions in the Lower Silesian Voivodship - Edition II	continuous recruitment	-	Environmental Protection and Water Management Fund https://wfosigw.wroclaw.pl/zloz-wniosek/wymiana-piecow-ii/w_426,cel-programu

Programme Name	Period of Recruitment	Total Budget	Managing Authority
Poviat Heating	continuous recruitment to 2025	-	Environmental Protection and Water Management Fund http://www.nfosigw.gov.pl/oferta-finansowania/srodki-krajowe/programy-priorytetowe/cieplownictwo-powiatowe--pilotaz/nabor-2019-cieplownictwo-powiatowe--pilotaz/
Fund for Thermo-modernization and Renovations	continuous recruitment	9,7 mln PLN	BGK Bank https://www.bgk.pl/samorzady/fundusze-i-programy/fundusz-termomodernizacji-i-remontow/
RPO WM – Regional Operational Programme 4.2 EE	2014-2020	618 652 325	Regional Government 91,51%
Jessica WM	2017	13 400 000	MAE 100,00%
Funding WFOŚiGW	continuous recruitment		WFOŚiGW – Regional Fund for Environmental Protection and Water Management http://wfosigw.pl/oferta-finansowania/programy/programy-2016/jst/#
"Czyste Powietrze" Clean Air Programme	2018-2029	103 mld PLN	Regional Fund for Environmental Protection and Water Management
Funding NFOŚiGW	continuous recruitment		NFOŚiGW – National Fund for Environmental Protection and Water Management http://nfosigw.gov.pl/oferta-finansowania/srodki-krajowe/programy-priorytetowe/
Norwegian funds	2014-2021	809,3 mln EUR	Ministry of the Environment and the National Fund for Environmental Protection and Water Management http://www.nfosigw.gov.pl/oferta-finansowania/srodki-norweskie/perspektywa-2014-2021/

Programme Name	Period of Recruitment	Total Budget	Managing Authority
POIŚ – Programme for Infrastructure and Environment Protection 2014-2020	2019	770 mln PLN	NFOŚiGW – National Fund for Environmental Protection and Water Management http://poiis.nfosigw.gov.pl/
INTERREG Lithuania – Poland 2014-2020	2019	70 769 277 EUR	Joint Secretariat http://lietuva-polska.eu/pl/interreg.html
INTERREG V A Brandenburg – Poland 2014-2020	2019	1.456.000	Joint Secretariat https://interregva-bb-pl.eu/pl/

3.7. Slovenia

3.7.1. Funding leveraged by ESIF in Slovenia

The following programmes on EE are co-financed by EU finds on national level in Slovenia:

EKO Fund (Slovenian Environmental Public Fund)

EKO Fund is an independent legal entity within the Ministry of the Environment and Spatial Planning. Eco Fund allocates loan or grant financing programmes:

- Loans to legal entities (municipalities and/or providers of public utility services, enterprises and other legal entities) and sole traders for investments in environmental infrastructure, environmentally sound technologies and products, energy efficiency, energy saving investments, and use of renewable energy sources.
- Loans to individuals (households) for conversion from fossil fuels to renewable energy sources, energy saving investments, investments in water consumption reduction, connections to sewage system, small waste water treatment plants, replacement of asbestos roofs.
- Grants to individuals (households) for investments in electric cars and for investments in residential buildings (energy efficiency and use of renewable energy sources).
- Grants to legal entities (municipalities and/or providers of public utility services, enterprises and other legal entities) for investments in electric cars and buses for public transport on compressed natural gas or biogas.
- Grants to municipalities for investments in buildings where public education takes place (schools, kindergartens, libraries etc.), newly constructed as well as low energy and passive buildings or renovated in passive standard.

In the last 10 years EKO Fund has co-financed nearly 110,000 EUR investments in energy efficiency with approximately EUR 260 million in grants and provided around EUR 280 million in loans for over 10,000 environmental investments. The effect of all these investments is to reduce CO2 emissions by almost 320,000 tonnes and to save 1,380 GWh of energy.

Association of Urban Municipalities of Slovenia

AUMS provides grants in the form of soft loans, primarily for revenue-generating projects. The projects must be designed in accordance with the urban development goals and priority areas of investment as defined by the Slovenian municipalities in their Sustainable Urban Strategies (TUS).

The loan can be used to finance the implementation of projects for the renovation or new construction of apartments and other projects aimed at the implementation of physical regeneration interventions in urban areas that are in accordance with the objectives of the TUS of eleven urban municipalities.

SID Bank (SID – Slovenska izvozna in razvojna banka, d.d., Ljubljana)

It is a promotional development and export bank, 100% owned by the Republic of Slovenia. With their banking and insurance services they promote sustainable development and improve the competitiveness of the Slovene economy. The fund is intended for the use of European cohesion funds.

- They offer municipalities financing for comprehensive energy renovation of public buildings.

- SID Bank issued a green bond to financing green projects and models of the circular economy.

SID Bank has issued a green bond with a maturity of five years in the closed circle of investors, in the nominal amount of EUR 75 million. This is the first green bond of this bank.

3.7.2. National funding in Slovenia

Other programmes, tools and support on national level for EE in Slovenia:

Model for contracting energy savings

The Energy Efficiency Directive (2012/27 / EU), in point (c) of Article 18 (1), provides that Member States shall promote the market for energy services and access for this sector to small and medium-sized enterprises (SMEs) by publishing and regularly updating the list of available energy service providers.

The Ministry which is responsible for energy publishes a list of energy service providers that already provide energy contracting services according to the model of contractual provision of energy savings (updated November 2018):

- Petrol d.d. Bled
- Resalta d.o.o. Ljubljana
- Stin d.o.o. Dravograd
- Tames d.o.o. Ptuj
- Plistor d.o.o. Ptuj
- Interenergo d.o.o. Ljubljana

3.7.3. Overview of programmes supporting energy efficiency in Slovenia

Programme name	Period of Recruitment	Total Budget	Managing Authority
Operational Programme for the implementation of the European Cohesion Policy 2014-2020	2015 - 2023	306.600.000 EUR - CF 44.000.000 EUR - EFRD	• Ministry for infrastructure http://www.mzi.gov.si/ • The Ministry of Economic Development and Technology http://www.mgrt.gov.si

4. BEST PRACTICES

4.1 Austria

Interreg CENTRAL EUROPE
European Union European Regional Development Fund
BOOSTEE-CE

JUDENBURG

DISTRICT HEATING GRID BASED ON WASTE HEAT FROM PULP&PAPER MILL

Best Practice Factsheet #9

Judenburg, Austria
District heating grid based on waste heat from pulp&paper mill Zellstoff Pöls AG

DESCRIPTION OF THE ACTION

The Zellstoff Pöls AG annually processes approximately 2 million cubic meters of thinning wood and sawn timber into both pulp and paper. Together with the know-how partner "Bioenergie Wärmeservice Gmbh" from Köflach, an expert for district heating and waste heat recovery systems, a joint venture was formed into the company "Biowärme Aichfeld Gmbh".

The objective was to use the waste heat sensibly, in combination with an existing biomass heating plant and a storage solution with large-district-pressure reservoirs. The result allows for a sustainable, environmentally friendly and regional heat supply for more than 15,000 households in the greater Aichfeld area. For this purpose, the joint venture partners invested € 18 million and laid over 18 km of piping for the district heating project.

This is a heat grid infrastructure project, to connect the cities, business and industrials parks in the region. The cities, business and industrial parks are served by ESCOS, which take over the heat from the infrastructure heat grid, and distribute the heat to the customers.

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

JUDENBURG

DISTRICT HEATING GRID BASED ON WASTE HEAT FROM PULP&PAPER MILL

Best Practice Factsheet #9

PARTNERS INVOLVED

- Zellstoff Pöls AG and Biowärme Wärmeservice GmbH form the Biowärme Aichfeld GmbH, which is the operator of the infrastructure heat grid, connecting the sub-heat grids of the region. It is a private company acting as an ESCO, providing energy services for the municipalities.
- ESCO's like Stadtwerke Judenburg AG, Biowärme Wärmeservice Gmbh, Energie Steiermark AG, Kelag Wärmeservice GmbH or Fernwärme Fohnsdorf with the heat from Biowärme Aichfeld GmbH, and deliver the heat to their customers.
- Energy Agency Upper Styria – EAO and other consultants assist in energy advice
- Kommunalkredit Public Consulting Gmbh provides public subsidies to the district heating grid operators and Zellstoff Pöls AG for recovering the waste heat from the pulp&paper mill. These subsidies are non-repayable grants for the investments, covering up to 30 % of the investment costs.

Time period: 2011 onwards

Success factors

- **The main success factors are innovative ESCO's as heat supplier, and an innovative company Zellstoff Pöls AG, which made the decision to take private money and invest it into the projects**
- **The competence of these people to convince stakeholders of the overall strategy and investment project**
- **The availability of direct non repayable funds as a part of financing the investment**
- **Involvement of the important regional stakeholders from municipalities, politics, enterprises and other local organisations was very important**

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

JUDENBURG

DISTRICT HEATING GRID BASED ON WASTE HEAT FROM PULP&PAPER MILL

FINANCING

Investment costs = 18.000.000 EUR

- **Own sources from the Zellstoff Pöls AG and Biomasse Wärmeservice Gmbh as shareholders of the Biowärme Aichfeld GmbH; The Biowärme Aichfeld GmbH also takes long term loans from banks. It's the private company, acting as an ESCO.**

- **Subsidies (Ecofund) Kommunalkredit Public Consulting GmbH provided national and European non repayable subsidies to the project via their program "Umweltförderungen im Inland – UFI" which is available for district heating grids, and for recovering the waste heat from the industrial process. The funding rate consists of a basis rate of 25 % and 5 % sustainability surcharge according to the law of environmental subsidies. The actual program can be seen at https://www.umweltfoerderung.at/betriebe**

Financial and other benefits of the project:

- The companies Zellstoff Pöls AG and Biowärme Aichfeld created additional business, income and jobs.
- The benefit of the customers like households, enterprises and municipalities are in a way, that they get heat from renewable energy (biomass) for a competitive price. The heat tariff is bound in a long term contract over 15 years, bound to an official index based on a mix of fuels, monthly published by the Statistik Austria. So the development of the price is transparent. They pay just the heat they use, and a small part of a fixed price based on the load demand. They will not have any risk as they have in operation their own heating facilities, and no additional costs for maintenance, service or chimney wiper
- New regional economic cycles are established for additional income and value creation at local level, and this by energy and climate actions, by replacing fossil oil and gas-heating by renewable energy, which saves a lot of CO2-emissions

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

JUDENBURG

DISTRICT HEATING GRID BASED ON WASTE HEAT FROM PULP&PAPER MILL

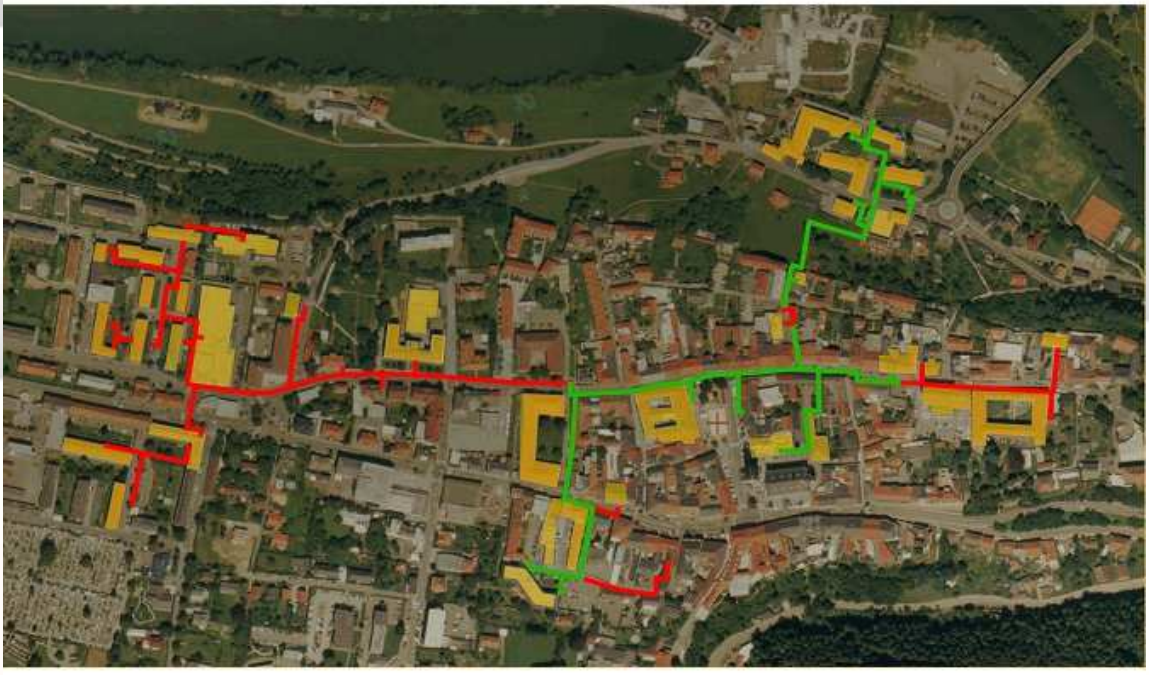
Best Practice Factsheet #9

BARRIERS ENCOUNTERED

- Some stakeholders and decision makers are not easy to convince for innovative projects
- Economic questions, because the project has to be competitive with low prices for heating oil and natural gas at the moment
- Some regional players haven't been satisfied, like chimney wipers, because they lost business

Ways to deal with barriers

- Detailed preparation of projects, including economic and ecologic analysis
- Preparation of arguments with the advantages and disadvantages of the project
- Transparent information politics to the public and potential partners and customers
- Involvement of relevant stakeholders who can help as catalysts or inhibitors of the projects



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JUDENBURG

DISTRICT HEATING GRID BASED ON WASTE HEAT FROM PULP&PAPER MILL

Best Practice Factsheet #9

Key results

In 2011 Zellstoff Pöls AG realised a large district heating project and now delivers district heating to the communities Pöls, Fohnsdorf, Judenburg and Zeltweg through an 18 km long supply network. With this we came closer to the goal of annual CO2 savings of 25 000 tons and the slogan „Q² your heating advantage from Pöls" has become reality for approx. 15 000 households. The district heating supply currently is at 23.0 MW.

- **A infrastructure heat grid was formed for the connection of the company which has the waste heat available, and the district heating grids in cities, business and industrial parks of the region**
- **District heating grids in the cities and business and industrial parks have been installed, to substitute fossil fuels with regional available waste heat**

Key figures of the infrastructure heat grid

- 18 km infrastructure head grid for the connection of cities, business and industrial parks
- 15 000 households are served with waste heat at the moment, additional potential available
- 25 000 t CO2-reduction
- 30 MW power capacity of the heat recovery and heat decoupling
- 18 Mio. € investment of the mail infrastructure heat grid
- 6 month of construction period

CONTACT: Bioenergie Aichfeld GmbH, Dr. Luigi-Angeli-Straße 9, A-8761 Pöls

E-Mail: info@waerme-vorteil.at

http://www.wärme-vorteil.at/

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

JUDENBURG
PV INSTALLATION AS PPP MODEL

Best Practice Factsheet #10

Judenburg, Austria
PV Installation as PPP model

DESCRIPTION OF THE ACTION

Time period: 2013 onwards

The Stadwerke Judenburg AG (ESCO, 100 % owned by the municipality of Judenburg) planned and installed a PV – system on a green field at the west-end of the City of Judenburg. The PV-system has a power of 500 kWp and consists of 2.000 PV-modules. The area of the field is 3.500 m². The PV-system was built in accordance to the green energy law, this means the electricity is fed into the public electricity grid, financed by subsidised feed-in tariffs.

The innovative part is that the citizens of the city and customers of the Stadtwerke can participate in this model in a public private partnership PPP. The PPP-model is called SALE & LEASE BACK, this means people can buy 1 to max 10 PV modules for a price of 650 €/unit, maximum investment per person is 6.500 €. These people get an interest rate of 3,125 % on their investment, which is significantly more compared to a bank account, without any risks. The minimum time of the partnership is five years. This amount of money will be balance on the electricity bill for the customers.

PARTNERS INVOLVED

- Stadtwerke Judenburg AG, as initial investor and operator
- City of Judenburg, as 100 % owner of the Stadtwerke, to assist in the model and marketing
- Customers and citizens as investors in the PPP-model, they buy and own the modules, but lease them back to the Stadtwerke, therefore they get the interest rate of 3,125 % on their investment.

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

JUDENBURG

PV INSTALLATION AS PPP MODEL

Best Practice Factsheet #10

KEY RESULTS

- The project is installed; citizens are partners and owners of the modules and earn profit from them. The Stadtwerke has the investment sum of the people available for covering the initial investment costs.
- The model is profitable for participating customers as well as the Stadtwerke, because they get also the feed-in tariff by the green electricity law.

Success factors

- **Available feed-in tariffs by the green electricity law**
- **Innovative PPP model based on SALE and LEASE BACK**
- **Trust into a strong public owned ESCO Stadtwerke for a long term partnership**

BARRIERS ENCOUNTERED

- Investment only possible if feed-in tariffs are available

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

JUDENBURG
PV INSTALLATION AS PPP MODEL

Best Practice Factsheet #10

FINANCING

Investment costs	**700.000 EUR**
Lifetime (service life)	**30 years**
Annual operational costs (incl. repairs, maintenance and other specific costs)	**1% of the investment costs**
Annual revenues from feed-in-tarrifs	**App. 92.000 EUR**

HOW PV PPP MODEL WORKS IN JUDENBURG

- Customers of the Stadtwerke bought 1 – 10 PV-modules for a fixed price of 650 €/unit, the Stadtwerke leased back the modules and operate the system. Minimum period for partnership is 5 years.
- Customers get an interest rate of 3,125 % on their investment from the Stadtwerke, balanced on their energy bill
- The Stadtwerke get a feed-in tariff of 0,1659 €/kWh delivered to the public grid, based on the green electricity law
- Annual operational cost incl. salaries, repairs, maintenance and other specific costs are approx. 1 % of the investment costs.
- Annual revenues – approx.. 92.000 €/year from the feed-in tariffs according to the green electricity law. With this money the Stadtwerke pay the interest rate to the customer, and the other part they have to reserves for buying back the modules from the people at the end of the lifetime of the sale & lease back contract.

CONTACT: Stadtwerke Judenburg AG
Burggasse 13
8750 Judenburg, Austria
office@stadtwerke.co.at
www.stadtwerke.co.at

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

BEST PRACTICE IN AUSTRIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Renovation of Competence Center Dornbirn (office building)

Energy efficiency measures implemented in the building: Improvement of the energy efficiency of the façade and reduction of thermal bridges; Reduction of the cooling requirement through external, automatically controlled shading

Location:

City: Dornbirn

Region: Province of Vorarlberg

Country: Austria

GoogleMaps link:

https://goo.gl/maps/usH1aTZZx1t

Partners involved:

- Owner: BHD Liegenschaftsvermietungs GmbH
- Operator and contact: PRISMA Zentrum für Standort- und Regionalentwicklung GmbH, Mag. Gero Riedmann, Hintere Achmühlerstraße 1, A-6850 Dornbirn; www.prisma-zentrum.com
- Planner and Architect: Architekturbüro Nikolussi Häusler, www.nikolussi.at; https://mustersanierung.at/projekte/buerogebaeude/competence-center-dornbirn/

Implementation year: 2016

Photo:

Source: *https://mustersanierung.at/projekte/buerogebaeude/competence-center-dornbirn/#&slider1=5*

SYSTEM CHARACTERISTICS

Brief Description*:*

The Competence Center Dornbirn accommodates various companies from the fields of construction, environment and energy as well as complementary business services and is affiliated to the University Campus Dornbirn. The modernisation of the building was intended to consolidate and promote its use as an innovation centre in the long term.

The shell, which was already well conditioned when the building was erected, and the building services will be adapted to the current state of the art with a focus on economic benefits. The following measures were implemented:

- Deconstruction of steel and reinforced concrete elements to reduce thermal bridges in the attic and façade area.
- Replacement of the old mullion-transom facade on ground floor and 1st floor
- Use of aluminium windows with 3-fold glazing
- new shading by electrically driven, controlled external blinds
- Replacement of the existing ventilation system by a system with higher efficiency

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 1.270.963 €

Investment scale

Thermal reconstruction of the building envelope:

- Facade: Dismantling of the existing facade cladding and insulation with 20 cm ETICS EPS-F (U-value 0.15 W/m²K)
- Post-and-beam façade new on ground floor and 1st floor made of aluminium with triple glazing; interior facing in those areas where panels are mounted (U-value 0.15 W/m²K)
- Newly insulated attika
- Roof remains unchanged

Building material:

- Facade insulation by 20 cm EPS F-Plus

Windows:

- New aluminium windows with triple glazing (U-value - 0.86 - 0.91 W/m²K).

Building technology:

- Space heating - no changes: Combination of biomass district heating and gas boiler with biogas; heat dissipation by means of component activation and ventilation system
- Cooling: compression refrigeration system, distribution by building component activation and ventilation system
- Ventilation system: Mechanical ventilation system with heat recovery WRG degree 75%
- Use of energy-saving lighting system.
- Light: Maximisation of daylight utilisation through external blind shading and daylight-controlled use of artificial light; conversion to LED and T5 fluorescent tubes leads to total energy savings of more than 30 MWh/a

Energy Efficiency:

- Improvement of the energy efficiency of the façade and reduction of thermal bridges
- Reduction of the cooling requirement through external, automatically controlled shading

Sources of financing: This project was co-financed by funding of the Austrian Climate and Energy Fund (Mustersanierung) with € 454.048,-; and by the building owner.

Electricity savings (MWh/year): -

Or fuel savings (kg or m3 or kWh or GJ): reduction of HWB from 48,1 to 15,6 kWh/m².y, this means a reduction of 67 %; Reduction of cooling energy from 2,3 to 0,8 kWh/m².y

Cost savings (EUR/year): -

CO2-savings: of 28,3 tons per year

PROJECT IMPLEMENTATION BENEFITS

The measures implemented have led to a significant improvement in comfort. The sound absorption through the new windows helps to significantly reduce the noise level in the offices. The technical building measures lead to a considerably improved room climate, which is noticeably and pleasantly noticed by the users.

Mechanical ventilation was a major topic in the target definition, whether centralised or decentralised. The negative experience of a ventilation system in a school that had just been implemented at that time had a strong influence on this discussion.

ADDITIONAL INFORMATION

In the case of refurbishment during ongoing operation, it is important to ensure that the work is well prepared and scheduled well in advance, and that these deadlines are communicated to all parties involved on an ongoing basis. In combination with the knowledge that a great result can be expected after the refurbishment, a large consensus with the users is possible despite any impairments that may occur.

Already in the planning phase, random test openings were carried out to determine whether the originally planned master details had also been implemented during the construction of the existing building.

BEST PRACTICE IN AUSTRIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Renovation of the primary school Bad Eisenkappel

Energy efficiency measures implemented in the building: thermal energetic renovation, optimization of lighting system

Location:

City: Bad Eisenkappel

Region: Province of Carinthia

Country: Austria

GoogleMaps link:

https://goo.gl/maps/MuJcKK3Zf1F2

Partners involved:

- Owner and Operator: Immobilienverwaltung Schulzentrum Völkermarkt KG, Ritzingstraße 33, 9100 Völkermarkt; Contact: Mag. Daniela Leiter-Kuschnig, office@sgv-voelkermarkt.at
- Planner and Architect: halm.kaschnig.führer architekten, Kaiser-Josef-Platz 5, 8010 Graz
- Building technology planning: HONESTA e.U., Ingenieurbüro für Gebäudetechnik, Auenfischerstraße 42, 9400 Wolfsberg; https://mustersanierung.at/projekte/schulen-kindergaerten/Hauptschule-Bad-Eisenkappel/

Implementation year: 2014

Photo:

Source: *https://mustersanierung.at/projekte/schulen-kindergaerten/Hauptschule-Bad-Eisenkappel/#&slider1=2*

SYSTEM CHARACTERISTICS

Brief Description:

The "Immobilienverwaltung Schulgemeindeverband Völkermarkt KG" carries out a thermal renovation of the secondary school in Bad Eisenkappel. Due to demographic developments, the number of pupils has fallen sharply in recent years. In order to preserve the regional infrastructure, it was decided to carry out a general renovation. The future utilisation concept provides for the accommodation of the Neue Mittelschule and the Volksschule Bad Eisenkappel. The music school, the local afternoon care and a library will also be integrated.

The building shell will be thermally improved by 18 cm of mineral wool plaster boards (U-value from 0.78 W/(m²K) to 0.16 W/(m²K)). Also the earth-facing ground will be insulated with 13 cm XPS or EPS (U-value from 2.82 W/(m²K) to 0.25 W/(m²K)). The existing windows with an average U-value of 2.56 W/(m²K) will be replaced by new aluminium windows with a U-value of 1.21 W/(m²K). Shading is provided by centrally controlled external Venetian blinds.

Heating will continue to be provided via the local local heating network. Only the configuration must be changed due to the measures (mechanical ventilation and exhaust system for the lounges with 85% heat recovery; reduction of the building heating load) to nine heating groups with demand-oriented control. Hot water is produced decentrally.

Due to the new full thermal insulation and the ventilation system with heat recovery, as well as the zone-related heating regulation, the specific heating demand (HWB*) drops from 31.57 kWh/(m³a) to 5.95 kWh/(m³a).

To increase electrical energy efficiency, the lighting system is optimised by using LEDs and efficient fluorescent lamps. By changing the lighting, 5 MWh of energy can be saved annually. However, due to the installation of the controlled aeration and ventilation system, the energy requirement hardly changes.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 5.300.000 €

Investment scale

Thermal reconstruction of the building envelope:

- The outer masonry consisting of 35 cm solid brick was thermally improved by 18 cm mineral wool plaster base boards (U-value from 0.78 W/(m²K) to 0.16 W/(m²K)). The ground level is also insulated with 13 cm XPS or EPS (U-value from 2.82 W/(m²K) to 0.25 W/(m²K)).

Building material:

- Mineral wool plaster base boards for facade insulation
- EPS for ceiling to roof space
- XPS or EPS for newly erected ground adjacent to the ground

Windows:

- The existing windows with an average U-value of 2.56 W/(m²K) were replaced by new aluminium windows with a U-value of 1.21 W/(m²K).

Building technology:

- Space heating and water heating via district heating with biogenic heating energy were retained.
- Cooling: no requirement for cooling

- Ventilation system: In the course of the renovation, a mechanical ventilation system was installed in the school building to supply the main lounges with air. The efficiency of the heat recovery amounts to approx. 85%.
- Use of energy-saving lighting system.
- Monitoring has been installed. This serves for the optimal adaptation of the building to the user behaviour. In addition, parameters are provided which can be adjusted or regulated for energy optimisation by means of "remote maintenance".

Sources of financing: This project was co-financed by funding of the Austrian Climate and Energy Fund (Mustersanierung) with € 2.158.188,00; and by the Province of Carinthia and the Municipalities.

Electricity savings (MWh/year): 0; because of the additional ventilation system

Or fuel savings (kg or m3 or kWh or GJ): reduction of HWB from 125,1 to 23,4 kWh/m².y, this means a reduction of 81 %

Cost savings (EUR/year): 80 % heating cost reduction; +/- 0 electricity costs, because of the additional ventilation system
CO2-savings: of 117 tons per year

PROJECT IMPLEMENTATION BENEFITS

Due to demographic developments, the number of pupils has fallen sharply in recent years. In order to preserve the regional infrastructure, it was decided to carry out a general renovation.

Since the number of pupils has currently fallen below 90, the use of synergies was a prerequisite for retaining the location as a school location.

The current utilisation concept provides for the accommodation of the secondary school and the primary school Bad Eisenkappel.

The music school, the local afternoon care and a school library were also integrated.

Energy cost reduction and accessibility were also requirements for the planning. It was the client's wish not to have to make any major changes after the sample renovation for the next 30-40 years.

Mechanical ventilation was a major topic in the target definition, whether centralised or decentralised. The negative experience of a ventilation system in a school that had just been implemented at that time had a strong influence on this discussion.

ADDITIONAL INFORMATION

The reduction of soil sealing and parking spaces in favour of green areas was welcomed by the pupils, but led to discussions as to whether sufficient parking spaces would be available after the renovation.

The design ideas (e.g. dark ceiling colour) of the architecture and the ventilation concepts led to many discussions in the initial phase. A balance between the preservation of the old appearance (e.g. floors and inventory in selected areas) was a concern on the part of the clients.

BEST PRACTICE IN AUSTRIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Renovation of the townhall Neumarkt

Energy efficiency measures implemented in the building: thermal energetic renovation of the building, connection to district heating

Location:

City: Neumarkt in Styria

Region: Province of Styria

Country: Austria

GoogleMaps link:

https://goo.gl/maps/ZsR1CTZYzg92

Partners involved:

- Owner and Operator Municipality Neumarkt in Styria; Mayor J. Maier; BM Ing. E.Loecker; Hauptplatz 1,4, 8820 Neumarkt, Austria; gde@neumarkt-steiermark.gv.at
- Planner and Architect: Architekt Gerfried Ogris, St. Veiter Straße 103, 9020 Klagenfurt, Austria; ogris@arch-ogris.at; https://mustersanierung.at/projekte/oeffentliche-gebaeude/gemeindezentrum-neumarkt/

Implementation year: March 2017 – Dec 2018

Photos:

Source: *https://mustersanierung.at/projekte/oeffentliche-gebaeude/gemeindezentrum-neumarkt/#fotogalerie&slider1=4*

SYSTEM CHARACTERISTICS

Brief Description*:*

The original building was erected around 1700 and has been adapted to various uses over time. After the merging of the municipalities, the ground floor of the building was to house the sovereign administration with registration office, citizen service, staff area, meeting room, an office for general consultation days and public toilets. On the upper floor the rooms for the office management, the mayor incl. secretariat, the finance department and the archive were to be accommodated. The newly constructed attic was to be used for additional archive space and a meeting room.

The additional use of the attic increased the gross floor area from 1,581m² to 1,933m².

The space heating and hot water preparation took place so far electrically. In future, space heating and hot water preparation will be provided by district heating (renewable).

In the course of the thermal energetic building renovation the exterior walls (partly also with interior insulation), the roofs and the floors will be newly insulated. The existing box windows are either renovated (glass replacement and optimisation of the connection joints) or renewed. The renovation will reduce the average U-value of the building from 1.83 to 0.55 W/m²K.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 3.200.000 €

Investment scale
Thermal reconstruction of the building envelope:

- Internal insulation of the exterior walls with 12 cm perlite insulation reduces the U-value to 0.31 W/m²K;
- Insulation of the exterior wall DG with 18 cm mineral wool reduces the U-value to 0.16 W/m²K;
- Insulation of the flat roof with 25 cm mineral wool reduces the U-value to 0.19 W/m²K;
- Insulation of the roof with 20-24 cm thick mineral wool provides a U-value of 0.18 W/m²K;
- Insulation of the floor with 20cm XPS gives a U-value of 0.12 W/m²K;

In total, the measures reduce the average U-value of the building from 1.83 W/m²K to 0.55 W/m²K.

Windows:

- Either renovation of the existing box windows (glass replacement, optimisation of connection joints) or new installation of box windows U-values between 0.85-1.1 W/m²K

Building technology:

- Heating and hot water: replacement of electrical heaters by biomass district heating
- Cooling: no requirement for cooling
- Ventilation system: controlled aeration and ventilation to achieve optimum indoor air quality and to significantly reduce ventilation heat losses

Sources of financing: This project is financed by funding of the Austrian Climate and Energy Fund (Mustersanierung), the Province of Styria and the Municipality of Neumarkt

Electricity savings (MWh/year):

-

Or fuel savings (kg or m3 or kWh or GJ): reduction of HWB from 110,0 to 13,7 kWh/m².y, this means a reduction of 87,5 %

Cost savings (EUR/year): NA
CO2-savings: of 197,86 tons per year

PROJECT IMPLEMENTATION BENEFITS

-

ADDITIONAL INFORMATION

Vision of the mayor of Neumarkt:
The sample refurbishment is intended to significantly increase the thermal standard of the building envelope; the building is intended to serve as a showcase project for the population in the areas of building insulation and the use of renewable energies.

The refurbishment should modernise the building, adapt it to the increased space requirements of the large municipality and to modern standards, and improve the working climate of the municipal employees.

BEST PRACTICE IN AUSTRIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Renovation of the heating system and entrance of the primary school Judenburg-Stadt

Location:

Country: Austria

GoogleMaps link:

https://www.google.at/maps/place/Volksschule+Judenburg-Stadt/@47.16916,14.6569248,19z/data=!4m5!3m4!1s0x4771caf3ae351483:0x560a032cb717ecd6!8m2!3d47.1693032!4d14.6569352

Partners involved:

Stadtwerke Judenburg AG, Burggasse 15, A-8750 Judenburg*, Web: www.stadtwerke.co.at, role in the action]*

Owner and Operator

Municipality of Judenburg

Mayor Hannes Dolleschall

Hauptplatz 1

8750 Judenburg, Austria

post@judenburg.gv.at

Planner and Architect

Building department of the Municipality of Judenburg

bauamt@judenburg.gv.at

Volksschule Judenburg-Stadt

Dir. Silvia Celin

Herrengasse 20-22

http://www.vs-judenburg.at/

Implementation year: 2019

Photo: *[Fotocredit: ©Uwe Söllradl, City of Judenburg]*

Pictures of the building and from the opening ceremony on the 7th of Oct. 2019

SYSTEM CHARACTERISTICS

Brief Description

The Volksschule Stadt consists of a historical school building, the former girls and boys school. This was extended in the 1980's with the addition of a gym-hall, which also resulted in a beautiful assembly hall. The school building was heated with a night storage heating system in the last decades. This was not optimally controllable in terms of comfort, resulting in different temperatures in the classrooms.
In 2019, the Stadtwerke Judenburg AG - a 100% subsidiary of the municipality of Judenburg - installed a new heating system with radiators and connected the building to the towns's district heating system, which is fed with CO2-neutral heat from waste heat from the Pöls pulp and paper mill. This is an innovative PPP-model between the town and the ESCO, without high initial investment costs for the town.
In addition, the main entrance was moved back to the original entrance on the street side and made barrier-free.

Investment scale

Replacement of the electrical night storage heating by biomass district heating

Replacement of the electrical night storage heating system by a new heating system with radiators and connected to the town's district heating.

Installation of a smart heating control

A smart heating control unit allows for a good adaption of the room temperature to the demand. Smart meters count the energy consumption and deliver detailed data for monitoring and optimization.

Building technology

The redesigned main entrance on the street side was reopened and made barrier-free, giving the historic building a special touch again.

FINANCIAL SOURCES AND FINANCING DETAILS

Economic and Operating Data

Capital expenditure: *EUR 263,000 for the new entrance, elevator and barrier-free access. No direct investment in the heating system, this is included in an innovative contracting model.*

Return of investment: *no data*

Electricity savings (MWh/year): 378.000 kWh replaced by CO2-neutral heat

Or fuel savings (kg or m3 or kWh or GJ): --

Cost savings (EUR/year): n.n.

CO2-saving of 94 tons per year

The heat is supplied by Stadtwerke Judenburg AG via a heat supply contracting.

This heat supply contract includes also the replacement of the old electric heaters by a central heating system with radiators. Costs for installation of the heat transfer station, pumps, pipes and smart control system were financed by the ESCO Stadtwerke. The municipality pays only the heat which is consumed in the building, and a contracting fee for refinancing the investment.

PROJECT IMPLEMENTATION BENEFITS

The old night storage heaters offered little comfort when heating, they were also difficult to regulate. The new heating system is equipped with a modern smart heating control system and offers the highest comfort. The temperature can be adjusted very well to the demand.
The district heating comes from the pulp and paper factory in Pöls. It is fed with waste heat from biomass and thus very climate friendly and CO2-neutral.

ADDITIONAL INFORMATION

The replacement of the electric heating by CO2-neutral district heating from biomass is also a part of the energy and climate strategy of the City of Judenburg. Judenburg is part of the Climate Alliance and the Covenant of Mayors and was also awarded with the European Energy Award in Gold (5e) and the Climate Star Award.

BEST PRACTICE IN AUSTRIA – SMART METERING

BASIC INFORMATION

Title of the Best Practice:

Smart Metering at SZF Schulungszentrum Fohnsdorf (office building)

Energy efficiency measures implemented in the building:

Installing smart metering system: controlling heating system and the electrical network

Location:

City: Fohnsdorf

Region: Province of Styria

Country: Austria

GoogleMaps link:

https://www.google.de/maps/place/Schulungszentrum+Fohnsdorf/@47.2051779,14.6627515,17z/data=!3m1!4b1!4m5!3m4!1s0x4771ca1755a27015:0xadf7df13fc20a3f8!8m2!3d47.2051779!4d14.6649402

Partners involved:

Owner

Verein Schulungszentrum Fohnsdorf

Operator and contact

Verein Schulungszentrum Fohnsdorf

Hauptstraße 69

8753 Fohnsdorf

Tel.: +43 3573 6060

Fax: +43 3573 6060 1009

E-Mail: office@szf.at

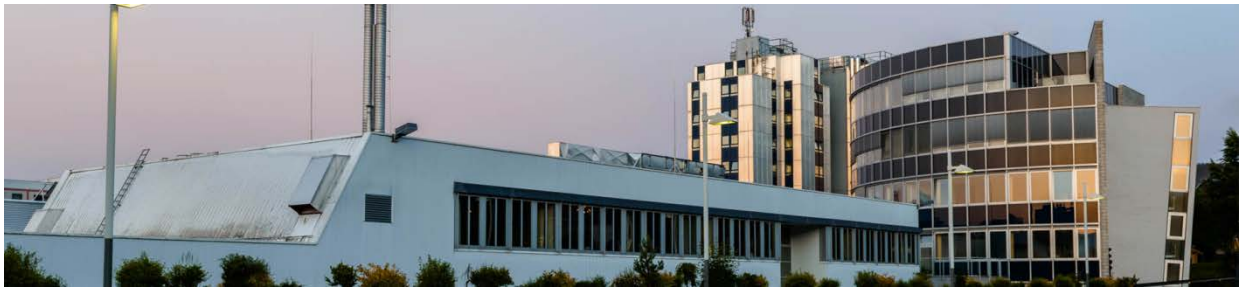
www.szf.at

Planner and Architect

Own staff of facility management of SZF, assisted by EAO (www.eao.st)

Implementation year: 2018

Photos:



Source: SZF Schulungszentrum Fohnsdorf [www.sfz.at]

Source: SZF Schulungszentrum Fohnsdorf [www.sfz.at]

Source: SZF Smart Meter Installation [www.sfz.at]

SYSTEM CHARACTERISTICS

Brief Description*:*

The SZF Schulungszentrum Fohnsdorf has been an active partner of the Public Employment Service and industry since 1975. With innovations, the development of new forms of teaching and learning and ongoing investments in machinery and equipment, we prepare participants for the demands of a modern working environment.

The graduates should be able to use and implement their qualification concretely in the workplace. Therefore, competence-oriented learning processes are designed in which learners are supported and instructed in the acquisition of skills and abilities in a certain occupational field and thereby develop into independent, capable specialists for the economy. Professional, social, personal and digital competences are promoted in an integrated way, i.e. always in connection with the professional activity. This requires interdisciplinary learning as well as learning at work tasks from practice and promotes the CANNESS of the participants.

Smart metering

The building complex consists of an office block, laboratories, kitchen, seminar rooms and living tower for pupils. Due to the complex building and usage structure, measures to increase energy efficiency are difficult to identify and evaluate. Therefore, smart meters were installed in both the heating system and the electrical network in order to assign energy consumption and load profiles to individual usage units.

Installation of Smart Meters

Smart meters are installed for different parts and organizational units of the building complex in the electrical system and in heating hydraulics.

The smart meters in the electrical system allow to analyze load curves on 15 min basis, and consumptions. This allows to identify optimization potential for energy saving.

The same was done in the heating hydraulics, but this is more complex than in the electrical system, since the flow rate and the temperature difference between the flow and return lines must be measured on the lines in order to calculate the power or consumption.

These smart meters are linked to a control unit in the office of the facility management. The facility manager is doing analyses of load curves and consumptions, based on this, energy saving projects will be planned. Measures can be organizational or investment based.

Energy Efficiency

Energy efficiency will be raised up by measures implemented based on analyses and planning after smart metering. Smart metering is also an important tool for monitoring and controlling the quality of implemented measures.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 20.000 € for smart metering

Sources of financing:

Smart metering was financed by own resources; funds will be used for financing of additional investments in future for energy saving.

Electricity savings (MWh/year): analyses of saving measures ongoing

Or fuel savings (kg or m3 or kWh or GJ): analyses of saving measures ongoing

Cost savings (EUR/year): analyses of saving measures ongoing

CO2-saving analyses of saving measures ongoing

PROJECT IMPLEMENTATION BENEFITS

The facility manager is doing analyses of load curves and consumptions, based on this, energy saving projects will be planned. Measures can be organizational or investment based.

Energy efficiency will be raised up by measures implemented based on analyses and planning after smart metering. Smart metering is also an important tool for monitoring and controlling the quality of implemented measures by using of energy performance indicators.

BEST PRACTICE IN AUSTRIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

klimaaktiv Building database

Location:

Country: Austria

GoogleMaps link:

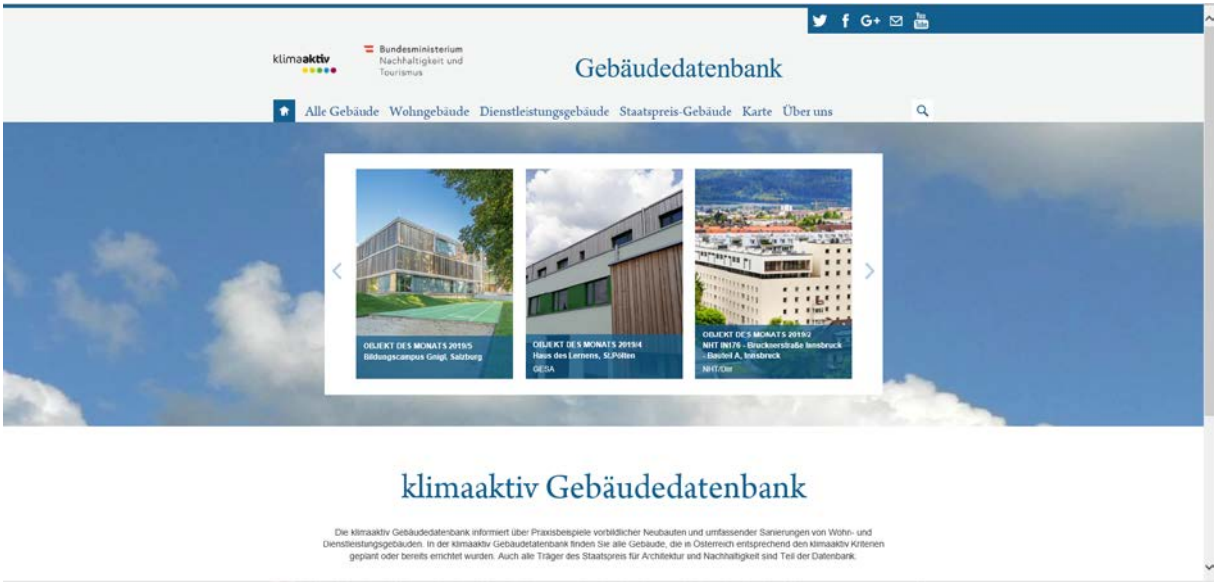
https://www.google.com/maps/place/Dunaj,+Avstrija/@48.220778,16.3100205,12z/data=!4m5!3m4!1s0x476d079e5136ca9f:0xfdc2e58a51a25b46!8m2!3d48.2081743!4d16.3738189

Partners involved:

klimaaktiv is the climate protection initiative of the Austrian Federal Ministry for Sustainability and Tourism. The database is operated by ÖGUT - Österreichische Gesellschaft für Umwelt und Technik
ÖGUT - Österreichische Gesellschaft für Umwelt und Technik
Hollandstraße 10/46, A-1020 Wien
E-Mail: klimaaktiv@oegut.at, Internet: www.oegut.at, https://klimaaktiv-gebaut.at/

Implementation year: 2016

Photo:



[Source: https://klimaaktiv-gebaut.at/]

SYSTEM CHARACTERISTICS

Brief Description:

The klimaaktiv building database informs about practical examples of exemplary new buildings and comprehensive refurbishments of residential and service buildings. In the klimaaktiv building database you will find all buildings planned or already constructed in Austria according to the klimaaktiv criteria. In addition to energy efficiency, the klimaaktiv building standard also assesses and evaluates the planning and execution quality, the quality of building materials and construction as well as central aspects of comfort and indoor air quality from a neutral perspective. Buildings in climate-active quality guarantee compliance with high-quality standards in these areas.

All winners of the Austrian State Prize for Architecture and Sustainability are also part of the database. The database contains 771 buildings at the time.

klimaaktiv supports building owners or planners in developing economic energy saving potentials in new or existing residential and service buildings and advises according to the klimaaktiv building standard. In this way, the quality requirements of the klimaaktiv building standard can be translated for every property and taken into account in every planning phase.

FINANCIAL SOURCES AND FINANCING DETAILS

klimaaktiv is the climate protection initiative of the Austrian Federal Ministry for Sustainability and Tourism.

PROJECT IMPLEMENTATION BENEFITS

klimaaktiv makes an important contribution to climate protection with the development of quality standards, active advice and training as well as a broad range of information work. klimaaktiv serves as a platform for initiatives by companies, countries and municipalities, organisations and private individuals.

4.2 Croatia

KOPRIVNICA

RECONSTRUCTION OF BOILER ROOM PLANT IN GENERAL COUNTY HOSPITAL

Best Practice Factsheet #5

Koprivnica, Croatia

Reconstruction of boiler room plant in General County Hospital "Dr. Tomislav Bardek" Koprivnica

DESCRIPTION OF THE ACTION

This project was a result of a trust among Hospital's management and Agency and successful implementation of several energy related projects on hospital's buildings (reconstruction of hospital's roof, solar plant for hot water etc.). Biggest challenge and high investment project identified as low hanging fruit (quick return on investment) was reconstruction of boiler room plant that is all purpose, has oversized steam boilers of total 10,5 MW & 16 t/h of steam, installed in far 1979.

After a six months preparation period, having implemented most economically advantageous tender and signed contract with business entity, works were finally executed in 2016. New situation after reconstruction is the following – three specialized blocks of boilers (steam production, heating, consumer hot water) of total 3,5 MW & 3,4 t/h of steam + connection with existing solar thermal collector plant, steam condensate recovery (hot water return).

Time period: 2016

Key Results

- **For Hospital first successfully implemented most economically advantageous tender**
- **Reconstructed boiler room plant**
- **Unburdened Hospital's technical staff**
- **substantial energy and maintenance costs savings**

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

KOPRIVNICA

RECONSTRUCTION OF BOILER ROOM PLANT IN GENERAL COUNTY HOSPITAL

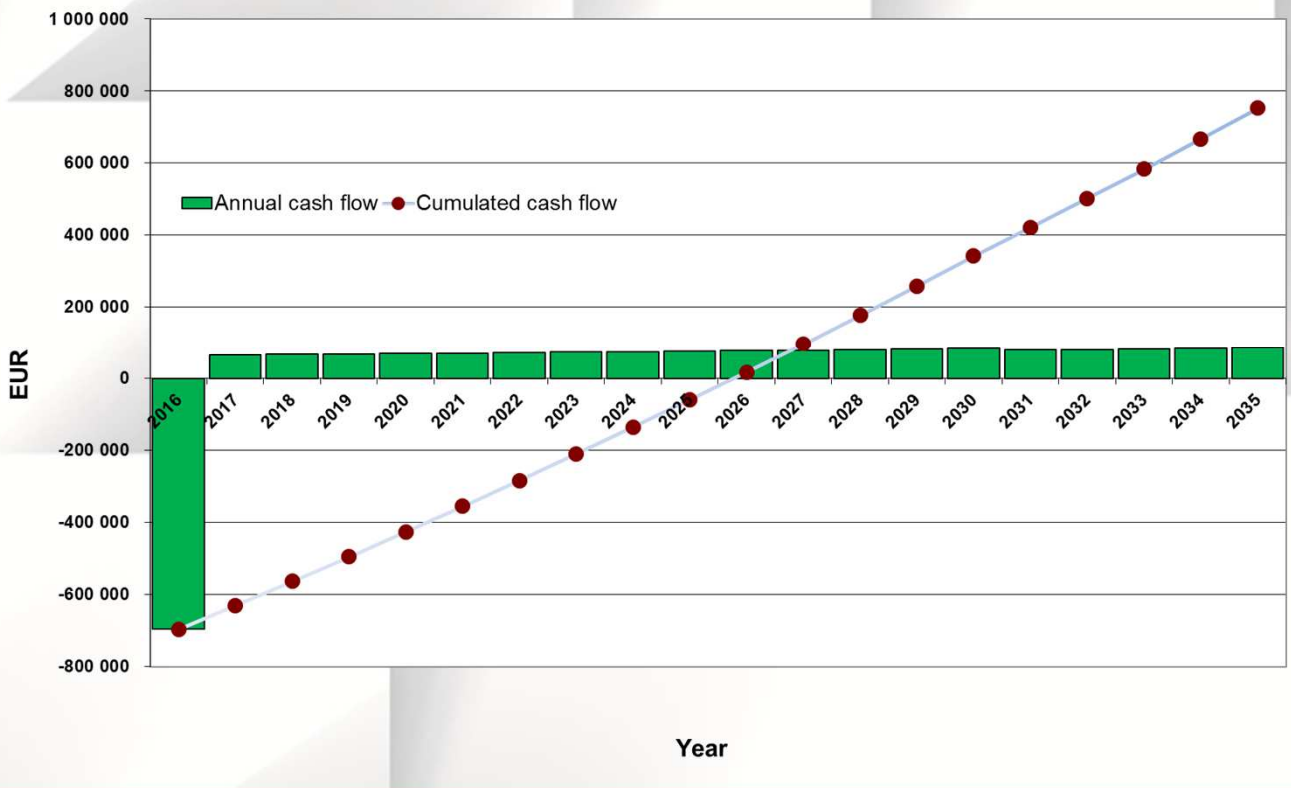
Best Practice Factsheet #5

FINANCING

Investment costs	**707.000 EUR**
- **Own sources**	**707.000 EUR**
- **Subsidies**	**-**
- **Loan**	**-**
Lifetime (service life	**20 years**
Annual operational costs (incl. repairs, maintenance and other specific costs	**12.000 EUR**
Annual revenues – energy savings	**80.000 EUR**

Financial indicators		
Net present value - NPV	382 925,50	EUR
Internal rate ratio - IRR	8,25%	
Payback period - simple	10	years
Payback period - discount	12	years
Evaluation year	2016	
Lifetime period	20	years
Discount	3,00 %	

Reconstruction of boiler room plant in General County Hospital "Dr. Tomislav Bardek" Koprivnica
Investor´s cash flow



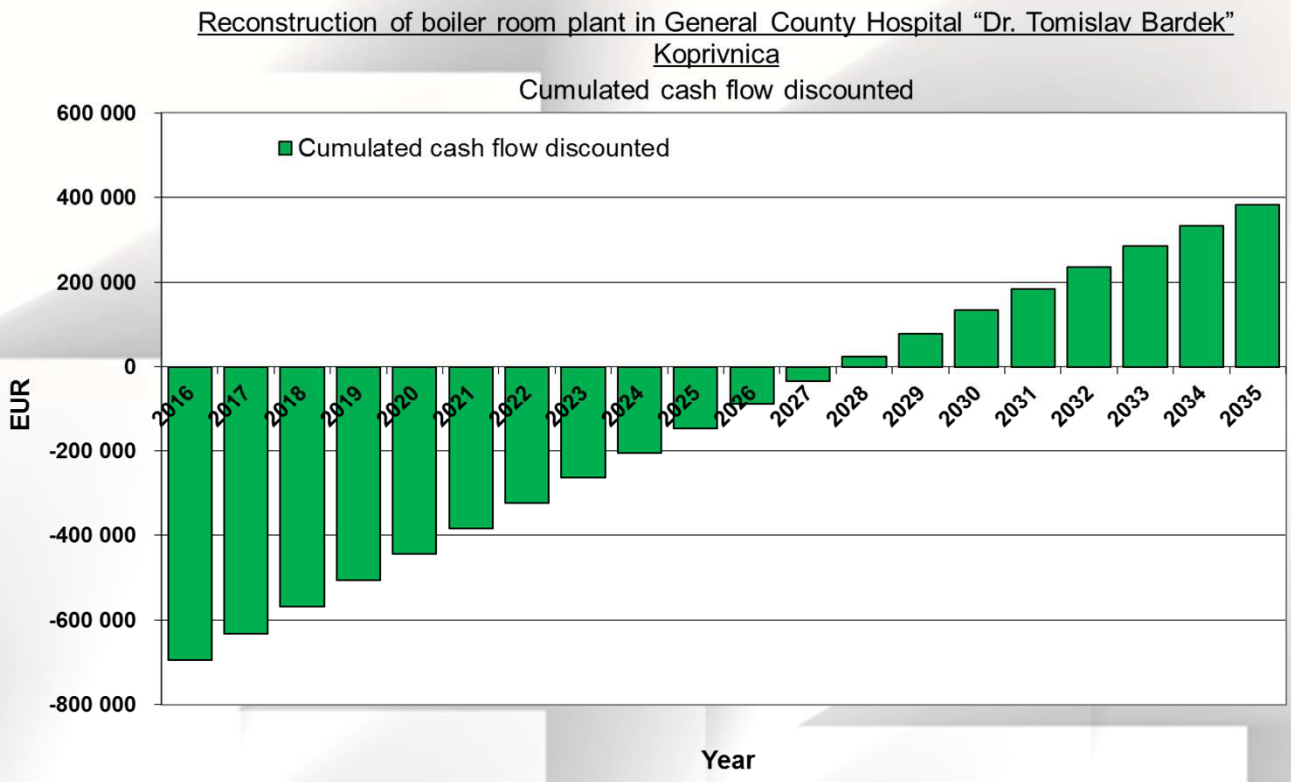
Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

KOPRIVNICA

RECONSTRUCTION OF BOILER ROOM PLANT IN GENERAL COUNTY HOSPITAL

Best Practice Factsheet #5

FINANCING



PICTURES

Partners involved

- Open University Koprivnica
- Regional Energy Agency North

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

KOPRIVNICA

RECONSTRUCTION OF BOILER ROOM PLANT IN GENERAL COUNTY HOSPITAL

Best Practice Factsheet #5

BARRIERS ENCOUNTERED

- Hospital management's lack of focus on non-medical issues,
- Securing sufficient funds for investment,
- private sector unprepared for new approach in public procurement process (most economically advantageous tender),
- Hospital technical staff's left out of major decision making processes and influence on project design, procurement and works

Success factors

- **Trust among partners as well as their successful prior cooperation,**
- **project involvement of competent and relevant individuals**
- **secured financing from the investor (Hospital)**
- **detailed and thorough preparation of the investment**

Ways to deal with barriers

Agency's experience is that it was critical that Hospital trusted Agency that it can and will successfully carry out the entire project. In this case, trust was earned by prior successful cooperation and implementation of EE projects/investments. Very important aspect of problems solving and removal of barriers was punctual and on-time communication with evidences (emails), regular meetings and more important always ready solutions. Agency always had ideas and propositions for problems and barriers so it was much easier for Hospital's management to plan and make decisions.

CONTACT: www.obkoprivnica.hr

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

BEST PRACTICE IN CROATIA – SMART METERING

BASIC INFORMATION

Title of the Best Practice

Smart metering system in kindergarten Loptica

Energy efficiency measures implemented in the building:

installing smart metering system: *controlling consumption of electricity, gas, water*

Location:

City: Koprivnica

Region: Koprivnicko - krizevacka County

Country: Croatia

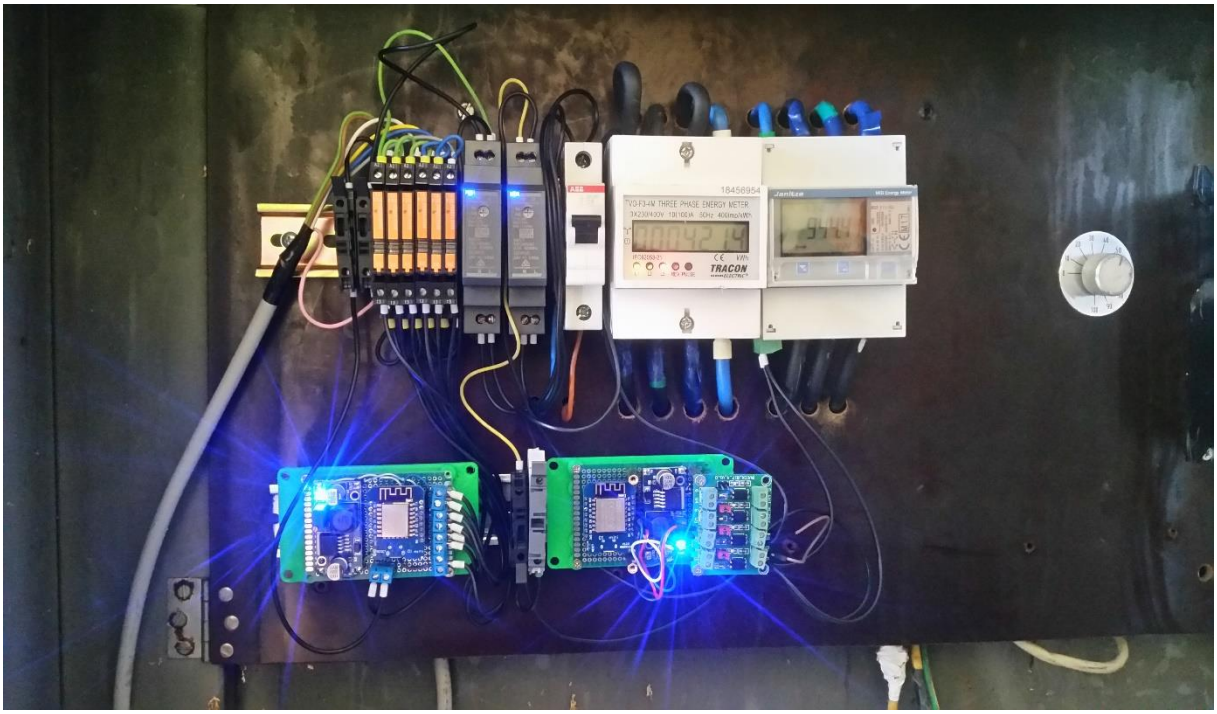
https://goo.gl/maps/7oHYFCjTCD52

Partners involved:

- City of Koprivnica, Zrinski square 1, Koprivnica - role - Pilot action city
- Regional energy agency North, Miroslava Krleze 81, Koprivnica - role – technical support during implementation
- utility companies

Implementation year: *2018*

Photo: (of a smart metering components)



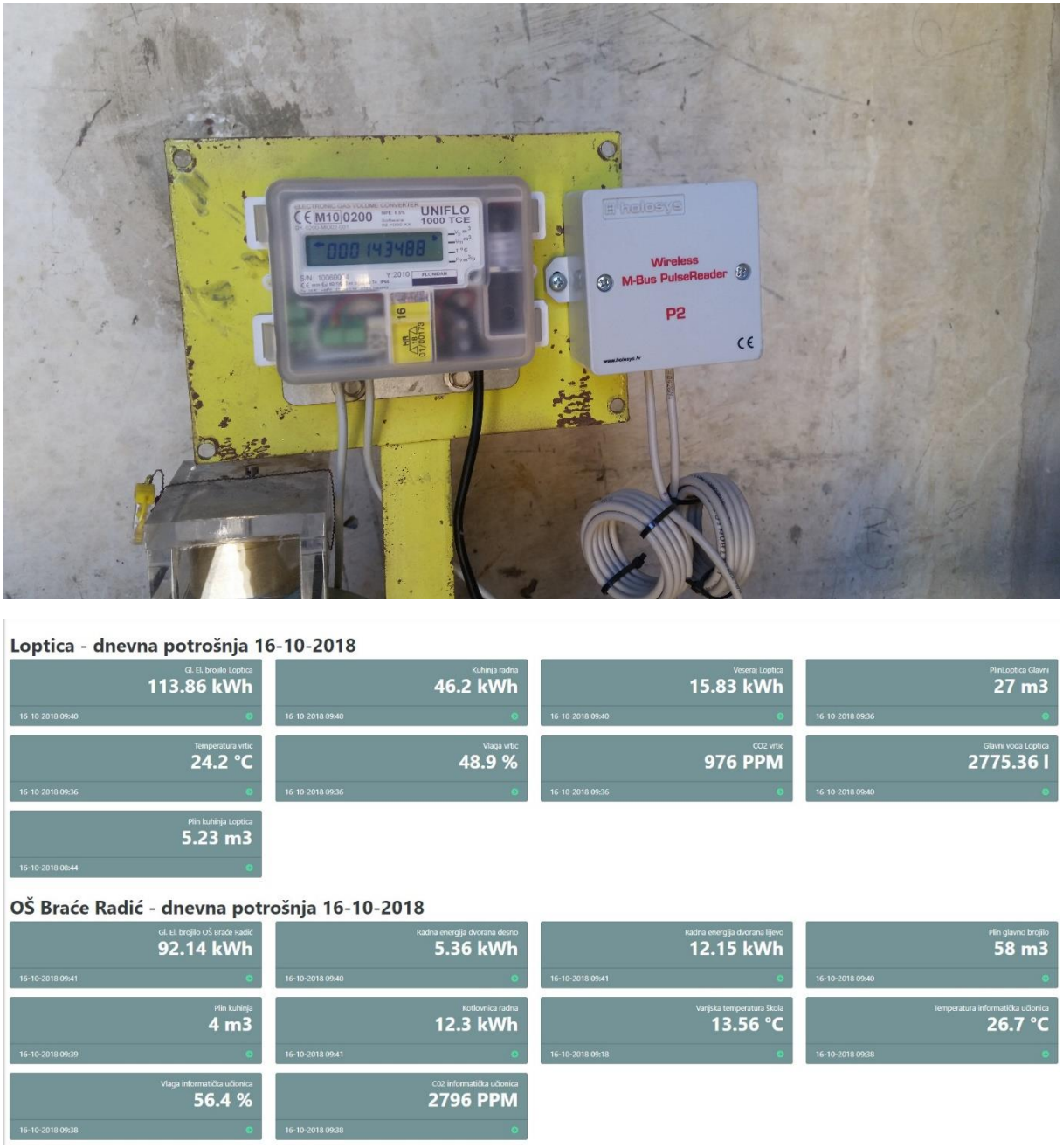


Figure 1 Smart metering system in kindergarten Loptica

SYSTEM CHARACTERISTICS

Brief Description*:*

The whole process of SM system implementation in kindergarten Loptica started with the first month of 2018 when the needs have been defined. Current state of the building was analysed. After that, market research was conducted in March 2018 to explore possibilities of available SM systems. In April, tech guys from Regional energy agency North linked the needs with the possibilities of SM systems considering financial frame. Considering that, project subject was defined and according to that, public procurement was carried out. Contract was sign in July with the ASR Group company which performed the works.

Smart metering system is implemented in the kindergarten for measuring electricity, gas and water consumption. The total value of completed works and equipment purchased is 104,150.00 HRK (14.000,00 €). Basically, the system includes measuring devices (smart meters) and software for displaying and monitoring the results. Measuring devices include reed switch that collect information about electric energy, gas and water consumption as well as internal temperature and CO_2 level. Central unit processes and displays collected data within specially designed software in real-time. System is in full function since the beginning of October 2018.

Type of a building where a smart metering (SM) system is installed:

Educational - kindergarten

What does the smart meter measure:

electricity consumption
gas consumption
water consumption
internal temperature
CO2 level

Responsible person for monitoring consumption:

Nenad Zamljacanec - superintendent

Name of a company which installed the SM system:

ASR GROUP d.o.o., Street of hrvatskih branitelja 11, Varazdin, E-mail: info@asr-group.hr, phone: +385 (095) 521 8662

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value:

14.000,00 €

Sources of financing:

SM system implementation in kindergarten Loptica in Koprivnica was fully finance within the project BOOSTEE-CE Interreg Central Europe. Project BOOSTEE aims to increase energy efficiency in public buildings through smart energy management.

Electricity savings (MWh/year):
-
Or fuel savings (kg or m3 or kWh or GJ):
-
Cost savings (EUR/year):
-
*SM system was implemented a month ago so no savings have been made yet.

PROJECT IMPLEMENTATION BENEFITS

This investment will provide numerous benefits such as monitoring, planning and control of energy and water consumption costs. Ultimately, the system will enable better management of energy consumption, easier maintenance of facilities and financial savings.

BEST PRACTICE IN CROATIA – SMART METERING

BASIC INFORMATION

Title of the Best Practice

Smart metering system in Braca Radic Elementary School

Energy efficiency measures implemented in the building*: controlling consumption of electricity, gas, water*

Location: *with GoogleMaps link*

City: Koprivnica

Region: Koprivnica-krizevci County

Country: Croatia

https://goo.gl/maps/nkSYBtYWe3Wbt6Ex6

Partners involved:

- City of Koprivnica, Zrinski square 1, Koprivnica - role - Pilot action city
- Regional energy agency North, Miroslava Krleze 81, Koprivnica - role – technical support during implementation
- ASR Group d.o.o. – role – contractor
- utility companies

Implementation year: 2018

Photo: (source: REAN)

Figure 1 Smart metering electronic component parts

Figure 2: Central Monitoring System – Main dashboard

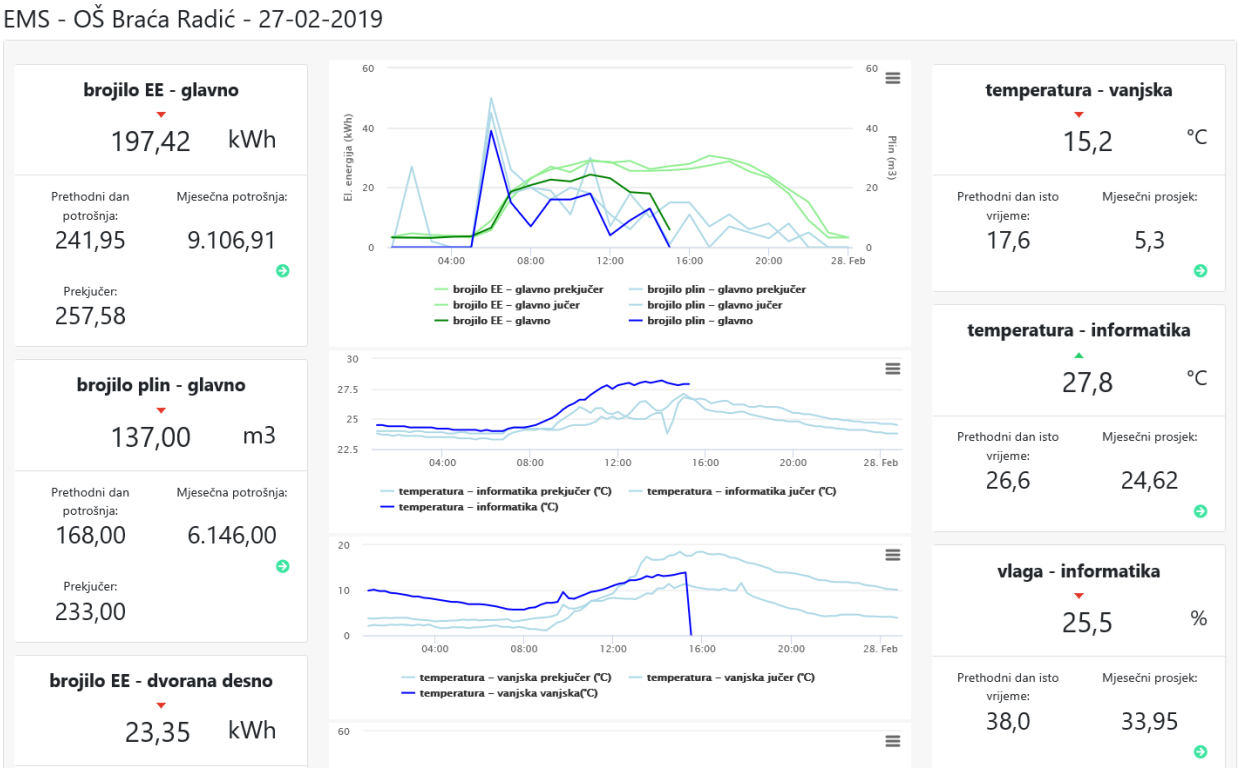


Figure 3: Central Monitoring System – Dashboard

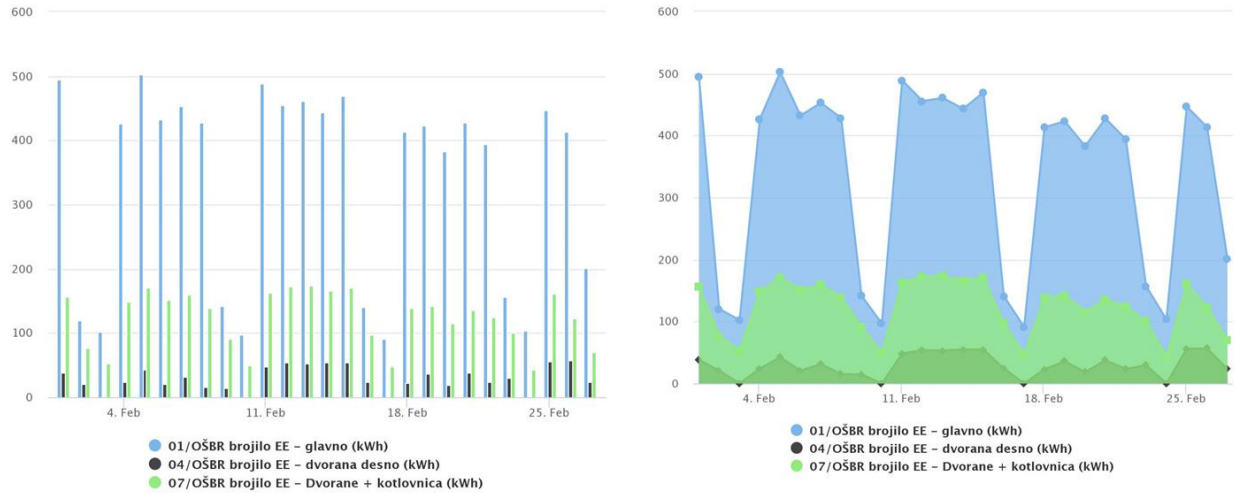


Figure 4: Central Monitoring System – Chart view

SYSTEM CHARACTERISTICS

Brief Description

The whole process of SM system implementation in Braca Radic Elementary School started with the first month of 2018 when the needs have been defined. Current state of the building was analysed. After that, market research was conducted in March 2018 to explore possibilities of available SM systems. In April, tech guys from Regional energy agency North linked the needs with the possibilities of SM systems considering financial frame. Considering that, project subject was defined and according to that, public procurement was carried out. Contract was sign in July with the ASR Group company which performed the works.

Smart metering system is implemented in the School for measuring electricity, gas and water consumption. The total value of completed works and equipment purchased is 104,150.00 HRK (14.000,00 €). Basically, the system includes measuring devices (smart meters) and software for displaying and monitoring the results. Measuring devices include reed switch that collect information about electric energy and gasr consumption as well as internal and outdoor temperature, humidity and CO_2 level. Central unit processes and displays collected data within specially designed software in real-time. System is in full function since the beginning of October 2018. Finally, smart metering data were integrated in Croatian Energy Management Information System (ISGE).

Type of a building where a smart metering (SM) system is installed:

Educational – School building

What does the smart meter measure:

electricity consumption (Main meter, sports hall and boiler room)
gas consumption (Main meter and kitchen)
internal and outdoor temperature
CO2 level
Humidity

Responsible person for monitoring consumption:

Nenad Radicek, custodian

Name of a company which installed the SM system:

ASR GROUP d.o.o., Street of hrvatskih branitelja 11, Varazdin, E-mail: info@asr-group.hr, phone: +385 (095) 521 8662

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 14.000,00 €

Sources of financing:

SM system implementation in Braca Radic Elementary School in Koprivnica was fully financed within the project BOOSTEE-CE Interreg Central Europe. Project BOOSTEE aims to increase energy efficiency in public buildings through smart energy management.

Electricity savings *(MWh/year):* Complete reconstruction project results in electricity savings in total 47.295,00 kwh per year, this means a reduction of 59 %.

Or fuel savings *(kg or m3 or kWh or GJ):* Complete reconstruction project results in reduction of energy needed for heating from 445.898,30 kWh/m^2 to 165.878,10 kWh/m^2, this means a reduction of 63 %.

Cost savings *(EUR/year):* 63 % heating cost reduction and 59 % electricity savings, or ca. 20.000,00 € per year

PROJECT IMPLEMENTATION BENEFITS

This investment will provide numerous benefits such as monitoring, planning and control of energy and water consumption costs. Ultimately, the system will enable better management of energy consumption, easier maintenance of facilities and financial savings.

ADDITIONAL INFORMATION

More information on following links: https://www.interreg-central.eu/Content.Node/PA/PA6.html and https://drava.info/2018/12/sustavi-za-pametno-upravljanje-energijom-ugradeni-na-dva-koprivnicka-objekta-u-sklopu-projekta-boostee-ce/

BEST PRACTICE – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Low energy reconstruction of Kindergarten Loptica

Energy efficiency measures implemented in the building:

- Sanation of all plumping and drainage installations and all sanitary facilities
- Energy efficient envelope insulation (façade, windows, doors) and thermal insulation of the ceiling
- Installation of transparent elements in the roofs of the terraces with the aim of increasing daylight in the children's living rooms
- Installation of didactic elements on the reconstructed facade of the building
- Sanation of internal partition walls damaged by moisture
- Floor reconstruction in children's living rooms and hallways
- Reconstruction of the existing boiler room and production of hot water
- Installation of ventilation in children's living rooms (recuperation)
- Installation of PV system
- Installation of LED lighting system

Location: *with GoogleMaps link*

City: Koprivnica

Region: Koprivnicko - krizevacka County

Country: Croatia

https://goo.gl/maps/kGokYJ7mkuPVTCJU7

Partners involved:

- Kindergarten Tratincica, Trg podravskih heroja 7, Koprivnica – role: user

- City of Koprivnica, Zrinski Square 1, Koprivnica – role: investor

- Regional Energy Agency North, Miroslava Krleže 81, Koprivnica – role: project management

- DESING d.o.o., Mosna 14, Koprivnica – role: lead project designer

- KET d.o.o., Đure Basaričeka 1b, Đurđevac- role: lead project designer

- ECO PROJEKT d.o.o., Duga ulica 35, Varaždinske toplice – role: lead project designer

- Fasaderski obrt Mijatović, Ljudevita Gaja 17, Koprivnički Bregi – role: contractor

- Termika Ružić j.d.o.o., Miklinovec 7, Koprivnica – role: contractor

- Solvis d.o.o., Cehovska 106, Varaždin – role: contractor

Implementation year: 2018 – 2019

Photos: (source: photo taken by REAN)

Figure 1 Reconstructed Kindergarten Loptica

Figure 2 Reconstructed boiler room in Kindergarten Loptica

Figure 3 Reconstructed Kindergarten Loptica

SYSTEM CHARACTERISTICS

Brief Description

The subject of this project was the reconstruction and refurbishment of existing Kindergarten Loptica in Koprivnica.

Kindergarten Loptica is a prefabricated building built in 1982. Extensive external and internal transformation of the building has extended its life span and significantly increased energy efficiency with the use of renewable energy sources. The project was implemented as part of an EU project called Prominent MED. The project was implemented using the public procurement of innovation procedure, which was conducted for the first time in Croatia.

The project carried out interventions to increase the energy efficiency of the building envelope (walls and ceiling of the building), which included exterior façade, reconstruction of the heating system, installation of a recovery system, reconstruction of the internal water supply and drainage system, and installation of a solar power plant. In addition, the reconstruction of floors and bathrooms, the repair of interior wall and ceiling surfaces and the installation of didactic elements as an integral part of the building were also carried out. The facility also replaced lighting using LED lighting. Unlike most energy renovations in buildings, where the focus is primarily on the outer envelope and building systems, this approach has been able to fully restore the kindergarten and improve the material conditions for the upbringing and education of children. The total area of the building is 850 m2, and the total cost of the project was close to 400.000,00 € (VAT included).

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value:

ca. 400.000,00 €

Sources of financing:

This project was co-financed by the Interreg MED Programme (Prominent MED project) with 54 % of total investment and the rest was covered by the City of Koprivnica (46 %).

Electricity savings (MWh/year):

Information not available.

Or fuel savings (kg or m3 or kWh or GJ):

Reduction of energy needed for heating from 97.352,73 kWh/m^2 to 32.534,26 kWh/m^2, this means a reduction of 67 %.

Cost savings (EUR/year):

67 % heating cost reduction results in ca. 2.600,00 € per year.

PROJECT IMPLEMENTATION BENEFITS

This investment will provide numerous benefits such as quality learning conditions for children, low energy costs, low CO_2 emissions, lower maintenance costs etc.

In addition to reduced heat consumption, the comfort of the user (children and kindergarten teachers) will be increased by the air recuperation system, which will constantly supply with fresh air, and will certainly have a positive impact on the health of children. Although this system will consume additional electricity consumption, this cost will be partially offset by the solar power plant, but also offset by less heat consumption. With reconstruction of internal walls, which were in some cases in extremely poor condition due to the constant influence of moisture, we completely eliminated the influence of moisture and the associated risks on the health of children. In addition, the natural illumination of the building was increased by increasing the glazed surface of the building and the exterior bright coatings of the above-ground terraces, and by installing new LED lighting improved the illumination even in conditions of reduced light outside.

ADDITIONAL INFORMATION

Additional information on following link: https://ppi.koprivnica.hr/.

BEST PRACTICE IN CROATIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Low energy reconstruction of Primary school Brace Radic in Koprivnica

Energy efficiency measures implemented in the building:

building envelope insulation (walls, roof, windows and doors reinstallation according to RAL standard), heat recovery ventilation system, LED lighting

Location:

City: Koprivnica
Region: Koprivnicko - krizevacka County **Country:** Croatia

GoogleMaps link:

https://goo.gl/maps/nScHqeACj72hMoBf8

Partners involved:

- Primary school Brace Radic, Miklinovec street 6A, Koprivnica – role: user
- City of Koprivnica, Zrinski Square 1, Koprivnica – role: investor
- The Environmental Protection and Energy Efficiency Fund, Radnicka road 80, Zagreb – role: investor
- Competent d.o.o., Varazdin, Trakoscanska 5 - role: lead project designer
- Svenda gradenje d.o.o. – role: contractor

Implementation year: 2018

***Photo**: (source: photo taken by REAN)

Figure 1 Reconstructed Primary school in Koprivnica

SYSTEM CHARACTERISTICS

Brief Description*:*

The subject of this project was the reconstruction and refurbishment of existing Primary school Brace Radic in Koprivnica. The building was constructed in 1989. and since then, no major refurbishments or reconstructions have been made. The school board wanted to ensure better learning conditions for their students, so they approached to energy experts in order to improve energy efficiency of the building and also to achieve savings.

Reconstruction included:

a) replacement of existing lighting with new LED lighting
b) thermal insulation of external walls and roof
c) existing windows dismantling and their reinstallation according to RAL standard
d) mechanical ventilation with heat recovery

Thermal reconstruction of the building envelope

The outer wall which consist of 29 cm brick block was thermally improved by 14 cm thick rock wool layer (U-value from 1.24 W/m²K to 0.22 W/m²K) and the roof was also refurbished and insulated with 22 cm thick mineral wool layer – 12 cm thick glass wool layer between the roof rafters and 10 cm thick rock wool layer above the rafters (U-value from 0.50 W/m²K to 0.15 W/m²K). Existing PVC windows with an average U-value of 1.40 W/m²K were dismantled and reinstalled according to RAL standard. Ventilation with heat recovery was installed in all classrooms, so that a minimum of 25 m^3/h of fresh air is provided per user through individual recuperator systems (24 pcs). Regarding the lighting system, all existing lighting fixtures have been replaced with the new LED lighting fixtures.

Building material

Mineral rock wool for facade insulation. Mineral
rock and glass wool for roof insulation.

Windows

Existing PVC windows with an average U-value of 1.40 W/m²K were dismantled and reinstalled according to RAL standard..

Building technology

Ventilation system: regarding the refurbishment, a mechanical ventilation system with heat recovery was installed in in all classrooms, school kitchen and in school sports hall. The efficiency of the heat recovery amounts to approx. 80 %.
The project implies energy-efficient, sustainable refurbishment, using renewable energy sources, materials, constructions and systems that provide low energy consumption. Use of energy-saving lighting system.
Monitoring system has been installed. This allows energy consumption monitoring and also serves for the optimal adaptation of the building to the user behaviour.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value:

1.390.828,00 € (EE works)

Sources of financing:

This project was co-financed by the Environmental Protection and Energy Efficiency Fund with 40 % of total investment and the rest was covered by the City of Koprivnica.

Electricity savings (MWh/year):

electricity savings in total 47.295,00 kwh per year, this means a reduction of 59 %.

Or fuel savings (kg or m3 or kWh or GJ):

reduction of energy needed for heating from 445.898,30 kWh/m^2 to 165.878,10 kWh/m^2, this means a reduction of 63 %.

Cost savings (EUR/year):

63 % heating cost reduction and 59 % electricity savings, or 20.000,00 € per year

PROJECT IMPLEMENTATION BENEFITS

This investment will provide numerous benefits such as quality learning conditions for students, low – energy costs, low CO_2 emissions, lower maintenance costs etc. Not only does a refurbishment reduce the level and cost of maintenance, it also provides the opportunity to introduce a variety of energy saving measures that will improve the overall efficiency of the building. These changes will lower the carbon footprint of the building and introduce state of the art renewable technologies. Energy cost reduction and low – energy standard were main requirements for the building refurbishment.

ADDITIONAL INFORMATION

Commitment of all people involved in this project enabled low-energy transformation of educational spaces for the benefit of staff, teachers and students.

BEST PRACTICE IN CROATIA– SMART METERING

BASIC INFORMATION

Title of the Best Practice

Smart metering system in “University North” Koprivnica

Energy efficiency measures implemented in the building: controlling electricity consumption, water consumption, calorimeters.

Location:

City: Koprivnica

Region: Koprivnica-krizevci County

Country: Croatia

GoogleMaps link:

https://goo.gl/maps/TyA5mv1Cize7nWB17

Partners involved:

- Kampus d.o.o., Dr. Zarka Dolinara Square 1, 48000 Koprivnica – role: user
- Regional energy agency North, Miroslava Krleze 81, 48000 Koprivnica – role: investor and technical support during implementation
- SmartWay d.o.o., Glavna 23, 40313 Sveti Martin na Muri – role: contractor

Implementation year: 2015

Photo: (source: screenshot taken by REAN)

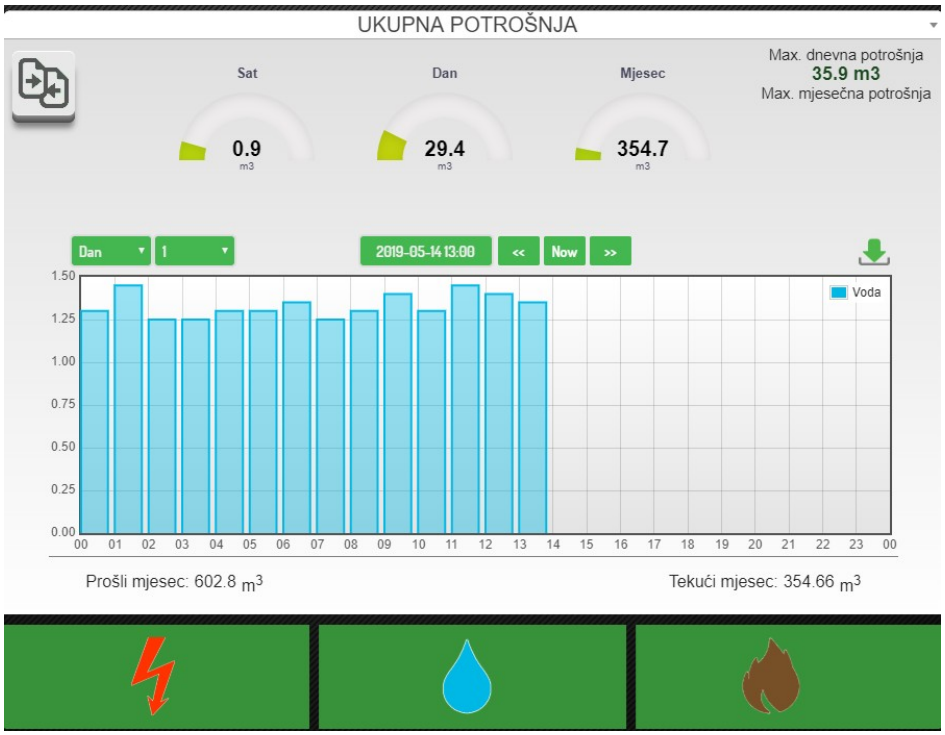


Figure 1 Smart metering interface

SYSTEM CHARACTERISTICS

Brief Description*:*

Within this project there was developed smart metering system that includes remote measurements and readings of electricity, heat energy and water that are monitored using SCADA system. The system for monitoring of energy consumption is based on minimum 15 – minute reading. There is also possibility of data analysis, the ability to access the system at any time and the ability to use the system by more users. Contract includes three year system maintenance.

Type of a building where a smart metering (SM) system is installed: Educational – University building

What does the smart meter measure:

Electricity consumption – main electricity meter
Electricity consumption – heat pump, climate chambers, operation of fan coils
Heat production – calorimeter for measuring heating energy used for preparing domestic hot wat water from heat pumps
Water consumption – two flow meters for heat supply and heat return

Responsible person for monitoring consumption: Saša Sabolović, custodian

Name of a company which installed the SM system: SmartWay d.o.o., Glavna 23, 40313 Sveti Martin na Muri, mail: info@smartway.com.hr, tel: +385954690513

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 7,500 EUR

Sources of financing: Internal and EU Funds (V-educa project)

Electricity savings *(MWh/year):* Indirect

Or fuel savings *(kg or m3 or kWh or GJ):* Indirect

Cost savings *(EUR/year):* Indirect

PROJECT IMPLEMENTATION BENEFITS

This investment will provide numerous benefits such as monitoring, planning and control of energy and water consumption costs. Ultimately, the system will enable better management of energy consumption, easier maintenance of facilities and financial savings.

ADDITIONAL INFORMATION

Implementation of Smart metering system in University North Koprivnica was co-financed through project V-educa within Hungary-Croatia IPA Cross-border co-operation programme 2007.-2013. Main focus of the project was education and promotion of nZEB solutions.

BEST PRACTICE IN CROATIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Low energy reconstruction and repurpose of existing building in former military complex

Energy efficiency measures implemented in the building:

Building envelope insulation (walls, roof, new exterior windows and doors), heat pumps for heating and cooling

Location:

City: Koprivnica

Region: Koprivnicko - krizevacka County

Country: Croatia

GoogleMaps link:

https://goo.gl/maps/oTfbmVsw89x

Partners involved:

- Kampus d.o.o., Dr. Zarka Dolinara Square 1, Koprivnica – role: user

- City of Koprivnica, Zrinski Square 1, Koprivnica – role: investor

- The Environmental Protection and Energy Efficiency Fund, Radnicka road 80, Zagreb – role: investor

- Tehnika projektiranje d.o.o., Zagreb, Andreja Arezina Crnaric - role: lead project designer

- The consortium „Detono-Primiko“ – role: contractor

Implementation year: 2013

Photo:

Figure 1 Reconstructed building in in former military complex
(Source: University North student portal “Pressedan.hr”; http://pressedan.unin.hr)

SYSTEM CHARACTERISTICS

Brief Description*:*

The subject of this project was the reconstruction and repurpose of existing building in the former “ban Krsto Frankopan” military complex in Koprivnica for the purpose of forming a study space for the Media University - journalism studies, media design studies and business and management studies in media. Former military complex "ban Krsto Frankopan" is intended for the establishment of the University Campus. The Kampus complex is ultimately designed as a complex in the concept of zero carbon dioxide emissions. The Kampus complex is intended to be a complex of zero carbon dioxide emissions. The investor's request was that the building must be a low-energy building.

Reconstruction included:

a) removing the existing wooden roof and forming a heat-insulated flat roof
b) thermal insulation of external walls
c) replacement of external windows and doors
d) mechanical ventilation with heat recovery

Thermal reconstruction of the building envelope

The outer wall which consist of 38 cm solid brick or 30 cm brick block was thermally improved by 18 - 20 cm extruded polystyrene - XPS (U-value from 0.83 W/m²K to 0.14 W/m²K) and the outer wall of ventilated façade was thermally improved by 18 cm rock wool (U-value from 0.81 W/m²K to 0.21 W/m²K). The flat roof is also insulated with 24 cm extruded polystyrene - XPS (U-value from 1.24 W/m²K to 0.12 W/m²K). The existing wooden windows with an average U-value of 3.40 W/m²K were replaced by new PVC windows with a U-value of 1.16 W/m²K.

Building material

Mineral rock wool and extruded polystyrene (XPS) for facade insulation.
XPS for roof insulation.

Windows

The existing wooden windows with an average U-value of 3.40 W/m²K were replaced by new PVC windows with a U-value of 1.16 W/m²K.

Building technology

Space heating and cooling via heat pumps (water – air). Heat pumps are using ground water heat.
Ventilation system: regarding the renovation, a mechanical ventilation system with heat recovery was installed in the university building to supply classrooms with air. The efficiency of the heat recovery amounts to approx. 82 %.

The project implies energy-efficient, sustainable reconstruction, using renewable energy sources, materials, constructions and systems that provide low energy consumption. Use of energy-saving lighting system.

Monitoring system has been installed. This allows energy consumption monitoring and also serves for the optimal adaptation of the building to the user behaviour.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value:

1.000.000 € (EE works)

Sources of financing:

This project was co-financed by the Environmental Protection and Energy Efficiency Fund with 40 % of total investment and by the City of Koprivnica with 60 % of total investment.

Electricity savings (MWh/year):

0; because new heating and cooling system is using electricity (heating pumps)

Or fuel savings (kg or m3 or kWh or GJ):

reduction of energy needed for heating from 159.436,80 kWh to 62.028,58 kWh, this means a reduction of 61 %.

Cost savings (EUR/year):

61 % heating cost reduction, or 3.820,00 € per year

PROJECT IMPLEMENTATION BENEFITS

This investment will provide numerous benefits such as quality learning conditions for students, low – energy costs, low CO_2 emissions etc. Reconstruction and repurpose of the existing building will provide new space for the students of the Media University thus directly contributes to University complex expansion.

Energy cost reduction and low – energy standard were main requirements for the building reconstruction. It was the investor's wish to have a low – energy renovated building which will have low energy costs during the whole life-cycle of the building.

ADDITIONAL INFORMATION

The Kampus complex is intended to be a complex of zero carbon dioxide emissions. The concept implies the reconstruction of the existing buildings and the construction of new facilities according to the low - energy standard, the use of renewable energy sources and a space without use of motor vehicles on fossil fuels.

4.3 Czech republic

Interreg CENTRAL EUROPE
European Union European Regional Development Fund
BOOSTEE-CE

ZLÍN REGION

WASTE INCINERATOR UPGRADE IN UHERSKÉ HRADIŠTĚ HOSPITAL

Best Practice Factsheet #1

Zlín Region, Czech Republic
Waste incinerator upgrade in Uherské Hradiště hospital

DESCRIPTION OF THE ACTION

Uherské Hradiště hospital is one of four regional hospitals established by the Zlín region. In recent years the massive reconstruction of the whole hospital are is taking place and increasing the capacity of the existing waste incinerator is one of the considered measures which would improve the economy of the hospital as well as contribute to the energy efficiency of the region and reduction of the waste disposed in landfills.

The project outlined should resolve the upgrade of the currently technically and morally obsolete device of hospital waste incinerator in the hospital area.
The case study and financial analysis is serving as a necessary basis for investor in his decision-making process in case increasing of the capacity of the existing hospital waste incinerator. The investor (the Zlín Region) is considering to increase the capacity from actual capacity 300 tons/year to 500 tons/year, eventually up to 1000 tons/year.
The incinerator will dispose the waste produced by the hospital as well as by other external sources of combustible waste. The supporting fuel is natural gas and this source will be preserved. There are two scenarios considered:

- scenario A with annual processing capacity of waste in amount of 500 t/year
- scenario B with annual processing capacity of waste in amount of 1.000 t/year

Time period: 2018 - 2019

Key results:

- **Hospital will have upgraded and modernized its source of heating which will ensure heat supply**
- **Hospital will improve its economy and self-independence in energy supply**
- **The amount of combustible from sources outside the hospital waste will be reduced**

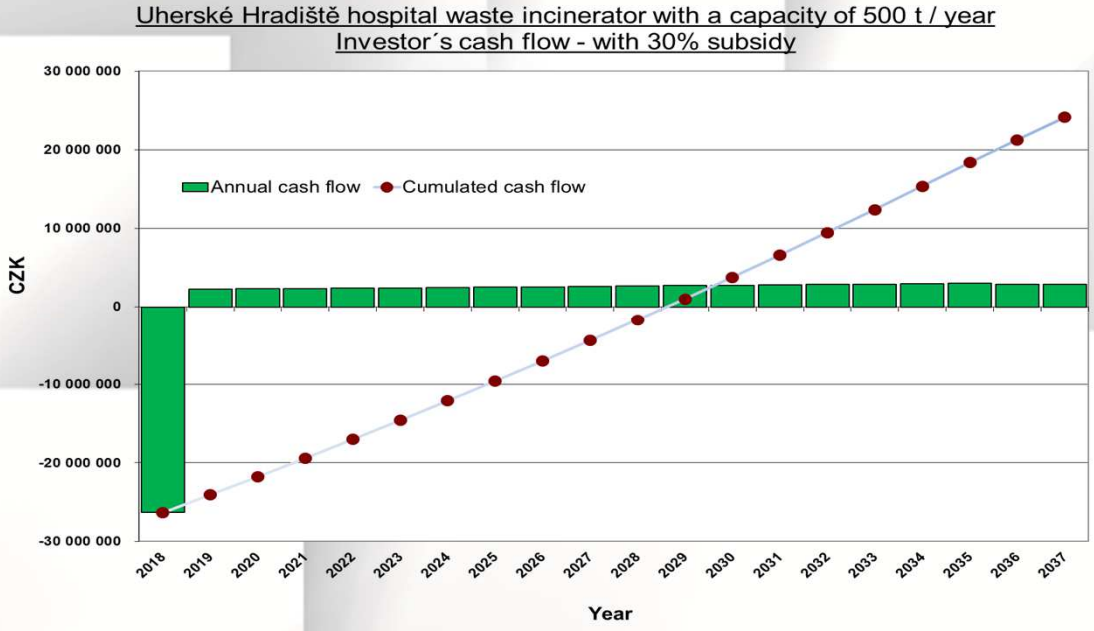
Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

FINANCING

Scenario A - Annual processing capacity of waste incinerator is 500 t/year (30% subsidy)

Investment costs	**38.500.000 CZK (1.540.000 EUR)**
- Own sources – 70%	26.950.000 CZK (1.078.000 EUR)
- Subsidies (OP Environment) – 30%	11.550.000 CZK (462.000 EUR)
- Loans	0,- CZK
Lifetime (service life	**20 years**
Annual operational costs (salaries, repairs, maintenance etc.)	**3.400.000 CZK (136.000 EUR)**
Annual revenues	**5.800.000 CZK (232.000 EUR)**
- Thermal energy	2.300 000 CZK (92.000 EUR)
- Waste	3.500 000 CZK (140.000 EUR)

Financial indicators		
Net present value - NPV	11 208 366,07	CZK
Internal rate ratio - IRR	7,13%	
Payback period - simple	11	years
Payback period - discount	13	years
Evaluation year	2018	
Lifetime period	20	years
Discount	3,00 %	

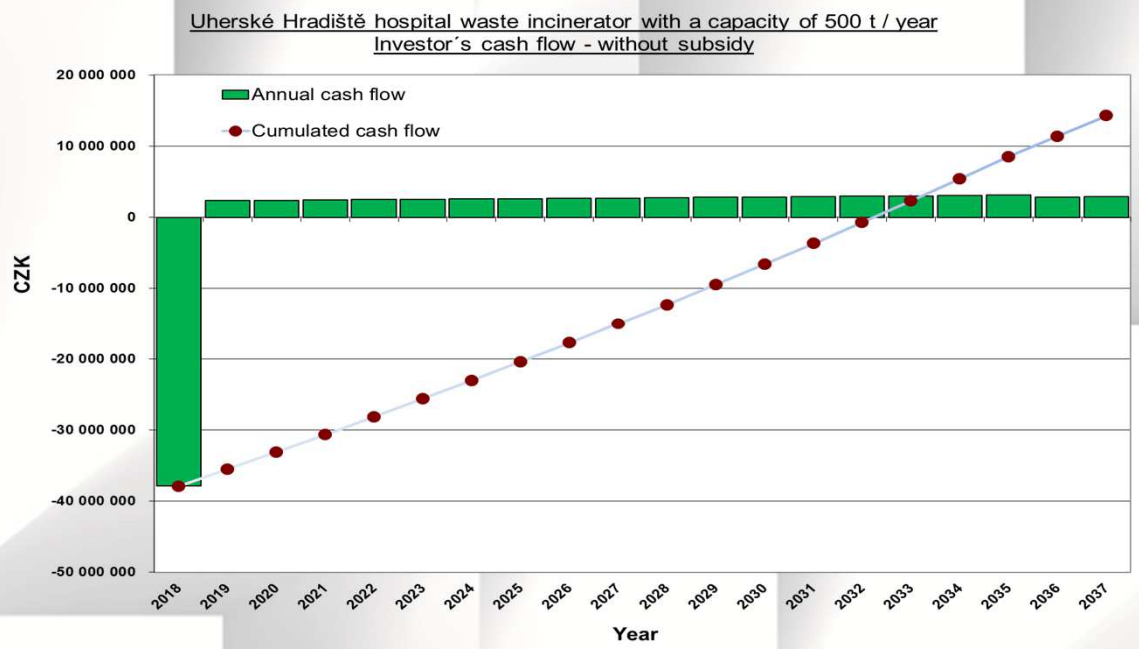


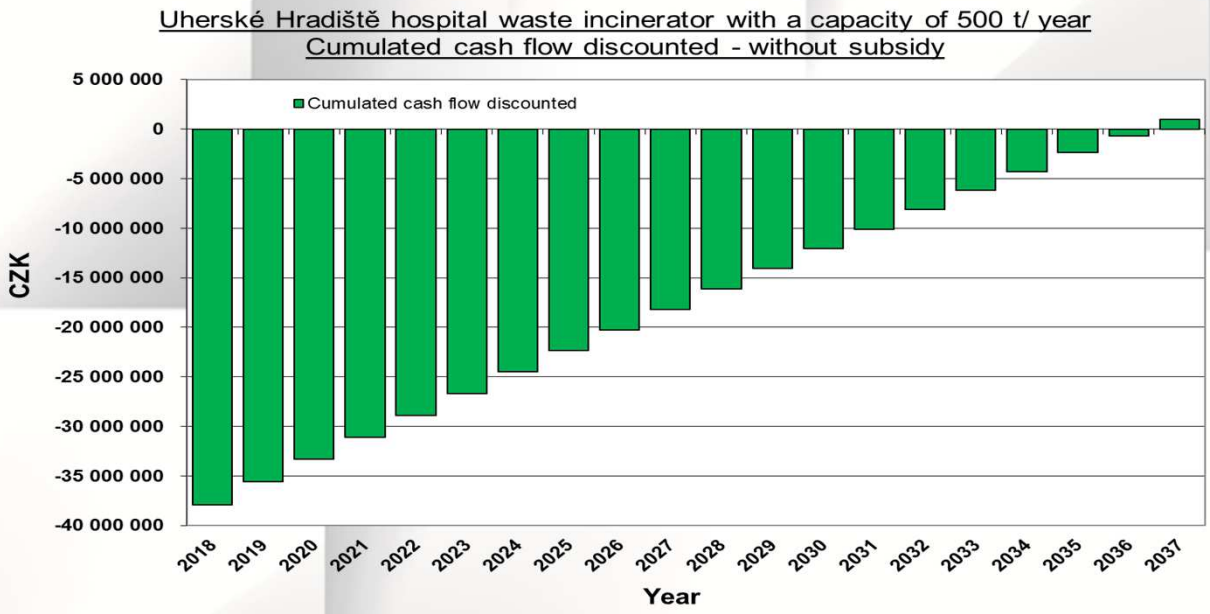
Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

FINANCING

Scenario A - Annual processing capacity of waste incinerator is 500 t/year (without subsidy)

Financial indicators	
Net present value - NPV	961 811,79 CZK
Internal rate ratio - IRR	3,27%
Payback period - simple	15 years
Payback period - discount	19 years
Evaluation year	2018
Lifetime period	20 years
Discount	3,00 %





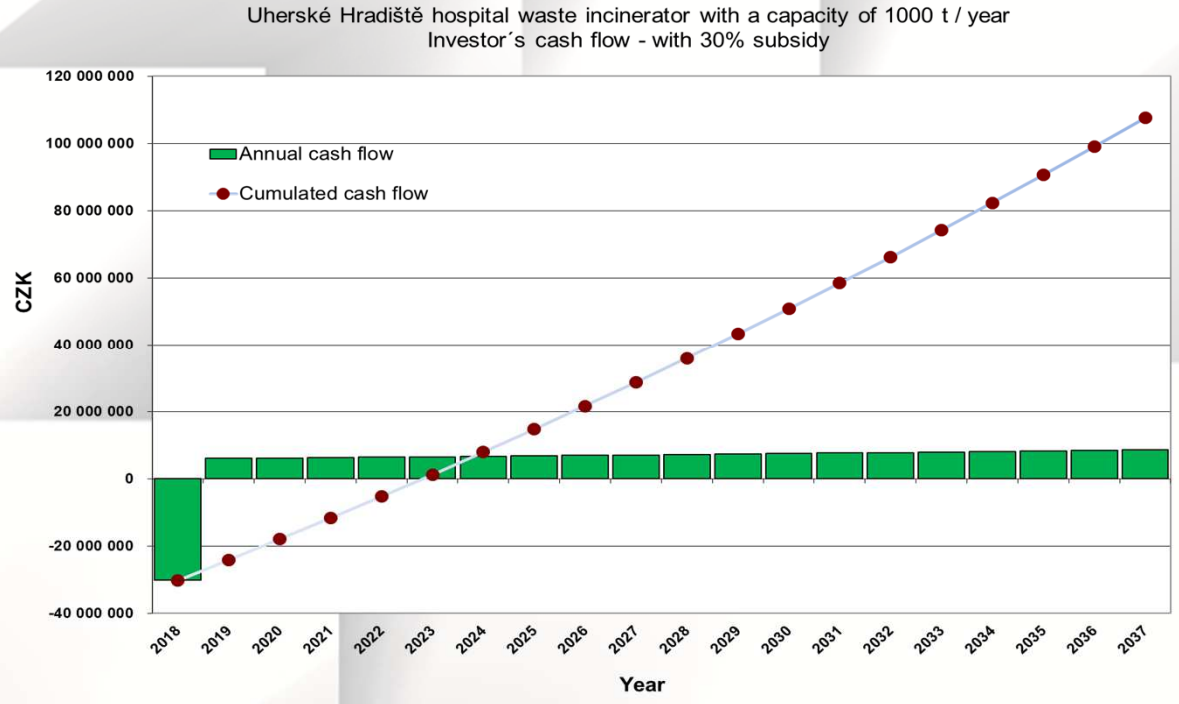
Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

FINANCING

Scenario B - Annual processing capacity of waste incinerator is 1.000 t/year (30% subsidy)

Investment costs	**44.500.000 CZK (1.780.000 EUR)**
- Own sources – 70%	31.150.000 CZK (1.246.000 EUR)
- Subsidies (OP Environment) – 30%	13.350.000 CZK (534.000 EUR)
- Loans	0,- CZK
Lifetime (service life	**20 years**
Annual operational costs (salaries, repairs, maintenance etc.)	**3.400.000 CZK (136.000 EUR)**
Annual revenues	**11.400.000 CZK (172.000 EUR)**
- Thermal energy	4.400.000 CZK (176.000 EUR)
- Waste	7.000.000 CZK (280.000 EUR)

Financial indicators		
Net present value - NPV	71 968 603,40	CZK
Internal rate ratio - IRR	21,27%	
Payback period - simple	5	years
Payback period - discount	6	years
Evaluation year	2018	
Lifetime period	20	years
Discount	3,00 %	

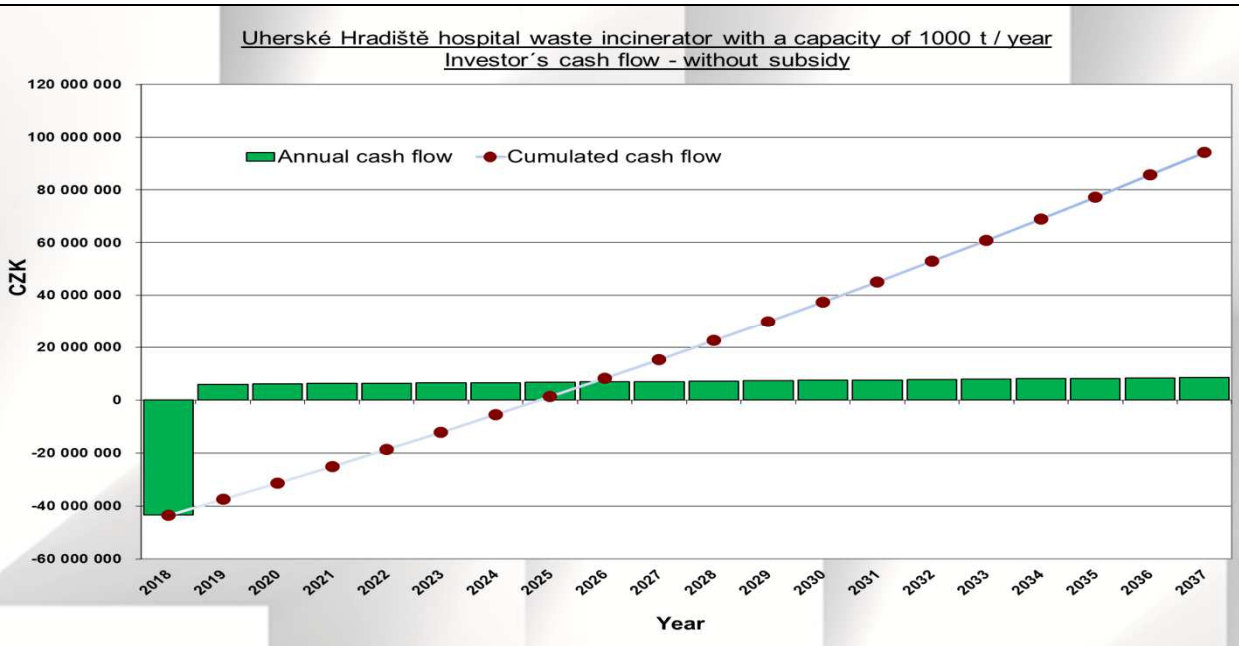


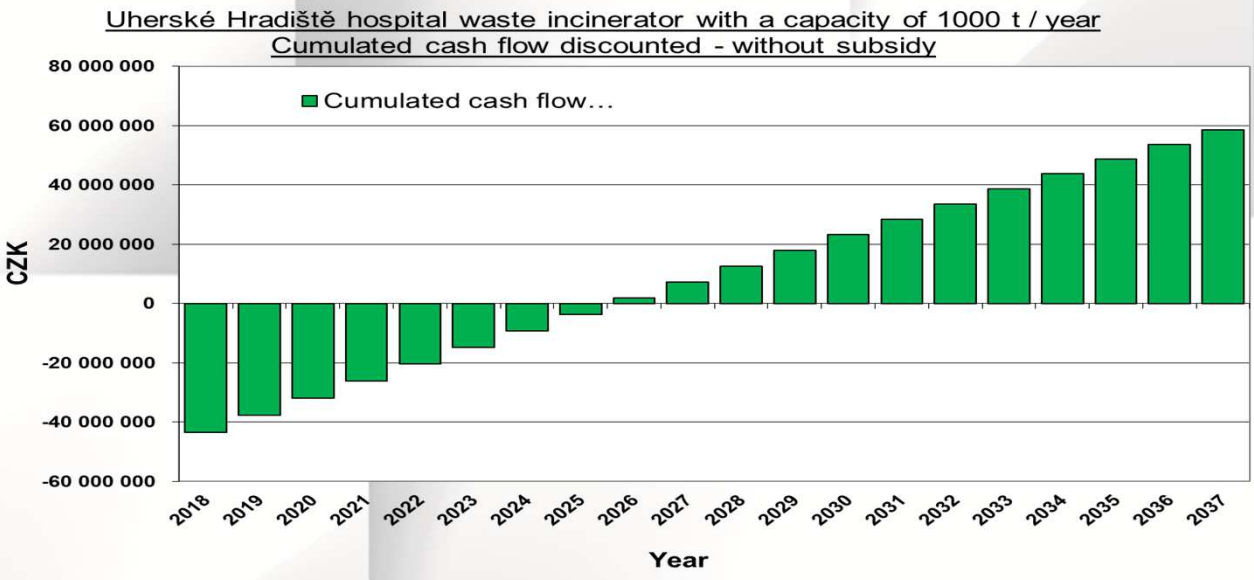
Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

FINANCING

Scenario B - Annual processing capacity of waste incinerator is 1000 t/year (without subsidy)

Financial indicators		
Net present value - NPV	58 618 603,40	CZK
Internal rate ratio - IRR	14,27%	
Payback period - simple	7	years
Payback period - discount	8	years
Evaluation year	2018	
Lifetime period	20	years
Discount	3,00 %	





Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

ZLÍN REGION

WASTE INCINERATOR UPGRADE IN UHERSKÉ HRADIŠTĚ HOSPITAL

Best Practice Factsheet #1

TECHNICAL PARAMETERS

Parameter	Value
Annual processing capacity of waste scenario A / scenario B	500 / 1000 tons/year
Fund of working time	5400 hours/year
Thermic capacity var. A / var. B, during calorific value of waste 10 MJ/kg and during natural gas consumption 6 mN3/h, or 10 mN3/h	0,87 / 1,64 GJ/hour
Max. concentration of pollutants in output exhaust	According by Czech Directive no. 415/2012 Sb.

BARRIERS ENCOUNTERED

- Resistance of NGO sector to the waste combustion
- Lack of understanding from the general public related to usefulness of this project and negative ecological aspects of waste disposals to landfills

Ways to deal with barriers

- Feasibility study
- Report on the project effects on the environment
- Educational campaign

PARTNERS INVOLVED

- **Uherské Hradiště hospital**
- **Zlín Region**
- **Energy Agency of the Zlín Region**

Success factors

- Understanding and support from regional policy makers
- General consent from the side of public
- Financial support from OP Environment

CONTACTS: Energy Agency of the Zlín Region,
www.eazk.cz, info@eazk.cz

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

BEST PRACTICE IN CZECH REPUBLIC – SMART METERING

BASIC INFORMATION

Title of the Best Practice:

Smart metering of indoor clime in 5 schools of the Zlín Region

Energy efficiency measures implemented in the building: Installing smart metering system – Indoor measurement of CO2, relative humidity and temperature. Including energy management of the buildings from year 2008.

Locations:

City: 2x Kroměříž (https://goo.gl/maps/6vJyu7kptQ92 and https://goo.gl/maps/78eXA3ns46x)

Holešov (https://goo.gl/maps/gyEjuK5JNHM2),

Vsetín (https://goo.gl/maps/5Lb8qfL8Wex),

Valašské Klobouky (https://goo.gl/maps/FnJmMUYJQTt)

Region: Zlín Region

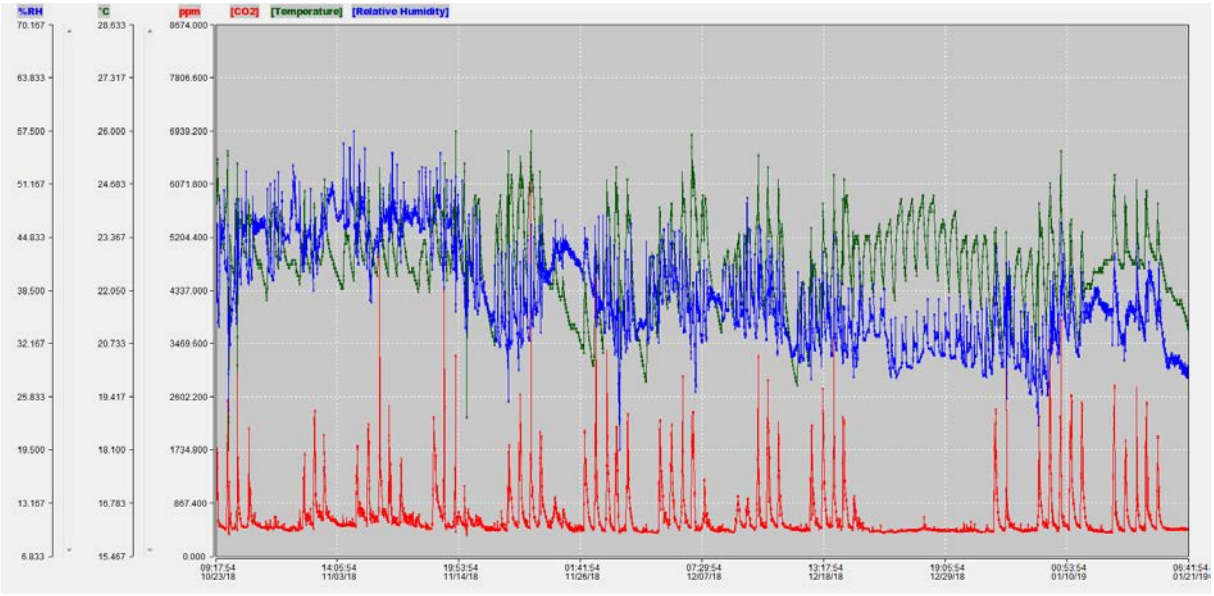
Country: Czech Republic

Partners involved:

- Grammar school Holešov (https://www.gymhol.cz/)
- Secondary pedagogical and social school Kroměříž (https://www.ped-km.cz/)
- Basic school 1. Máje Kroměříž (http://www.zs1majekromeriz.4fan.cz/)
- Grammar school Valašské Klobouky (https://www.gymnazium-vk.cz/)
- Grammar school and secondary medical school Vsetín (https://www.mgvsetin.cz/index.php?type=Homepage&id=154)

Implementation year: 2017-2018

Photos:



Source: Energy agency of the Zlín region

Energy management system:

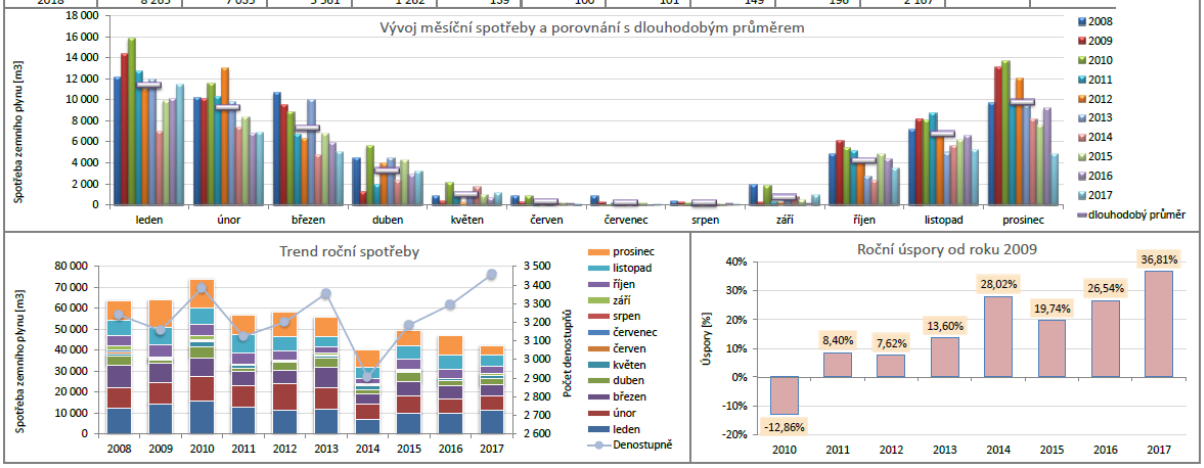
Spotřeba zemního plynu [m3]

Kategorie - školy. Podkategorie - gymnázia.

Gymnázium Valašské Klobouky (IČO 61716707), Valašské Klobouky, Komenského 60, PSČ 76626 , Cepková Eva, RNDr. (ředitelka), e-mail: e.cepkova@gymnazium-vk.cz ,tel.: 577 006 969

Odběrné místo: Valašské Klobouky, Gymnázium - hl. budova, Valašské Klobouky, Komenského 60, Krůželová Jaroslava, Ing., e-mail: j.kruzelova@gymnazium-vk.cz. Jistič: 50, Sazba: C25D

rok	leden	únor	březen	duben	květen	červen	červenec	srpen	září	říjen	listopad	prosinec	celkem rok
2008	12 087	10 154	10 670	4 461	855	827	856	324	1 889	4 859	7 166	9 675	**63 823**
2009	14 386	10 120	9 465	1 229	311	282	220	220	262	6 115	8 160	13 081	**63 851**
2010	15 831	11 565	8 796	5 584	2 101	819	28	175	1 817	5 432	8 010	13 690	**73 848**
2011	12 698	10 292	6 718	1 868	1 065	165	145	146	272	5 135	8 697	9 656	**56 857**
2012	11 111	12 987	6 312	3 998	200	141	109	123	143	4 356	6 859	12 026	**58 365**
2013	11 942	9 825	9 995	4 419	1 117	377	121	74	858	2 698	4 982	9 412	**55 820**
2014	6 937	7 325	4 757	2 251	1 706	120	102	104	712	2 321	5 640	8 165	**40 140**
2015	9 849	8 349	6 728	4 207	964	140	150	79	467	4 872	6 151	7 572	**49 528**
2016	10 074	6 768	5 916	2 832	687	111	14	110	117	4 380	6 551	9 224	**46 784**
2017	11 438	6 915	5 027	3 190	1 158	108	42	38	904	3 454	5 193	4 863	**42 330**
2018	8 265	7 035	5 561	1 262	139	100	101	149	196	2 167			



Source: Energy agency of the Zlín region

SYSTEM CHARACTERISTICS

Brief Description*:*

Public authorities like the Zlín Region faced particular challenges resulting from the need to obtain data from multiple organizations to develop and monitor their energy consumption. Energy data is crucial for identifying trends and priority sectors in energy policies, and for tailoring measures in terms of energy efficiency improvements. Energy management is an essential tool in the field of economical as well as therefore environmental friendly energy consumption which leads to low carbon economy. Nowadays 120 organizations from the whole Zlín Region are included in the EM system developed by the Energy agency of Zlín Region. Thanks to the EM the bills for energy consumption are crosschecked and verified and also several malfunctions were indicated from year 2008 like spontaneous leak of water and natural gas, functionless electricity meters etc.

Smart metering was installed in 5 public schools. Metering supports the energy management of buildings with more data and more information leading to the better operation of buildings.

What does the smart meter measure:

CO2 concentration
Relative humidity
Temperature

Type of a building where a smart metering (SM) system is installed:

Primary and secondary schools handle the measurement.

Responsible person for monitoring consumption:

In every school the respective school caretaker is the responsible person for monitoring. EAZK is responsible for the regular upload od the data to its own complex monitoring system.

Name of a company which installed the SM system:

Energy agency of the Zlín Region

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 7.200 EUR

Sources of financing: Project BOOSTEE-CE and OP Environment of the Czech Republic

Electricity savings (MWh/year)*:* Indirect. Measurement improves the indoor clime and prevents the overheating classrooms.

Or fuel savings (kg or m3 or kWh or GJ)*:* Indirect

Cost savings (EUR/year): Indirect

PROJECT IMPLEMENTATION BENEFITS

Measurement provides several benefits such as monitoring, planning and controlling of indoor clime, which has an positive effect on the students and teachers wellbeing.

BEST PRACTICE IN CZECH REPUBLIC – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Thermal renovation and reconstruction of the heat source in sports hall in Zubří

Energy efficiency measures implemented in the building:

Reducing heating demand: improving the heat insulation, reconstruction of the heat source and installation of the heat recovery ventilation in the whole sports hall

Location:

City: Zubří

Region: Zlín Region

Country: Czech Republic

GoogleMaps link:

https://goo.gl/maps/xkrcx4pMJF12

Partners involved:

Owner and Operator
Zubří (municipality)
U Domoviny 234
756 54 Zubří
podatelna@mesto-zubri.cz

Planner and Architect
EP Rožnov, a.s.,
Boženy Němcové 1720,
756 61 Rožnov pod Radhoštěm
tel.: +420 571 664 111,
e-mail: ep@eproznov.cz

Building technology planning
Ing. arch. Pavel Koláček
Authorized Architect and energy auditor
Na Tabulovém vrchu 2
779 00 Olomouc
Olomoucký kraj
777 674 466
architekt.kolacek@gmail.com

Implementation year: 2017

Photo:

Source: Energy agency of the Zlín region

Source: Energy agency of the Zlín region

SYSTEM CHARACTERISTICS

Brief Description*:*

There were several reasons for the project implementation - improvement of the general state of the sports hall, the sanitation of the façade, indoor environment was very often unadvisable.

Municipality of Zubří decided for the complete reconstruction. With the support from the Energy Agency of the Zlín Region the municipality submitted the application for funding to the national Operational Programme Environment 2014-2020. The project was approved for funding. The final share of the subsidy was 21% from the overall investment costs.

The most important part of the project was the reconstruction of heat source and heat recovery ventilation of the whole building. Nowadays, the heating demand of the building is 44 kWh/(m2.a).

Smart metering of the all energy supplies has been installed.

Thermal reconstruction of the building envelope
The outer walls were improved by 20 cm mineral wool bachl EXTRAPOR 70F with lambda 0,031 W/(mK) (U-value from 0,686 W/(m²K) to 0.149 W/(m²K)). The ground level is also insulated with 23 cm DCD Ideal EPS NEO with lambda 0,031 W/(mK) (U-value from 2,9 W/(m²K) to 0,14 W/(m²K)).
The roof of the sports hall is insulated by the mineral wool of 50+410 mm thickness with lambda = 0,037 W/(m²K). The roof has now U = 0,12 W/(m²K)).

Windows and doors
The existing windows with an average U-value of 2,4 W/(m²K) were replaced by new plastic windows with a U-value of 0,73 W/(m²K). The new doors were improved to aluminum with U = 0,9 W/(m²K)). Finally the gates were improved to U = 1,1 W/(m²K)).

Building technology
Heating and hot water preparation is now being generated by 5 natural gas heat pumps with overall power of 179 kW. SCOP of the heat pumps is 1,42. This means 1 GJ of the natural gas produces 1,42 GJ of heat on average.

For the support of the heating two natural gas boilers with overall power of 73,4 kW are installed.

Cooling: no requirement for cooling

Ventilation system: There are 4 heat recovery units installed (16800 m3/h for the hall, 3000 m3/h for the minor hall, 2120 m3/h for dressing room and 500 m3/h for another dressing room)

Solar system: Solar system was installed before the project started, the yearly production is about 37 GJ.

Use of energy-saving lighting system – sponsored by private company ROBE Vsetín.

Energy monitoring has been installed. This serves for the optimal adaptation of the building to the users´ behavior.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value:

1 950 000 €

Sources of financing:

This project was co-financed by the Operational Programme Environemt of the Czech Republic with subsidy € 415 000; and by Zubří municipality.

Electricity savings (MWh/year):

0; because of the additional ventilation system

Or fuel savings (kg or m3 or kWh or GJ):

Reduction of natural gas from 2147 GJ before project implementation to nowadays 1110 GJ, which means 44 kWh/(m2.a) for the heating.

Cost savings (EUR/year):

21 300 € per year; +/- 0 electricity costs, because of the additional ventilation system

PROJECT IMPLEMENTATION BENEFITS

Overall reconstruction of the sports hall significantly reduced consumption of the natural gas and improved the indoor environment as well as the outer design of the building.

Thanks to the reconstruction the sports hall has become the shop window of the municipality and the local handball club.

The reduction of the energy consumption and operational costs has the positive effect on a sustainable operation of the sports hall in the next 30 years.

Mechanical ventilation was a major topic in the target definition, whether centralized or decentralized. The negative experience with a decentralized ventilation system in a school that had just been implemented at that time had a strong influence on this discussion.

ADDITIONAL INFORMATION

The sports life of the youth and adults in the hall varies significantly throughout the year from alternative hours of school gymnastics, handball youth and adult training, modern gymnastics, to indoor football, floorball, ballroom tournaments.

The most frequent users of the sports and teaching hall are Zubří Elementary School and the Zubří Handball Club.

BEST PRACTICE IN CZECH REPUBLIC – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Thermal renovation, change of the source and installation of air recuperation in primary school Podolí

Energy efficiency measures implemented in the building:

Reducing heating demand: improving the heat insulation, exchange of the heat source and installation of local air recuperation in the whole school

Location:

City: Podolí

Region: Zlín Region

Country: Czech Republic

https://goo.gl/maps/C24nAJpgy7QrQCKx7

Partners involved:

Owner and Operator
Základní škola a Mateřská škola, Podolí, příspěvková organizace
Podolí č.p. 53, 68604 Kunovice
E-mail: zspodoli@zsmspodoli.cz
Web: www.zsmspodoli.cz
IČO: 70993891
Mgr. Ing. Jana Buršová - director

Planner and Architect
MIKULÍK projekty s.r.o.
Svatoplukova 285
686 01 Uherské Hradiště
info@projektymikulik.cz; www.projektymikulik.cz
tel.572 540 123

Building technology planning
Tespora profi s.r.o.
Na Příkopě 814
755 01 Vsetín
www.tespora.cz

Implementation year: *2020*

Photo:

Current state:

Source: Energy agency of the Zlín Region

SYSTEM CHARACTERISTICS

Brief Description:

The municipality submitted the application for funding to the national Operational Programme Environment 2014-2020, with the support from the Energy Agency of the Zlín Region. The application succeeded and the project was approved for funding. The final share of the subsidy from OP Environment was 30,4 % from the overall investment costs.

The facade was improved by 16 cm of EPS with λ= 0,039 W/(mK). The ceiling was insulated with 200 mm mineral wool with λ= 0,037 W/(mK). The existing windows with an average U-value of 2,7 W/(m²K) were replaced by new plastic windows with a U-value of 0,9 W/(m²K). The doors were improved to U = 1,2 W/(m²K)).

The air recuperation for the whole school was projected with the overall power of 1 475 m^3/h because of the inadequate indoor environment.

Nowadays, the heating demand of the building is 69 kWh/(m^2.a), which means B-class for this type of building.

Thermal reconstruction of the building envelope
The outer walls were improved by 16 cm of EPS with λ= 0,039 W/(mK). The ceiling was insulated with 200 mm mineral wool with λ= 0,039 W/(mK).

Windows and doors
The existing windows with an average U-value of 2,7 W/(m²K) were replaced by new plastic windows with a U-value of 0,9 W/(m²K). The doors were improved to U = 1,2 W/(m²K)).

Building technology

Cooling: no requirement for cooling.

Ventilation system: Local air-units were installed with overall power 1 475 m^3/h.

Heat technology: Old natural gas boilers were replaced by the new natural gas boilers with the much higher efficiency of burning natural gas with the installed power of 43 kW.

Energy management has been carried out in this school by the Energy Agency of the Zlín Region since 2008

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value:

252 000 €

Sources of financing:

This project was co-financed by the Operational Programme Environment of the Czech Republic with subsidy € 76 600; and by the Zlín Region.

Electricity savings (MWh/year):

0; because of the additional ventilation system

Or fuel savings (kg or m3 or kWh or GJ):

Implementation of the project decreased the consumption of natural gas from 388 GJ before project implementation to present 151 GJ which means the new heating demand 65 kWh/(m^2.a).

Cost savings (EUR/year):

4 296 € per year; +/- 0 electricity costs, because of the additional ventilation system

PROJECT IMPLEMENTATION BENEFITS

Overall reconstruction of the school has a positive effect on the energy consumption and long-term sustainability of the whole project.

Project has generally improved visual appearance of the whole building.

Mechanical air-ventilation is necessary for the suitable indoor clime. Comfortable place for the teachers and students another benefit of the building upgrade.

BEST PRACTICE IN CZECH REPUBLIC – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

PV system in Uherské Hradiště hospital

Energy efficiency measures implemented in the building:

Reducing electricity demand and decreasing the electricity capacity:
decreasing the electricity demand and reducing peaks of the consumption curve

Location:

City: Uherske Hradiste

Region: Zlín Region

Country: Czech Republic

https://goo.gl/maps/fvkvTiWR5munWFKz5

Partners involved:

Owner and Operator
Uherskohradišťská nemocnice a.s.
J. E. Purkyně 365
686 68 Uherské Hradiště
572 529 111

Planner and Architect
Energ-Servis a.s.,
Příkop 843/4
602 00 Brno

Building technology planning
Tespora profi s.r.o.
Na Příkopě 814
755 01 Vsetín
www.tespora.cz

Implementation year: *2019*

Photo:

Source: Energy agency of the Zlín region

SYSTEM CHARACTERISTICS

Brief Description*:*

Two PV systems were installed on two buildings with overall output of 99,99 kW. First one has 40,59 kW installed power, which means 123 pcs of 330kWp panels, and second has 59,4 kW which means 180 pcs of 330kWp panels.
Supposed energy production is calculated on 97,835 MWh/year.

The PV system has more benefits like improving the consumption curve in the summer and decreasing the electricity peaks in the summer caused by the air conditions.

Thermal reconstruction of the building envelope

-

Windows and doors

-

Building technology

Cooling: -

Ventilation system: -

Heat technology: -

PV system: 99,9 kW installed

Energy management in this building has been implemented and carried out by Energy Agency of the Zlín Region since 2012.

FINANCIAL SOURCES AND FINANCING DETAILS

***Total investment value*:**

170 000 €

Sources of financing:

This project was co-financed by the Operational Programme Environment of the Czech Republic with subsidy 68 000 €; and by the Zlín Region.

Electricity savings (MWh/year):

97,835 MWh yearly production

Or fuel savings (kg or m3 or kWh or GJ):

-

Cost savings (EUR/year):

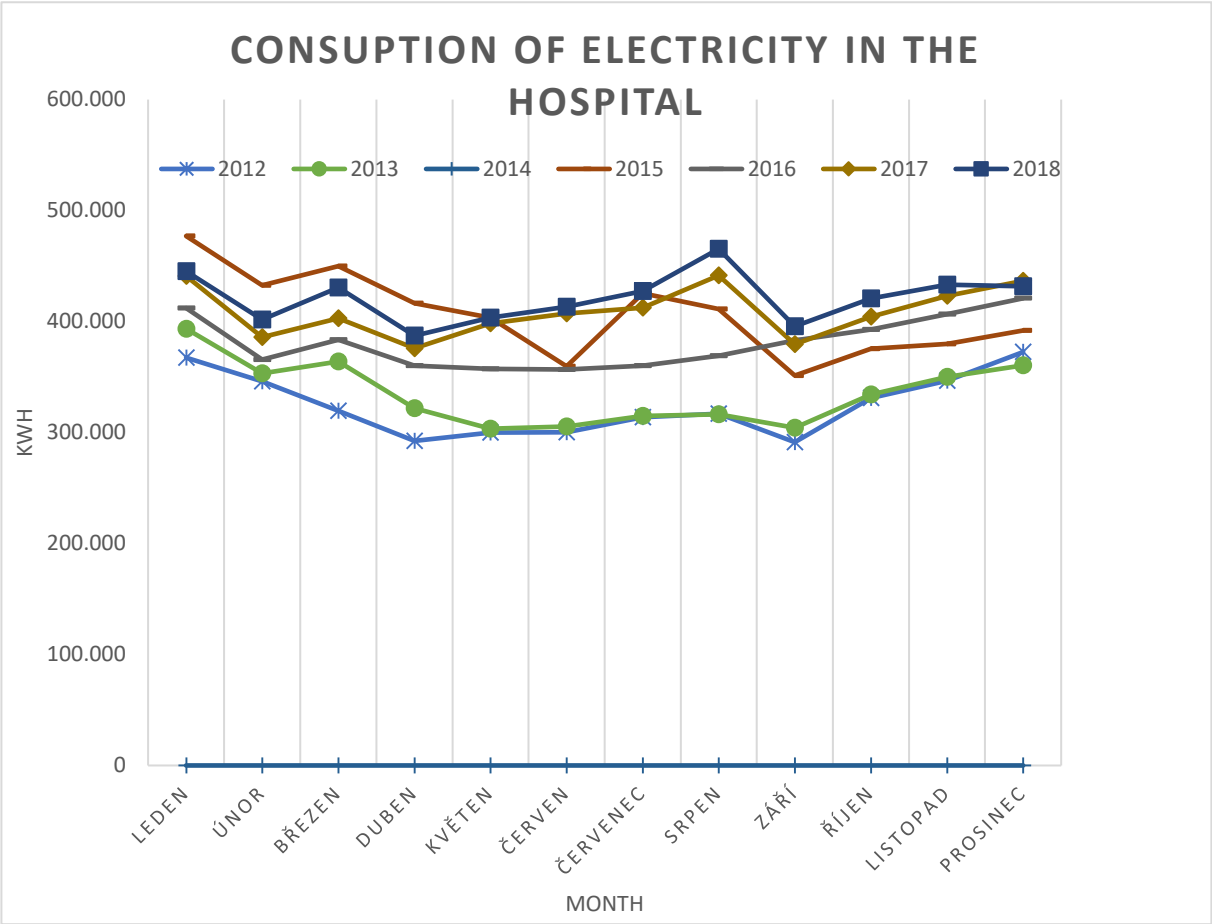
6 600 € per year

PROJECT IMPLEMENTATION BENEFITS

Project did not aeffect visual appearance of the whole building.

ADDITIONAL INFORMATION

Energy Agency of the Zlín Region is continuously monitoring the consumption of the natural gas, electricity and water consumption of the buildings related to this project.
Moreover, Energy Agency of the Zlín Region is able to be collecting actual data from the PV system.
On the picture below you can see the electricity consumption the in the hospital since 2012:



BEST PRACTICE IN CZECH REPUBLIC – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Thermal renovation and installation of air recuperation in Special primary school Turkmenska

Energy efficiency measures implemented in the building:

Reducing heating demand: improving the heat insulation, changing of heat source and installation of local air recuperation in the whole school

Location:

City: Vsetín

Region: Zlín Region

Country: Czech Republic

https://goo.gl/maps/EJ2y3YBLXhpvmdhn7

Partners involved:

Owner and Operator
Special primary school turkmenska
Turkmenská 1612, Vsetín 755 01
Tel. 00420571411824
info@zsms-turkmenska.cz

Planner and Architect
Ing. PETR BRAVENEC projektová kancelář s.r.o.
Ústí 50, 755 01 Vsetín
Office: Dolní Jasenka 215
755 01 Vsetín
IČ 28561279
DIČ CZ28561279
Tel.+420 603 725 199

Building technology planning
Tespora profi s.r.o.
Na Příkopě 814
755 01 Vsetín
www.tespora.cz

Implementation year: 2017 - 2018
2017 heat insulation and air recuperation, 2018 heat source

Photos:

Source: Energy agency of the Zlín region

SYSTEM CHARACTERISTICS

Brief Description:

With the support from the Energy Agency of the Zlín Region the municipality submitted the application for funding to the national Operational Programme Environment 2014-2020. The application succeeded and the project was approved for funding. The final share of the subsidy was 23,6 % from the overall investment costs.

The outer walls were improved by 16 cm of EPS with λ= 0,035 W/(mK) (U-value were reduced to 0,189-0,217 W/(m²K) depending on the initial construction). The roof were insulated with 280 mm mineral wool with λ= 0,037 W/(mK). The existing windows with an average U-value of 2,7 W/(m²K) were replaced by new plastic windows with a U-value of 0,9 W/(m²K). The doors were improved with U = 1,2 W/(m²K)).

Because of the inadequate indoor environment air recuperation the air recuperation for whole school was projected with the overall power of 7 100 m^3/h.

Nowadays, the heating demand of the building is 87 kWh/(m^2.a), which means C-class for this type of building. The building wasn´t reconstructed to the A-class because of the inadequate cost for the material and the benefit is too speculative.

Energy management has been implemented on this building for ten year and EM is carried out by the Energy Agency of the Zlín Region.

Thermal reconstruction of the building envelope
The outer walls were improved by 16 cm of EPS with λ= 0,035 W/(mK). The roof were insulated with 280 mm mineral wool with λ= 0,037 W/(mK).

Windows and doors
The existing windows with an average U-value of 2,7 W/(m²K) were replaced by new plastic windows with a U-value of 0,9 W/(m²K). The doors were improved with U = 1,2 W/(m²K)).

Building technology

Cooling: no requirement for cooling.

Ventilation system: There are 71 local air-units installed with overall power 7 100 m3/h.

Heat technology: 20 years old natural gas boilers were replaced by the new natural gas boilers with the much higher efficiency of burning natural gas.

Energy management has been implemented on this building for ten year and EM is carried out by the Energy Agency of the Zlín Region.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value:

854 198 €

Sources of financing:

This project was co-financed by the Operational Programme Environment of the Czech Republic with subsidy € 201 983; and by the Zlín Region.

Electricity savings (MWh/year):

0; because of the additional ventilation system

Or fuel savings (kg or m3 or kWh or GJ):

Reduction of natural gas from 1451 GJ before project implementation to nowadays 747 GJ which means 65 kWh/(m2.a) for the heating after the reconstruction and installation of local air-recuperation.

Cost savings (EUR/year):

9 856 € per year; +/- 0 electricity costs, because of the additional ventilation system

PROJECT IMPLEMENTATION BENEFITS

Overall reconstruction of the school has positive effect on the energy consumption and long-term sustainability of the whole project.

Project has generally improved visual appearance of the whole building.

Mechanical air-ventilation is necessary for the suitable indoor clime. Visible Benefit is the comfortable place for the teachers and students.

ADDITIONAL INFORMATION

Energy Agency of the Zlín Region is continuously monitoring the consumption of the natural gas, electricity and water consumption of the buildings related to this project and related to whole building.
On the picture below you can see the consumption of the natural gas in the school.

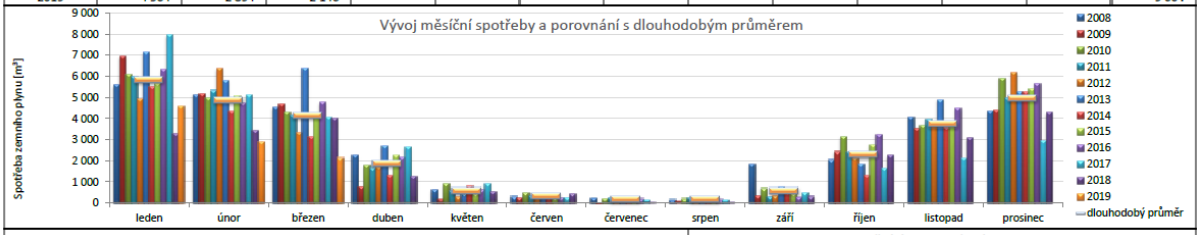
Spotřeba zemního plynu [m³]

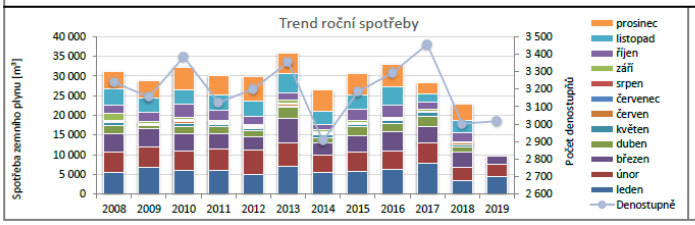
Kategorie - školy. Podkategorie - ZŠ/MŠ (praktické a spec.).

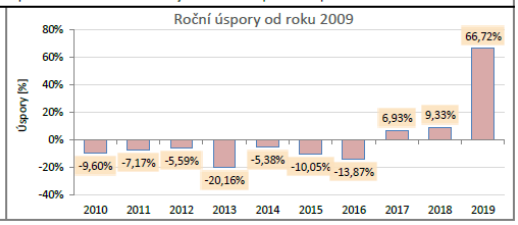
Základní škola, Mateřská škola a Praktická škola Vsetín, Turkmenská (IČO 70238898), Vsetín, Turkmenská 1612, PSČ 755 01 , Třetina Roman, Mgr. (ředitel), e-mail: tretina.roman@zsms-turkmenska.cz ,tel.: 571 411 824

Odběrné místo: Základní škola a Mateřská škola Vsetín, Turkmenská, Vsetín, Turkmenská 1612, PSČ 755 01 , Štecová Iva, e-mail: ucetni@zsms-turkmenska.cz ,tel.: 571 411 824. Jistič: 125, Sazl

rok	leden	únor	březen	duben	květen	červen	červenec	srpen	září	říjen	listopad	prosinec	celkem rok
2008	5 589	5 130	4 519	2 260	606	301	219	160	1 827	2 048	4 068	4 329	**31 056**
2009	6 937	5 164	4 691	754	178	237	20	68	331	2 433	3 542	4 377	**28 732**
2010	6 086	4 987	4 287	1 762	913	477	187	210	693	3 136	3 683	5 903	**32 324**
2011	6 006	5 334	4 137	1 655	588	325	238	235	297	2 402	3 940	4 962	**30 119**
2012	4 913	6 356	3 311	1 674	297	292	221	238	326	2 137	3 856	6 157	**29 778**
2013	7 137	5 769	6 367	2 695	402	371	237	130	764	1 810	4 886	5 275	**35 843**
2014	5 522	4 334	3 130	1 299	808	277	202	200	537	1 303	3 568	5 265	**26 445**
2015	5 644	5 078	4 196	2 246	448	235	222	241	423	2 761	3 778	5 409	**30 681**
2016	6 326	4 712	4 762	2 175	635	245	207	158	257	3 250	4 490	5 669	**32 886**
2017	7 950	5 121	4 031	2 644	927	244	116	137	483	1 620	2 096	2 956	**28 325**
2018	3 280	3 444	3 998	1 244	532	401	25	27	307	2 273	3 077	4 281	**22 891**
2019	4 564	2 894	2 146										**9 604**







BEST PRACTICE IN CZECH REPUBLIC – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Thermal renovation and installation of air recuperation in Secondary medical school Kromeriz

Energy efficiency measures implemented in the building:

Reducing heating demand: improving the heat insulation, and installation of air recuperation in the whole school

Location:

City: Kromeriz

Region: Zlín Region

Country: Czech Republic

https://goo.gl/maps/HqdZWihgboN2

Partners involved:

Owner and Operator
Secondary medical school Kromeriz
Albertova 4261/25a, 767 01 Kroměříž
577 002 250
sekretariat@szskm.cz
www.szskm.cz

Planner and Architect
KB projekt, s. r. o.
Lešetín I/659, 760 01 Zlín
Česká republika
tel.: +420 577 431 400
kbprojekt@kbprojekt.cz

Building technology planning
Tespora profi s.r.o.
Na Příkopě 814
755 01 Vsetín

Implementation year: 2018

Photos:

Source: Energy Agency of the Zlín Region

SYSTEM CHARACTERISTICS

Brief Description:

With the support from the Energy Agency of the Zlín Region the municipality submitted the application for funding to the national Operational Programme Environment 2014-2020. The application succeeded and the project was approved for funding. The final share of the subsidy was almost 30 % from the overall investment costs.

The outer walls were improved by 14 cm of EPS with λ= 0,039 W/(mK) (U-value were reduced to 0,186 W/(m²K)). The roof were insulated with 300 mm mineral wool with λ= 0,037 W/(mK). The existing windows with an average U-value of 2,7 W/(m²K) were replaced by new plastic windows with a U-value of 0,9 W/(m²K). The doors were improved with U = 1,2 W/(m²K)).

Because of the inadequate indoor environment air recuperation for whole school was projected with the overall power of 35 900 m^3/h.

One of the most important part of the project was the improving the light to the LED technology. This means reducing the energy consumption by 42 GJ per year.

Nowadays, the heating demand of the building is 102 kWh/(m^2.a), which means A-class for this type of building.

Thermal reconstruction of the building envelope

The outer walls were improved by 14 cm of EPS with λ= 0,039 W/(m.K) (U-value were reduced to 0,186 W/(m²K)). The roof were insulated with 300 mm mineral wool with λ= 0,037 W/(mK).

Windows and doors

The existing windows with an average U-value of 2,7 W/(m²K) were replaced by new plastic windows with a U-value of 0,9 W/(m²K). The doors were improved with U = 1,2 W/(m²K)).

Building technology

Cooling: no requirement for cooling.

Ventilation system: There are several units installed with overall power 35 900 m^3/h (8500 m3/h for the sport hall, 7000 m^3/h for the auditorium, 4500 and 4500 m^3/h for dressing room and several 350-650 m^3/h for class rooms)

Use of energy: saving lighting system powered by LED technology

Energy management has been implemented on this building for ten year and EM is carried out by the Energy Agency of the Zlín Region.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value:

2 373 680 €

Sources of financing:

This project was co-financed by the Operational Programme Environment of the Czech Republic with subsidy € 703 900; and by Zlín region.

Electricity savings (MWh/year):

0; because of the additional ventilation system

Or fuel savings (kg or m3 or kWh or GJ):

Reduction of natural gas from 1544 GJ before project implementation to nowadays 903 GJ which means 102 kWh/(m2.a) for the heating after the reconstruction.

Cost savings (EUR/year):

10 720 € per year; +/- 0 electricity costs, because of the additional ventilation system.

PROJECT IMPLEMENTATION BENEFITS

Overall reconstruction of the school significantly reduced consumption of the natural gas and improved the indoor environment as well as the outer design of the building.

The reduction of the energy consumption and operational costs has the positive effect on a sustainable operation of the school for the next 40 years.

Mechanical ventilation is necessary for the suitable indoor clime. The visible benefit is also the comfortable place for the teachers and students.

ADDITIONAL INFORMATION

Energy Agency of the Zlín Region is continuously monitoring the consumption of the natural gas, electricity and water consumption of the buildings related to this project.

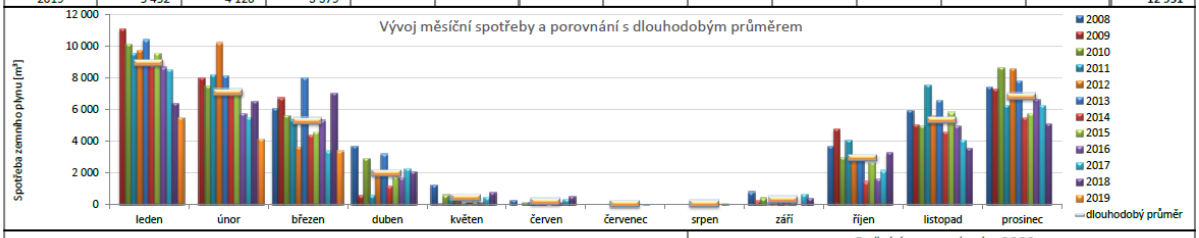
Spotřeba zemního plynu [m³]

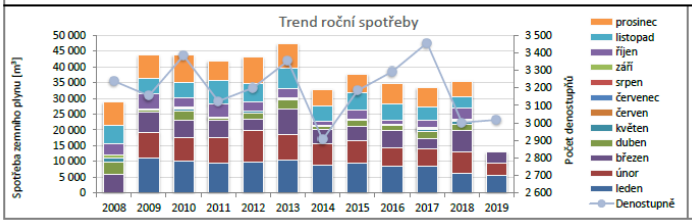
Kategorie - školy. Podkategorie - střední školy/učiliště.

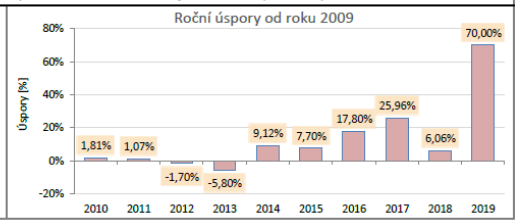
Střední zdravotnická škola Kroměříž (IČO 00637939), Kroměříž, Albertova 4261/25a, PSČ 767 01 , Hanáková Ludmila, PhDr. (ředitelka), e-mail: reditel@szskm.cz ,tel.: 577 002 251

Odběrné místo: Střední zdravotnická škola Kroměříž, Kroměříž, Albertova 4261/25A, Mikšíková Ivana, e-mail: sekretariat@szskm.cz ,tel.: 577 002 250. Jistič: 200, Sazba: C02D

rok	leden	únor	březen	duben	květen	červen	červenec	srpen	září	říjen	listopad	prosinec	celkem rok
2008	0	0	6 066	3 656	1 195	252	0	0	788	3 649	5 929	7 378	**28 913**
2009	11 073	7 982	6 727	580	41	0	0	0	220	4 738	5 021	7 271	**43 653**
2010	10 116	7 490	5 611	2 900	603	123	0	0	412	2 950	4 936	8 598	**43 739**
2011	9 514	8 178	5 351	552	346	120	0	0	85	4 039	7 541	6 216	**41 942**
2012	9 723	10 205	3 623	1 858	478	151	0	0	85	2 905	5 583	8 541	**43 152**
2013	10 400	8 116	8 004	3 179	54	104	0	0	211	2 895	6 574	7 801	**47 338**
2014	8 790	6 924	4 362	1 172	95	0	0	0	137	1 439	4 542	5 474	**32 935**
2015	9 543	7 185	4 557	1 755	220	54	0	0	217	2 615	5 829	5 752	**37 727**
2016	8 662	5 731	5 312	1 665	130	126	0	0	0	1 596	4 969	6 633	**34 824**
2017	8 494	5 462	3 376	2 246	419	322	9	58	608	2 148	4 057	6 245	**33 444**
2018	6 347	6 504	7 007	2 027	765	504	0	0	372	3 288	3 553	5 078	**35 445**
2019	5 452	4 120	3 379										**12 951**







4.4 Hungary

Interreg CENTRAL EUROPE
European Union European Regional Development Fund
BOOSTEE-CE

TOLNA COUNTY
GEOTHERMAL ENERGY UTILIZATION AND PUBLIC UTILITY INSTALLATION AT TAMÁSI

Best Practice Factsheet #3

Tolna County, Hungary
Geothermal energy utilization and public utility installation at Tamási

DESCRIPTION OF THE ACTION

The aim of the project was to replace the gas heating of public institutions to geothermal heating. The core element of the system is the 830 meters deep production well on the campsite, providing 47 °C thermal water used for heating. The permissible yield is 75 m3 / h. This water is pumped through a 4.7 km long pipeline by high pressure pumps. The heat exchangers in the 17 connecting public buildings are installed on this piping system, where heat exchangers with low heat drop transfer the heat energy of thermal water to local heating systems. With intelligent remote control, the system is able to provide total heating energy up to an average outdoor temperature of 2 °C to 5 °C every day, back-up gas heating is only operating on colder days. The thermal water drawn through the city is transferred back to the ground and to the natural water stream by a 750 m deep reinjection well located about a thousand meters away from the production well. The production well provides 1200 litres of water at 47 °C per minute, and the capacity of the well is fully utilized during the peak heating period. The geothermal heating system operates under 8 bar pressure, so that hot water can be passed without heat loss. With thermal water, the city's kindergarten and schools (Würtz Ádám Elementary School, Béri Balogh Ádám Secondary School, Vályi Péter Vocational School), the medical center, land office, court, library, cultural center, mayor's office, Gyulaj Zrt. office building and the police station - a total of 17 buildings - are heated.

Time period: 12/2014 – 10/2015

Key results:

By exploiting geothermal energy, 60% of the natural gas consumption of local government institutions is saved, which means 16,000 GJ of heat each year. With this, the greenhouse gas emissions of the settlement is reduced by 570 tonnes of CO2 annually. Non-governmental institutions spend 20% less on heating as a result of this system.

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

TOLNA COUNTY

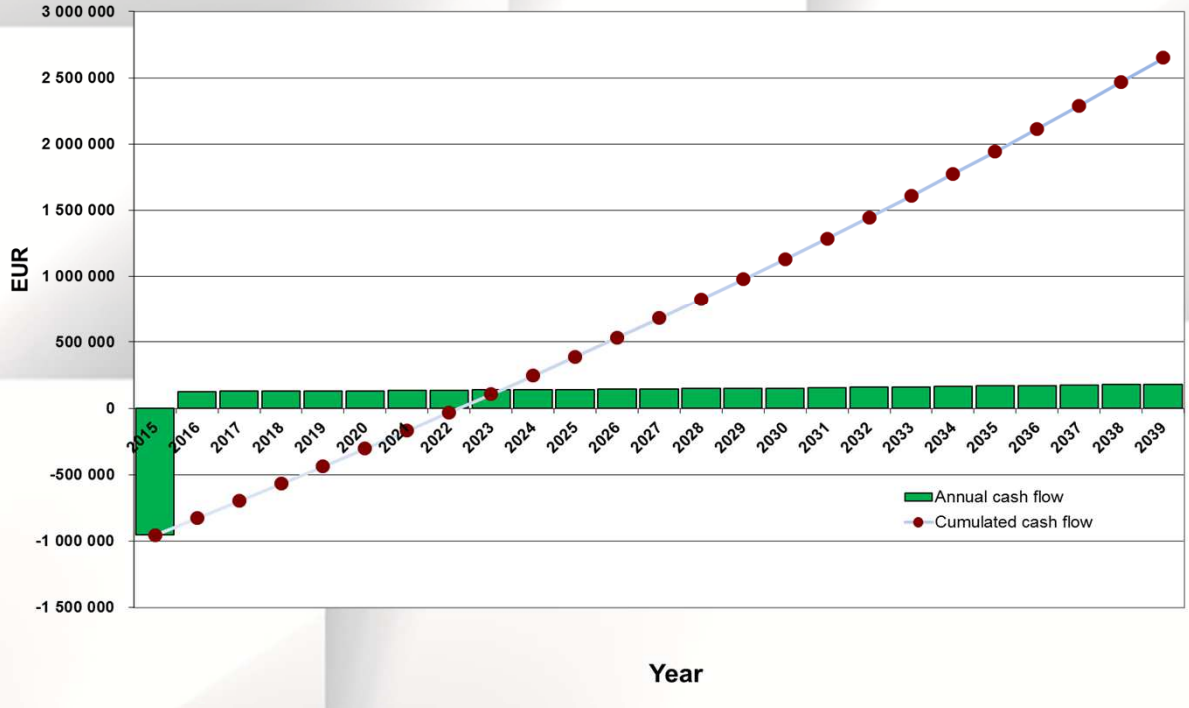
GEOTHERMAL ENERGY UTILIZATION AND PUBLIC UTILITY INSTALLATION AT TAMÁSI

FINANCING

Investment costs	**4.635.917 EUR**
- Own sources	985.589 EUR
- Subsidies	
- Environment and Energy OP (EEOP)	1.825.164 EUR
- State support for covering partly own contr. of EEOP	1.825.164 EUR
- Loans	-
Lifetime (service life	**25 years**
Annual operational costs (salaries, repairs, maintenance etc.)	**45.240 EUR**
Annual revenues – savings in natural gas supply	**172.492 EUR**

Financial indicators		
Net present value - NPV	1 042 391,40	EUR
Internal rate ratio - IRR	13,72%	
Payback period - simple	8	years
Payback period - discount	10	years
Evaluation year	2015	
Lifetime period	25	years
Discount	5,00 %	

Geothermal energy utilization and public utility installation at Tamási
Investor´s cash flow

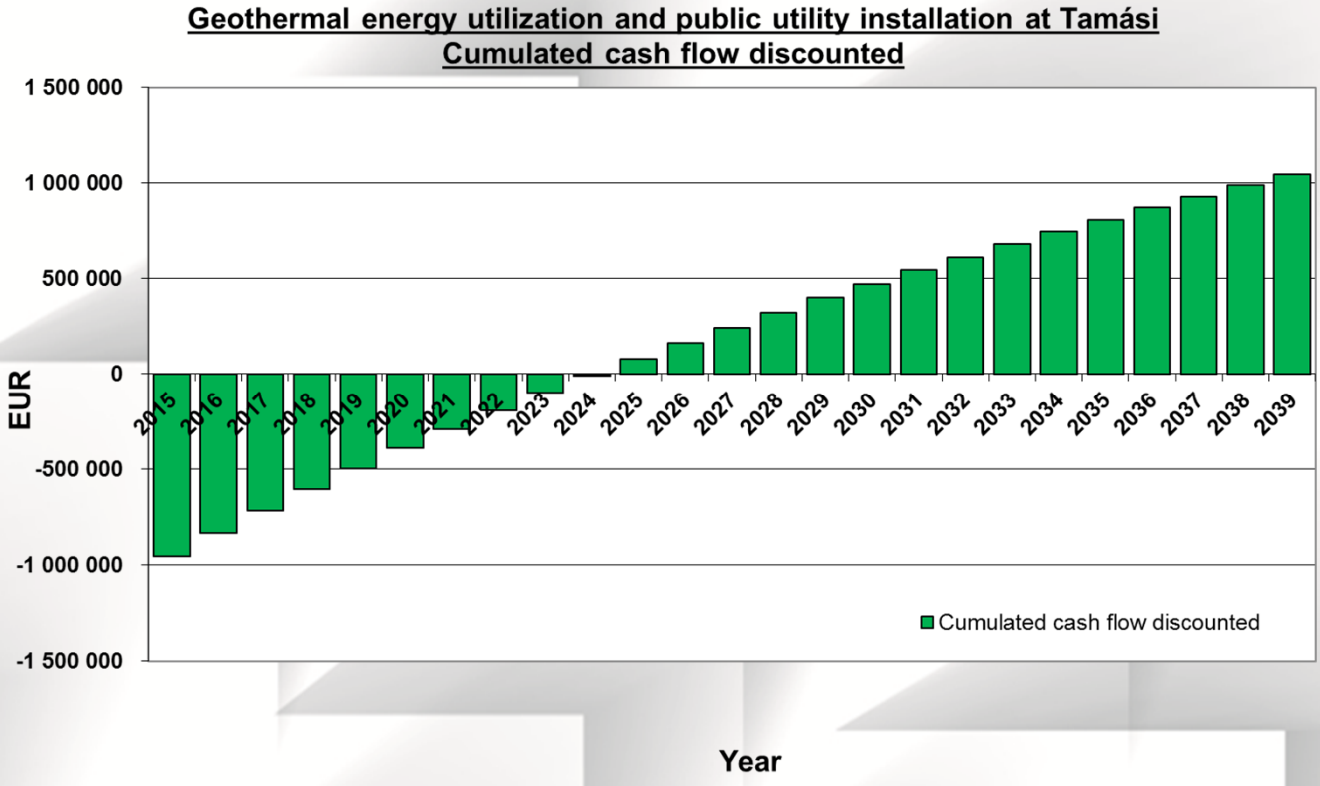


TOLNA COUNTY

GEOTHERMAL ENERGY UTILIZATION AND PUBLIC UTILITY INSTALLATION AT TAMÁSI

Best Practice Factsheet #3

FINANCING



MAP OF THE AREA

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

TOLNA COUNTY

GEOTHERMAL ENERGY UTILIZATION AND PUBLIC UTILITY INSTALLATION AT TAMÁSI

Best Practice Factsheet #3

BARRIERS ENCOUNTERED

- Due to the relatively low temperature of the thermal water, the existing gas boilers of the building have to be kept as back-up boilers to support the heating system on colder days. The thermal water is able to heat up the buildings up to an outside temperature of 2 - 5 °C.
- At a too high secondary return temperature, there is a risk of reheating the thermal water.
- Big (expensive) heat exchangers are required for performance. DHW production from thermal water is not advisable

Ways to deal with barriers:

Existing boilers have been integrated in the control technology of the thermal system and can be put into operation if necessary.

Success factors

- **Thermal water at 47 ° C available in Tamási.**
- **Public institutions are close to each other, which provides the possibility to transfer heat with minimal heat losses.**
- **The necessary call of the relevant operational programme was available to support the financing of the investment.**
- **Gas heating is a costly heating mode, thus replacing it to a renewable energy based system can generate remarkable savings.**
- **It is also possible to further develop the system: the transmission line has been constructed so that it can be extended later to the housing estates and is planned to use the thermal water later for heating greenhouses.**

CONTACTS: Ms Zita Hamar
hamar.zita@tamasi.hu

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

BEST PRACTICE IN HUNGARY – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice:

Refurbishment of the "Village House", Óbuda, Budapest, Hungary

Energy efficiency measures implemented in the building:

The building was constructed in the '70s and is the biggest single residential building in the country with 886 flats. It was intended to be a testbed of various heating technologies, but the former state of the art technical solutions did not age very well: waste of energy (esp. heating) and very high heating costs quickly became a major issue for the residents. Insulation, new windows and doors, solar panels were installed along the 315 m long housing block. Parts of the works were financed by the STACCATO-project (EU CONCERTO Program) and the Panel Plus Program (Hungarian Government), and contribution from the Municipality and the residents**.**

Location:

City: Budapest

Region: Budapest**, Central Hungary**

Country: Hungary

GMaps link:
https://www.google.com/maps/place/47%C2%B032'29.1%22N+19%C2%B002'14.1%22E/@47.5414048,19.0361597,18z/data=!3m1!4b1!4m6!3m5!1s0x0:0x0!7e2!8m2!3d47.5414027!4d19.0372541

Partners involved:

1. **Municipality of Óbuda-Békásmegyer**
   website: https://obuda.hu/ ;
   postal address: **H-1033 Budapest, Harrer Pál utca 2.**

2. **Amsterdam Noord and Sofia Oborishte (CONCERTO project partners)**
   website: http://www.concerto-project.org

Contacts:

Silvia Mazzini
Intecs
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56121 Pisa
Italy
Tel: +39 050 965 7513
E-mail: silvia.mazzini@intecs.it

Scott Hansen
The Open Group
Avenue du Parc de Woluwe 56

1160 Brussels
Belgium
Tel: +32 2 675 1136
E-mail: s.hansen@opengroup.org

3. **Hungarian Government (Panel Plus Programme; financing)**
   website: https://www.kormany.hu/hu
   postal address: **H-1357 Budapest, Pf. 6.**

4. **Épkar Zrt. (constructor)**
   website: http://www.epkar.hu/ ;
   postal address: **H-1149 Budapest, Egressy út 28-30.**

5. **Főtáv Zrt. (district heating provider)**
   website: http://www.fotav.hu/ ;
   postal address: **H-1138 Budapest Váci út 121-127.**

6. **Energia Klub – Energy Club (publicity, media)**
   website: https://www.energiaklub.hu/;
   postal address: **H-1056 Budapest, Szerb u. 17-19.**

7. **Central European University (CEU, sociological research)**
   website: https://www.ceu.edu/
   postal address: **H-1051 Budapest, Nádor u. 9.**

8. **BECO HU (EU project management, sustainability training)**

9. **The Union of Energy Efficient Municipalities (EHÖSZ, publicity)**
   website: http://www.klimabarat.hu/
   postal address: **H-2800 Tatabánya, FŐ TÉR 6.**

10. **The Village House community (residents)**
    website: http://www.faluhaz.net/viewpage.php?page_id=1
    postal address: **H-1032 Budapest, Szőlő u. 72.**

Implementation year: *Jun 2009 – Dec 2009*

Photo:

SYSTEM CHARACTERISTICS

Brief Description

The so-called Village House is the biggest residential building in Hungary with an estimated lifetime of 55-60 years. Waste of energy and high upkeep costs are huge issues for the residential blocks built in the socialist era when resource efficiency was not top priority. Since the share of block of flats is around 20% of the total buildings stock it is quite a widespread issue concerning 1,741,577 as of 2011.

From 2001 a development programme (the current being the third iteration now involving financial instrument backed by EU-funds) involving direct government finance and financial instruments supports insulation, refurbishment of doors and windows, improvement of technical building systems, such as heating and installing RES. The renewal of the Village House also involved socioeconomical research as the ultimate goal of project STACCATO was to provide replicable good practices & renovation concepts and accelerate the spread of RES. The heating costs had reduced by around 45-50% and related energy use decreased by the same degree whereas as an additional benefit of the project CO2 emission had decreased by an estimated 243 tonnes.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: *4,000,000 EUR (approximately)*

Sources of financing:

- *national funds: Panel Plus Program (Government Scheme)*
- *EU funds: FP6 (CONCERTO Program)*
- *Own contribution (residents, Municipality)*

Electricity savings *(MWh/year):* **not applicable**

Or fuel savings *(kg or m3 or kWh or GJ):* ***5.183 GJ / year***

Cost savings *(EUR/year):* **not applicable**

CO_2 reduction: 243 t/year

PROJECT IMPLEMENTATION BENEFITS

The heating costs had reduced by around 45-50% and related energy use decreased by the same degree whereas as an additional benefit of the project CO2 emission had decreased by an estimated 243 tonnes.

ADDITIONAL INFORMATION

More information available at:

https://smartcities-infosystem.eu/sites-projects/projects/staccato

https://www.youtube.com/watch?v=dz5n85d5oR4

BEST PRACTICE IN HUNGARY – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Installing photovoltaic capacities in the public buildings of the Municipality of Tolna

Energy efficiency measures implemented in the building:

An overall of 53,4 KWp capacity was installed in three public buildings: the Town Hall (72 pieces), Szent István High School (formerly Sztárai Mihály High School, 70 pcs.) and the Wosinsky Mór Primary School (36 pcs.) generating an overall of 55,4 MWh/year.

Location:

City: Tolna

Region: Tolna, Tolna County**, South Transdanubia**

Country: Hungary

GMaps link:
https://www.google.com/maps/place/Unnamed+Road,+Tolna,+7130/@46.4323655,18.781895,20z/data=!4m12!1m6!3m5!1s0x0:0x5065e1ad7f6d3f49!2sTolnai+Szent+Istv%C3%A1n+Katolikus+Gimn%C3%A1zium!8m2!3d46.4323632!4d18.7820774!3m4!1s0x4742f1499a1e4159:0xed5a3be91ce4e014!8m2!3d46.4322793!4d18.7822758

Partners involved:

1. **Municipality of Tolna (applicant; László Mireider, Head of Department, Department of Building and Maintenance; epites@tolna.hu)**
   wesite: http://www.tolna.hu/
   postal address: H-7130 Tolna, Hősök tere 1.

2. **Sztárai Mihály High School (investment site)(renamed, new name is Szent István Catholic High School)**
   wesite: http://tolnaigimi.hu/
   postal address: H-7130 Tolna, Bajcsy-Zs. u. 73.

3. **Wosinsky Mór Primary School (investment site)**
   wesite: http://www.wosinskyiskola.hu/
   postal address: H-7130 Tolna, Bartók B. u. 23.

Implementation year: *May 2015*

Photos:

Fig 1: High school in Tolna [Source TCDA]

Fig 2: Tolna Town hall [Source TCDA]

SYSTEM CHARACTERISTICS

Brief Description*:*

The specific call this project was submitted to is a national (except Central Hungary) program aimed at increased the share of RES in public buildings and supports deployment of small-scale photovoltaic capacities. The maximum project size is roughly 350,000 €, whereas most projects were around 100,000-150,000 €. The call introduced numerous restrictions/conditions, such as limiting the group of potential beneficiaries by excluding those who were support by previous calls. Further limitations were: achieving net GHG-emission and fossil fuel usage reduction were mandatory; a price limit was imposed on the unit price of the photovoltaic panels.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: *100,000 EUR (approximately)*

Sources of financing:

- *EU funds: EEOP (Hungarian mainstream OP)*

Electricity generation *(MWh/year):* 55,4 MWh/year (generated by RES)

Or fuel savings *(kg or m3 or kWh or GJ): 199,44 GJ / year*

CO_2 reduction: 51,788 t/year

PROJECT IMPLEMENTATION BENEFITS

Decreased GHG emission and fossil fuel usage. Increased visibility and possible spill-over effect within the general population.

BEST PRACTICE IN HUNGARY – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice:

Successful crowdfunding campaign and installation of LED lighting in the Karolina High School, Szeged, Csongrád County, Hungary

Energy efficiency measures implemented in the building: LED lighting was installed in the 1100 m² building which will save around 66,203 kWh energy annually and 40.12 tons of CO2.

Location:

City: Szeged

Region: Csongrád County, Southern Great Plains region

Country: Hungary

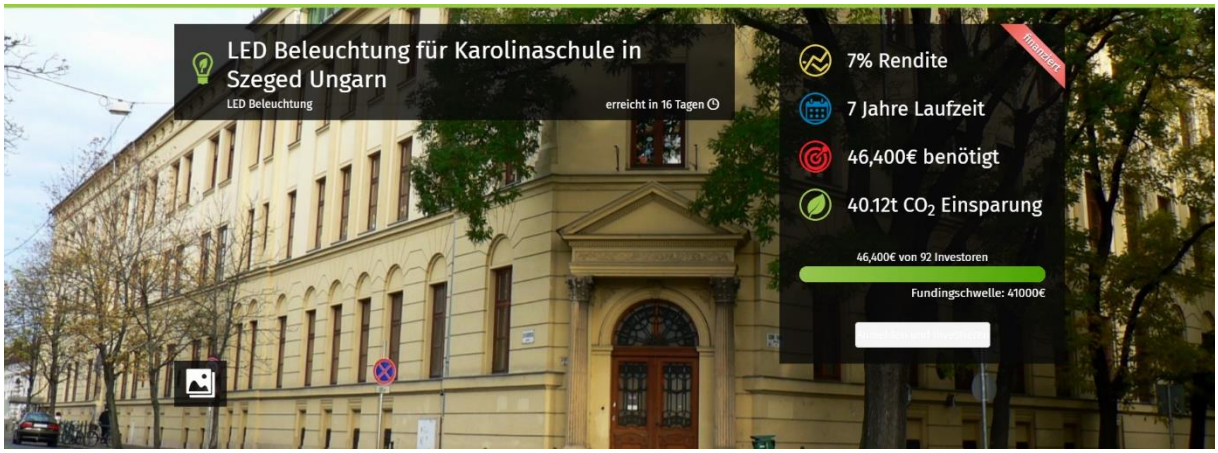
GMaps link: https://goo.gl/maps/BYYW3qboBRNvd4Xj6

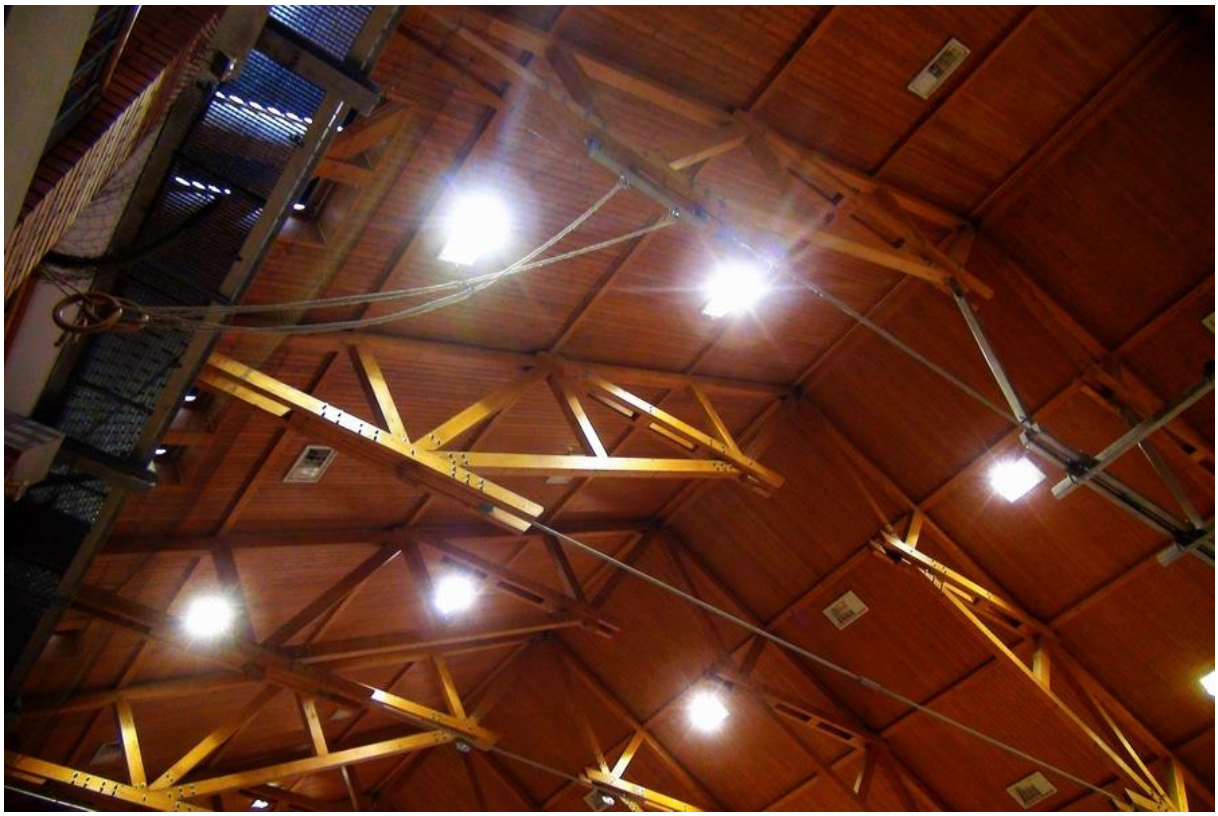
Partners involved:

Karolina Óvoda, Általános Iskola, Gimnázium, Alapfokú Művészeti Iskola és Kollégium (titkarsag@karolinaiskola.hu)
wesite: http://www.karolinaiskola.hu
postal address: H-6725 Szeged, Szentháromság u. 70-76**.**

Implementation year: *2015*

Photo:





[Source: **https://www.bettervest.com/en/projekt/LED-Karolinaschule-Ungarn#beschreibung**]

SYSTEM CHARACTERISTICS

Brief Description*:*

Crowdfunding Campaign for Energy Efficiency Project in Hungary. The project focuses on installing LED lighting in Karolina High School in Szeged, Hungary. The school was founded at the end of the 19th century, and an additional extension with a floor area of 1100 m² was built in 2001, which houses the kitchen, the dining room, the chapel and the sports hall. LED lighting was installed in the new extension, the aim of the project was to generate savings from reducing electricity costs for lighting in this additional section. The project contributes to climate protection in Hungary and also serves as an educational project to demonstrate to young people practical steps towards a low carbon future. Crowdfunding is not widespread in Hungary especially for energy projects, however this project demonstrates the feasibility of such solutions*.*

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: *46,400 EUR*

Sources of financing: *Private donors through crowdfunding platform Bettervest*

Electricity savings *(MWh/year):* ***66,203 kWh/year***

Or fuel savings *(kg or m3 or kWh or GJ):* ***40.12 tons of CO2/year***

Cost savings *(EUR/year):* **8,239.63 EUR/year**

PROJECT IMPLEMENTATION BENEFITS

- Proves the feasibility of crowdfunding in energy investments in Hungary
- offers lighting solutions that make it possible to make more economical use of worldwide resources.
- A dynamic annuity factor for consumption costs is included in all energy costs, which simulates an electricity price increase of 3.5% annually over the project duration.

ADDITIONAL INFORMATION

https://www.bettervest.com/en/projekt/LED-Karolinaschule-Ungarn#details

BEST PRACTICE IN HUNGARY – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice:

Innovative, livable, sustainable and healthy city

Energy efficiency measures: As a result of the planned infrastructure modernization, the city of Paks aims to reduce the operational energy consumption of vehicles used in public transport and public services by at least 35-40%, and to achieve at least a 50% reduction in their total pollutant emissions, i.e. CO2 emissions, dust and particles, and traffic noise.

Location:

City: Paks

Region: Tolna, Tolna County**, South Transdanubia**

Country: Hungary

GMaps link: https://goo.gl/maps/h8eZ7hBzSpK5qJXn6

Partners involved:

Protheus Holding plc (applicant; CEO: **Péter KISS,** kiss.peter@ptsh.hu **)**

website: https://ptsh.hu/en/

postal address: H-7030 Paks, Dózsa György u. 55-61.

Implementation year: May 2017 – April 2020

SYSTEM CHARACTERISTICS

Brief Description*:*

The PROTHEUS project deals with the construction of local electric mobility (e-mobility) infrastructure, including the development of an electric bus and commercial vehicle fleet, the development of alternative refueling infrastructure and the extension of the project's economic and logistical catchment area. The PROTHEUS project aims to build a micro-regional network of electro-mobility and related electricity production, storage, distribution, smart grid integrations for the city of Paks and surrounding municipalities, thereby contributing to the creation of conditions for a new, liveable and healthier environment and creating a sustainable payback model for resource-efficient operation, with innovative and energy-efficient technology solutions for day-to-day tasks and long-term goals.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 2 244 719 EUR with a leverage factor of 25 *resulting in an investment generated of 40-45 million EUR (approximately)*

Sources of financing: *European Investment Bank (EIB) ELENA (European Local Energy Assistance) program*

Electricity generation *(MWh/year):* The aim of the project is to reduce public transport and public utility vehicles by at least 35-40% operating energy in Paks City and generate 9 130 MWh/year

Or fuel savings *(kg or m3 or kWh or GJ):* 1 640 MWh

CO_2 reduction: Annual expected total reductions of 18 064 CO2 eq t.

PROJECT IMPLEMENTATION BENEFITS

- Pioneering smart grid applications in Hungary incorporating e-mobility for local and regional transport.
- Contributing to the achievement of a competitive and resource efficient European transport system.
- New, liveable and healthier environment.
- Sustainable payback model for resource-efficient operation.
- Innovative and energy-efficient technology solutions for day-to-day tasks and long-term goals.
- Produce renewable electricity.

ADDITIONAL INFORMATION

https://ptsh.hu/en/

BEST PRACTICE IN HUNGARY – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice:

Construction of the “Boiling Point Energy House”, Paks, Tolna, Hungary

Energy efficiency measures implemented in the building: The building was constructed using traditional materials, such as adobe, which when used correctly, can reduce cooling and heating demand. A mobile hull was installed to increase insulation in cold weather and to decrease cooling demand; that also effect solar exposure. Geothermal probes and water-source heat pumps are also installed.

Location:

City: Paks

Region: Tolna County, South Transdanubia

Country: Hungary

GoogleMaps link:

https://goo.gl/maps/D53TWNvCpPF2

Partners involved:

- Prof. Dr. habil István Kistelegdi DLA, PhD; H-7624 Pécs, Ifjúság str. 20, Room A-114 (János Szentágothai Research Centre), web: https://energiadesign.hu/en; planner

- Active Energy Association (www.forraspontpaks.hu, H-7030 Paks, Elkerülő str. 4852/1), investor and applicant

Implementation year: 2017

Photos:

Source: http://epa.oszk.hu/02900/02971/00027/pdf/EPA02971_octogon_2017_1_056-061.pdf

SYSTEM CHARACTERISTICS

Brief Description*:*

The aim of the investment was to provide an example of a building which can adapt to the outer circumstances, such as temperature, solar exposure, humidity, ventilation, etc. by a mobile outer shell moved by a pulley system. The Energy House was built using traditional “adobe” bricks and a monolithic concrete structure, therefore it can exploit the advantages of said brick, which are improved humidity control due to the ability to absorb 40 times more water than modern bricks and to accumulate more heat which is useful both during winter and summer.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 46,000 EUR

Sources of financing: national funds: KEOP-6.2.0/B/11-2013-0006 (mainstream OP)

Electricity savings (MWh/year): not applicable

Or fuel savings (kg or m3 or kWh or GJ): not applicable

Cost savings (EUR/year): not applicable

PROJECT IMPLEMENTATION BENEFITS

The gains are diverse:

- the building itself benefits from the materials used as explained above and there are specific advantages coming from implementing the building as a project, since it is a testbed for specific technologies in itself.
- The City gained a community space, but the unusual solutions, such as the moving outer hull prove that such experimental techniques could be used elsewhere if the energy consumption data will support its usefulness.
- The Boiling Point Energy House gained a lot of publicity on its own drawing attention of the general public to energy efficiency.

ADDITIONAL INFORMATION

The project was funded by KEOP (Environment and Energy Operational Programme), one of the mainstream EU funded Operational Programmes of Hungary. The specific call was “Promoting sustainable lifestyle and consumption opportunities by implementing pilot projects” aiming at carrying out model investments that are innovative and can raise awareness to different topics of sustainability, such as energy efficiency.

BEST PRACTICE IN HUNGARY – SMART METERING

BASIC INFORMATION

Title of the Best Practice:

Smart Synergy Project, Hungary

Energy efficiency measures implemented in the building: smart meters were installed in private homes acting as a testbed for large-scale smart meter roll-out in Hungary.

Location:

City: not applicable

Region: not applicable

Country: Hungary

GMaps link: not applicable

Partners involved:

- Mr István Nagy, NKM Áramszolgáltató Zrt. project coordinator
- NKM Észak-Dél Földgázhálózati Zrt. (at time of project start ÉGÁZ-DÉGÁZ Földgázelosztó Zrt. - Gas DSO)
- Szegedi Vízmű Zrt. (Water Treatment Company, Szeged)
- NKM Áramszolgáltató Zrt. (at time of project start EDF DÉMÁSZ Zrt. - Universal service provider, electricity)
- NKM Áramhálózati Kft. (at time of project start EDF DÉMÁSZ Partner Hálózatüzemeltető és Szolgáltató Kft. - responsible for installing and maintaining meters)
- E.On North Transdanubia
- E.On South Transdanubia
- E.On Tiszántúl (Eastern Hungary)
- ELMŰ (Budapest Electricity Plc)
- ÉMÁSZ (North Hungarian Electricity Supply Plc)
- ARIOSZ (market research company)
- Iskrameco, ZPA, Sagemcom (smart meters)
- IC Co., IBM, eMeter, Energy IP (system and system operation)

Implementation year: July 2012 – June 2013 (installation), metering is still ongoing

SYSTEM CHARACTERISTICS

Brief Description*:*

The aim of the project was to bring smart-metering technology into the market with appropriate functionalities, information tools, support services that enable and enhance consumer empowerment.
The main objectives of the project were:

a. to examine the willingness of consumers to benefit from smart metering and to modify their consumption behaviour,

b. to demonstrate the technical and technological possibilities and conditions of establishing smart grids,
c. to test the appropriateness of smart metering from the aspect of delivery of the expected s ervices,
d. to contribute to the most appropriate business model taking into consideration the actual way of operation of the market,
e. to introduce the costs of establishment and operation of smart grids,
f. to pilot compliance of smart grids with data protection and data security.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value:

Hungarian law on electric energy authorised universal and license providers to test at their own costs smart metering so as to outline the long term costs and benefits. In case of NKM Áramszolgáltató Zrt. (at time of project start DÉMÁSZ) the incurred costs in 2012-13 were 500, million HUF (cca. 1,6 million EUR on current prices)

Sources of financing: own funds of the electricity service provider

Electricity savings *(MWh/year):* during the pilot phase on the demand side the consumers involved registered cca. 1-1,5% decrease in their electricity consumptions.

Cost savings *(EUR/year):* not applicable

PROJECT IMPLEMENTATION BENEFITS

- Decrease in consumption, costs: during the pilot phase on the demand side the consumers involved registered cca. 1-1,5% decrease in their electricity consumptions. Two groups of consumers were designated when installing the smart meters. One constantly received information on the state of the pilot, on the registered consumption data, and also did receive a formal tariff offer as well. The other had merely new smart meters installed, and functioned as the control group of the active smart group.
- The pilot was accompanied by a communication campaign and a consumer survey, which showed that 48% of consumers in the panel have already heard about smart metering (the ratio is lower in case of residential and higher in case of industrial/commercial consumers). Besides, a detailed analysis was done on frequency of household activities, penetration of multi-media devices, use of ventilation and air conditioning, daytime – night-time use of electricity. The lesson learnt is that 56% of respondents (big consumers, countrymen, the young, people with higher educational attainment) is willing to restructure its electricity consumption patterns provided that they realize 3-5 EUR/month saving. 42 % (the elderly, people living in Budapest, small consumers and people with lower educational attainment) remains aloof.
- The innovation of the pilot was not characterized by developing new devices or software, but by integrating them into the operation of the energy grids. Therefore new technologies have not been developed.

ADDITIONAL INFORMATION

Development stages:

a. Selection of national address lists,
b. System design, document creation, reviews and approvals,
c. Selecting communication service provider, SIM card purchase i
d. System installation, hardware & software
e. Preliminary tests (prior to meter installation)
f. Consultation and connection building with Waterworks and Gas Distribution
g. Preparing a Communication Campaign. Wide-ranging press, targeted information for affected users
h. Installation of meters
i. Creating a test environment
j. Metering period
k. Evaluation of results

The pilot showed that it is hard to ensure the compatibility of the meter, adapter, head end, system and SAP. Besides, integrating gas and water meters is not easy. Also, sound cooperation among different utility companies has to be set.
Following the pilot project there were developments that addressed the validation, filtering and processing of the data, for the further – not only pilot focused – rolling out of smart meters to other groups of consumers as well. These development directions are still valid up to now.

4.5 Italy

EMILIA-ROMAGNA
ENERGY FUND
(MULTYSCOPE REGIONAL
FUND OF PUBLIC FINANCING)

Best Practice
Factsheet
#2

Emilia-Romagna, Italy
Energy Fund (Multyscope Regional Fund of public financing)

DESCRIPTION OF THE ACTION

It is a Financial Instrument, according to the previous art. 37 of the EU Reg. n.1303/2013, set up with public resources on the ROP ERDF of ERR 2007–2013. The Fund is a revolving fund of soft loan financing, privately-funded for the purpose of providing loans at a reduced rate.

FINANCIAL CAPACITY Energy Fund of about € 23,750,000 (public 9,5 Ml, Private 14,25 Ml Euro

Beneficiaries: SMEs and large companies (registered in the Register of Companies operating ONLY in the sections of the economic activity (ATECO 2007 - B, C, D, E, F, G, H, I, J, L, M, N, R, S) with local units in which the investment project is implemented (ERR) active at the time of submission of the application provided they are not "Undertaking in difficulty" complying with the European Guidelines on State aid for rescuing and restructuring non-financial firms in difficulty (2014 / C 249/01)

During the implementation phase the fund was not attractive for SMEs therefore it was modified by increasing the public share to 70% and the private decreased to 30%
The Fund provides:

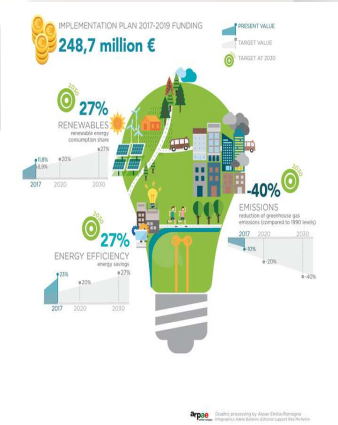
- New unsecured-loans at reduced rates with mixed provision resulting partly from the public share (70%) and partly from the private share (30%) for each admissible project.
- Every single funding covers 100% of the project

Time period: 2013 - 2014

Key results (2015):

47 projects financed with an estimation of:

- **Renewable energy: 23.246 MWh**
- **Reduction of energy consumption of 11.113 TOE/Y**
- **Reduction of GHG emissions of 26.001 TCO2 equi/Y**



Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

EMILIA-ROMAGNA
ENERGY FUND (MULTYSCOPE REGIONAL FUND OF PUBLIC FINANCING)

Best Practice Factsheet #2

DESCRIPTION OF THE ACTION

The amount of funding must be between of a min. of € 75,000 and a max. of € 300,000

The duration of the amortization period is between a min. of 36 months and a max. of 96 months (including any pre-amortization period of up to 12 months).

The facilitation is determined by:

• an interest rate equal to 0% on the part of the public share of the Fund (70%)
• a rate on the private portion (30%) calculated on the basis of the EURIBOR 6 months plus a maximum spread of 4,75%

Eligible initiatives

- Interventions addressed to improve energy efficiency and to reduce gas emissions causing climate change
- Interventions to produce energy from renewable sources, favouring those in self-consumption, as well as high efficiency cogeneration plants, complying with the EU Directive 2012/27 (EU Parliament and Council)

Eligible costs

a) Works on buildings: expansion and / or restructuring, works functional to the project

b) Purchase and installation, machine adjustments, plants, equipment, hardware

c) Acquisition of software and licenses

d) Technical and targeted consultancy services for the investment project

e) Costs to preparing an energy audit and / or project development design to carry out the intervention submitted in the application

Success factors

- **the choice to use a revolving fund is rewarding in terms of sustainability. In general, in fact, the refunds allow to refinance funds;**
- **the combination of loans and training is winning. Provide training on different aspects on the business development improves entrepreneurial skills, increasing the chances of creating jobs and reducing the risk failures;**

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

EMILIA-ROMAGNA
ENERGY FUND (MULTYSCOPE REGIONAL FUND OF PUBLIC FINANCING)

Best Practice Factsheet #2

DESCRIPTION OF THE ACTION

Non Repayable grants

The company may, at the time of submitting the application, require a non-repayable grant to be charged on technical costs such as energy audit and / or project, which are necessary for the submission of the investment project. This contribution, which covers up to a maximum of 100% of the aforementioned expenditure, taking into account the chosen aid scheme and the ceiling on the same amount of expenditure, will still be eligible for a maximum of 12,5% of the public funding admitted (up to 8.75% of the funding). In the grant communication, the manager will indicate the amount of the actually disbursed non-repayable grant, specifying the modalities and the timing for the delivery of it. The reimbursement of the expenses will be paid only after the final project finalization, after its verification. In the event of a difference between the intervention granted and the actual intervention, the deferred grant will be remodeled in order to respect the maximum permissible percentages

Documents to submit for the application phase

- Pre-Banking Resolution
- Budget Estimates
- State aid statement
- Energy audit or project
- If available, the last two full balance sheets

PARTNERS INVOLVED

- **Unifidi Emilia-Romagna** http://www.unifidi.eu/
- **Fidindustria Emilia-Romagna**

Grant benefit and aid regime

The public share of funding, allocated at zero rate and the non – repayable grant create a public benefit for the beneficiary which will be granted on the basis of the choice made by the requesting party and in accordance with the regulatory constraints under the provisions of the “de minimis” regime according to the EU Regulation 1407/2013

BARRIERS ENCOUNTERED

- **Low level of EE knowledge of financial operators**
- **EE awareness and information efforts not reaching some target groups**
- **Complicated bureaucratic procedures and limited support to potential beneficiaries**
- **Lack of permanent initiatives/programme to capitalise knowledge and experience**

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

EMILIA-ROMAGNA ENERGY FUND (MULTYSCOPE REGIONAL FUND OF PUBLIC FINANCING)

DESCRIPTION OF THE ACTION

Preparation of the energy intervention

At the request of the chosen financial aid, an Energy audit will have to be provided, stamped and signed by a qualified technician, and drawn up in accordance with UNI CEI EN 16247 - (parts 1 a 4)

- Definition of ENERGY AUDIT: "A systematic procedure aimed at obtaining an adequate knowledge of the energy consumption profile of a building or group of buildings, one industrial or commercial activity or plant or of public or private services, to identify and quantify cost-effective energy saving opportunities and report the results "

- Where the Energy audit procedure is not applicable, it will be necessary to attach to the request of the aid selected the project of the intervention, stamped and signed by qualified technician, which can be:

- A Feasibility Study / Preliminary Project / Final Project / Executive Project which shall, however, consist of the following elements:
  a) Technical report
  b) Graphic documents
  c) Analysis of project cash flows, where relevant

FINANCING

Investment costs	**13.460.000 EUR**
- **Own sources**	**-**
- **Subsidies**	
- Public	**6.350.000 EUR**
- Private	**7.110.000 EUR**
- **Loans**	**-**
Annual operational costs (salaries, repairs, maintenance and other specific costs)	**500.000 EUR**

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

EMILIA-ROMAGNA
ENERGY FUND (MULTYSCOPE REGIONAL FUND OF PUBLIC FINANCING)

DESCRIPTION OF THE ACTION

Examples

Hereafter an indicative/not exhaustive list of possible and eligible interventions to reduce the Energy consumption:

- Thermal insulation
- Replacement of transparent closures and fixtures
- Replacement of winter air conditioning systems
- Redevelopment of lighting systems
- Installation of automatic management and control technologies for thermal and electrical installations
- Installation of solar thermal collectors
- Installation of photovoltaic systems
- Industrial heat recovery
- Efficiency of refrigeration systems
- Efficiency and replacement of machinery
- Efficiency of the electric engine park of the production site
- Energy Reduction of compressed-air compression plant
- Savings in pumping systems
- Cogeneration plants

Ways to deal with barriers

- **in order to reach the widest amount of beneficiaries, it is important to highlight the activities communication, both in terms of results and opportunities offered by the Funds;**
- **it is necessary to assure stability and certainty over the time to the financial instrument.**
- **offering to the beneficiaries a counseling and tutoring service and accompaniment for the first year of activity, in order to guarantee a more effective use of financial resources;**
- **simplify documents preparation**

CONTACTS: http://www.fondoenergia.unifidi.eu/

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

BEST PRACTICE IN ITALY – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

An innovative approach of energy requalification: use of community funds (EEEF) and application of Energy Performance Contract for the Ducal Palace, headquarters of the Military Academy of Modena

Energy efficiency measures implemented in the building:

- replacement of the existing generators with high efficiency condensing generators and cogeneration module
- restructuring of the distribution network of hot water
- replacement of the old cast iron radiators with new ones steel heating bodies with thermostatic valves
- new control and regulation system for the heating system
- ceiling insulation with insulating mat
- installation of new windows with high thermal efficiency
- old plaster removal and insulation of opaque vertical walls with new thermal-dehumidifying heat-cell plaster

Location:

City: Modena

Region: Emilia-Romagna

Country: Italy

GoogleMaps link:

https://www.google.com/maps/place/Accademia+Militare/@44.6485328,10.9283201,18.5z/data=!4m19!1m13!4m12!1m4!2m2!1d11.3382364!2d44.5223478!4e1!1m6!1m2!1s0x477fef15da4ca319:0xa71b11f6a8dd805a!2saccademia+militare+modena!2m2!1d10.929063!2d44.6483311!3m4!1s0x477fef15da4ca319:0xa71b11f6a8dd805a!8m2!3d44.6483311!4d10.929063

Partners involved:

- Municipality of Modena, Piazza Grande 16 - 41121 Modena, Web: https://www.comune.modena.it, owner
- Ministry of Defence, Via XX Settembre 8 - 00187 Roma, Web: https://www.difesa.it, tenant
- University of Studies of Modena and Reggio Emilia, via Università 4 - 41121 Modena, Web: https://www.unimore.it/, designer
- AESS – Energy and Sustainable Development Agency, via Caruso 3 - 41122 Modena, Web: https://www.aess-modena.it, advisor

Implementation year: 2017 - 2020

Photos:

Source: University of Studies of Modena and Reggio Emilia

Source: University of Studies of Modena and Reggio Emilia

SYSTEM CHARACTERISTICS

Brief Description:

The building was built in 1291, but the current architectural appearance was conferred by the architect Avanzini in 1634. State-owned, with a restriction of scientific restoration, it is currently the headquarters of the Military Academy. The palace hosts several use destinations with different energy needs: is equipped with a centralized system for heating and domestic hot water with generation system from traditional boilers, the distribution system has pipes with non-existent or deteriorated insulation, emission system with old cast iron radiators, climatic and manual regulation. The thermal dispersions of the building envelope are high due to the obsolete and inefficient type of windows and the opaque non-thermally insulated structures with deteriorated plasters. An economic obstacle to the possibility of intervention is the scarcity of funds available to the property. From the technical point of view, the obstacle is constituted by the inadequacy of the normally used calculation tools based on a static model to correctly predict the behaviour of the building.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 12.000.000,00 €

Sources of financing:

- design and tender phases: European Energy Efficiency Fund;
- realization of the intervention phase: PREPAC-Program for the Energy Refurbishment of public buildings of the Central Administration, ROP-ERDF Emilia-Romagna Energy Fund, Thermal Account state incentive and Energy Performance Contracting

Energy savings: 13.300 MWh/y

Cost savings: 1.200.000,00 €/y

PROJECT IMPLEMENTATION BENEFITS

The intervention on the structures allows the reduction of the need for heating, with direct economic benefit. The new plant equipment will allow to adapt the indoor climate to the different needs of use of the various areas in which the building is articulated. The installation of a cogeneration system favours the self-consumption of electricity

The setting up of the contract according to the EPC model allows the best management of technical-economic risk and the availability of low-cost public financing favours the participation of private capital thanks to the reduction of financial risk

ADDITIONAL INFORMATION

Calculation tools based on a dynamic model (Trnsys) have been used, which allow to simulate and predict the behaviour of the building with greater precision and to optimize the programming of the regulation system.

BEST PRACTICE IN ITALY – SMART METERING

BASIC INFORMATION

Title of the Best Practice

'Sesto Senso': patented smart multisensory metering system with self-learning capability

Energy efficiency measures implemented in the building: installing smart metering system: controlling energy consumption, IAQ parameters

Location:

City: Bologna

Region: Emilia-Romagna

Country: Italy

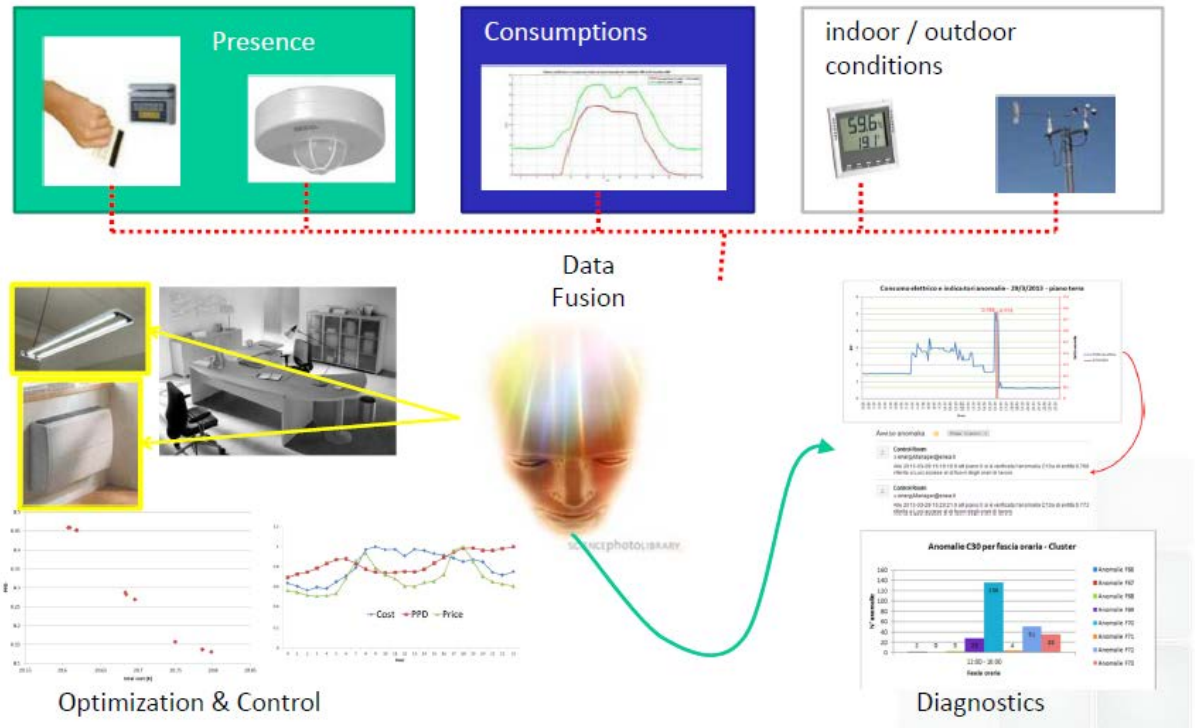
GoogleMaps link:

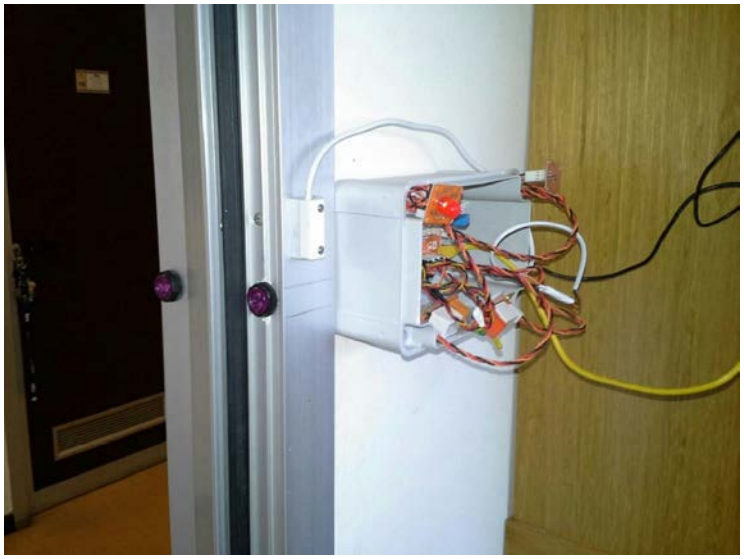
https://www.google.com/maps/place/44%C2%B031'32.1%22N+11%C2%B020'39.8%22E/@44.5255775,11.3444987,19z/data=!4m5!3m4!1s0x0:0x0!8m2!3d44.525589!4d11.344374

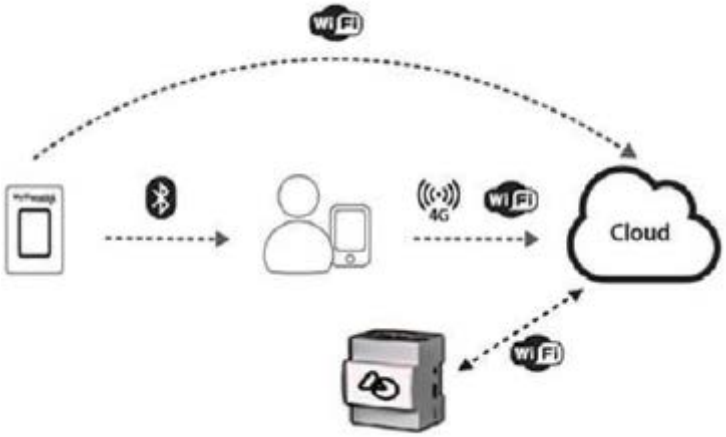
Partners involved: ENEA - National Agency for New Technologies, Energy and Sustainable Economic Development

Implementation year: 2017

Photos (of a smart metering components):







Source: F. Romanello, S. Romano - ENEA

SYSTEM CHARACTERISTICS

Brief description:

Intelligent multisensory system with totally open and scalable learning capacity both in the hierarchical levels and in the potential of the single element. In addition to monitoring energy carriers, the system includes: a sensory device able to count access to a room and therefore manage attendance so as to be able to administer the users: a virtual CO2 sensor that exploits the measured temperature values, humidity, number of hours / presence and opening / closing of doors and windows, dates back to the CO2 value after a set-up phase of the parameters of the neural network of which the sensors are part.

This architecture and cooperative logic also allows other repercussions such as that of self-validation of the acquired signals: in this case case is solved with the technique of redundancy and with the implementation of a routine that works with neural networks and fuzzy logic

Type of a building where a smart metering (SM) system is installed: Residential

Responsible person for monitoring consumption: Romanello Francesco - Pieroni Francesco - Romano Sabrina - Vaccari Erica

Name of a company which installed the SM system: ENEA - Lungotevere Thaon di Revel, 76 - 00196 ROMA

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: *n.a.*

Sources of financing: *internal*

Electricity savings: n.a.

Or fuel savings*: n.a.*

Cost savings*:* n.a.

PROJECT IMPLEMENTATION BENEFITS

Thanks to an attendance detection system, it can independently activate or deactivate lights, appliances, shutters and solar shading in the home; It also has a sensor that analyzes the percentage of CO2 and warns if you need to open the windows to ventilate the premises. Sesto Senso is an intelligent home automation solution, composed of a series of environmental monitoring sensors that acquire data on temperature, humidity, luminosity, CO2 values, but also information on movements, noise and transit of people in the home. They communicate, via wi-fi, with a central unit that collects data on the environmental situation, re-elaborates them and independently determines the correct energy management of the home. Inserted in a small box, Sesto Senso is not cluttered and can use sensors already installed for other purposes, thus integrating other functions aimed at safety, home automation, protection against fire and flooding, and finally assistance to user in need. The use of the neural network technique gives the multisensory system the ability to perceive additional information with respect to the pure and simple information content of the single signals coming from the sensors that are part of the installed sensory network

ADDITIONAL INFORMATION

Patented system with question number 102016000091625, 09/12/2016 registered

BEST PRACTICE IN ITALY – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Reducing greenhouse gas emissions through the energy conversion of social housing

Energy efficiency measures implemented in the building:

- External envelope thermal insulation
- Roof thermal insulation
- Basement thermal insulation
- Replacement of windows and glasses with low emission ones
- Seismic structural improvement of basement
- Activity of capacity Building for the tenants

Location:

City: Reggio Emilia

Region: Emilia-Romagna

Country: Italy

Coordinates: 44.698010°N 10.619503°E

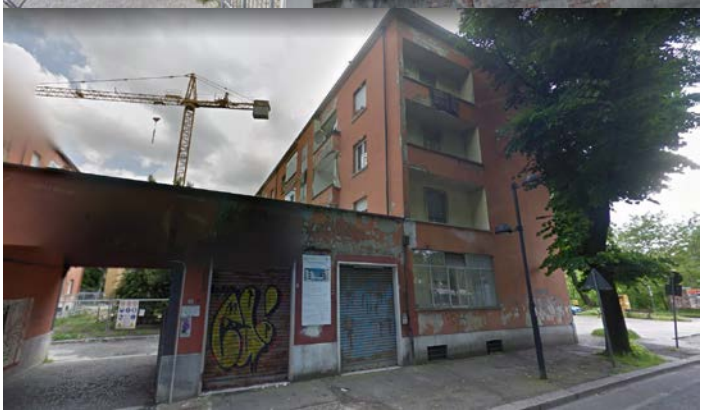
GoogleMaps link: https://goo.gl/maps/8f3XWA2YaaKj8jPu5

Partners involved:

- Municipality of Reggio Emilia, Piazza Prampolini, 1 42121, Reggio Emilia, Web: https://www.comune.re.it/, owner
- ACER Reggio Emilia, Via della Costituzione 6 - 42124 Reggio Emilia, Web: https://www.acer.re.it, administrator
- AESS – Energy and Sustainable Development Agency, via Caruso 3 - 41122 Modena, Web: https://www.aess-modena.it, advisor
- ART-ER, via Gobetti 101 - 40128 Bologna, Web: https://www.art-er.it/, capacity building

Implementation year: 2018÷2020

Photos



- **of the first works on the building:**

Source: ACER Reggio Emilia website [https://condominiovialemagenta.it/] and google street view [maps.google.com]

SYSTEM CHARACTERISTICS

Brief Description: The building was built in 1936 and consists of 51 social housing dwellings, representing a great condominium with a series of issues to be dealt with. The presence of low income tenants has driven many common goods into misuse and sent the building into degradation and vandalism. The thermal dispersions of the building envelope are high due to the obsolete and inefficient type of windows and the opaque non-thermally insulated structures with deteriorated plasters. The tenants started to face energy bill related problems, due to the lack of ordinary maintenance and knowledge of how to save energy.

In addition, the building is seismically obsolete and situated in a very seismic active area (thinking of the 2016 earthquake).

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 1.198.345,00 €

Sources of financing:

- design and tender phases: Horizon 2020 PDA EU fund;
- realization of the intervention phase: Legge 80 of Emilia-Romagna Region and Reggio Emilia municipality own funds

Energy savings: 336 MWh/y

Cost savings: 70.500,00 €/y

PROJECT IMPLEMENTATION BENEFITS

The intervention on the structures allows the reduction of the need for heating, with direct economic benefit. The new envelope will guarantee a better quality of life to the economically weak tenants, together with the addition of a improved aesthetic view of one of the main streets of the city.

The seismic upgrade, done together with the energy efficiency intervention, will guarantee the safety of the inhabitants and of the structure with a cost 17% higher than applying energy efficiency alone.

The experimentation of the Horizon Project Lemon has provided training and awareness campaigns to help future tenants to understand their energy consumption, demonstrating high effectiveness when in accordance to other interventions.

ADDITIONAL INFORMATION

Calculations are made by the managing company, ACER Reggio Emilia, and their technicians. With this intervention, Energy poor tenants will be able to save up to 50% of their actual bill.

BEST PRACTICE IN ITALY – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Refurbishment and insulation of San Benedetto del Tronto hospital

Energy efficiency measures implemented in the building:

- Perimeter walls insulation with external coat (20 cm).
- Roof insulation with 20 cm of thermal insulation.
- Replacement of windows and shutter boxes insulation (where present).
- Replacement of heat generators with condensing boilers, complete refurbishment of the thermal power station and water sub-station.
- Zone temperature regulation system with climatic compensation.
- Installation of solar panels for hot water production.
- Installation of PV panels for electricity production.

Location:

City: San Benedetto del Tronto

Region: Marche

Country: Italy

Coordinates:

https://www.google.si/maps/place/Madonna+del+Soccorso+Hospital/@42.947904413.8759722,17.62z/data=!4m5!3m4!1s0x13321fd6e7305a55:0xc90f4abe9ea39319!8m2!3d42.9479699!4d13.8768889

Partners involved:

- AESS – Energy and Sustainable Development Agency, via Caruso 3 - 41122 Modena, Web: https://www.aess-modena.it, advisor
- Marche Region, via Gentile da Fabriano, 9 - 60125 Ancona, web: http://www.regione.marche.it/, public body
- Università politecnica delle Marche, Piazza Roma, 22, 60121 Ancona, Web: www.univpm.it, university

Implementation year: 2017÷ongoing

Photo - sources: Marte report finale (http://www.marteproject.eu/Portals/1/Public%20reports/FinalReport/MARTE%20Final%20Report_EN_web.pdf); Google street view (almost only pictures of the state of the art, works are proceeding slowly and just begun)

- **of ex ante state**

- **of the first works on the building (the two floored one on the right):**

SYSTEM CHARACTERISTICS

Brief Description:

The various buildings of the complex were built in different periods, starting with an Art Nouveau villa which was, following a donation, the first nucleus from which, over time, the entire hospital complex evolved, from the blocks of the 60s to the more recent ones dating back to the 80s and 90s. The same buildings, over time, have also undergone partial renovations and changes in volume and distribution of internal spaces, as well as their intended use. The thermal power plant is unique for the whole building complex and the heat generation is carried out with three boilers, one of which is intended for the production of steam not related to air conditioning processes. In addition, there is a co-generator for the combined production of heat and electricity, operating mainly during the winter period, with methane gas supply.

The improvement scenarios concern the envelope of the entire volume, except for the outer walls of art nouveau villa; in it in the which the outer thermal coat does not appear to be a choice practicable due to law restrictions.

The works have been assigned through EPC contract, with the Energy Plus service system.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 4.433.788,00 €

Sources of financing:

design and tender phases: Horizon 2020 PDA EU fund;

realization of the intervention phase: Regione Marche funds, Energy and Mobility regional fund, Por Fesr Marche 2014-2020

Energy savings: 77% - 771 MWh/y

Cost savings: 340.000,00 €/y

PROJECT IMPLEMENTATION BENEFITS

The intervention on the envelope allows a strong reduction in energy primary need for the Hospital, able to reach 77% including the replacement of the obsolete boilers with a new, centralised one. The refurbishment of all the complex allows to reach a unity difficult to be seen before.

The payback period is quite long due to the application of EPC contract, where the ESCo needs to return back of the investment made. This application has the advantage to allow the intervention with an initial investment close to zero. The refurbishment is still ongoing, due to bureaucracy and need to keep the building working.

The training aspect allowed to broaden the interest in replicability. Three seminars have been organized in the Marche Region for technicians to replicate the procedure also in future refurbishments.

ADDITIONAL INFORMATION

This intervention is part of a series of 5 interventions for 5 hospitals in Marche Region, in the field of Marte Project

(http://www.marteproject.eu/Portals/1/Public%20reports/FinalReport/MARTE%20Final%20Report_EN_web.pdf).

4.6 Poland

PŁOCK

RECONSTRUCTION AND EXTENSION OF THE TENEMENT BUILDING

Best Practice Factsheet #6

Płock , Poland
Reconstruction and extension of the tenement building

DESCRIPTION OF THE ACTION

A tenement house located at Kościuszki Street 3b in Płock is located on a plot of 3.473 m2. The area of buildings after the project implementation will amount to 578,4 m2 (the building in the present state covers 220,9 m2). It is a building built on a rectangular plan with dimensions of 12,52 m x 20,69 m, partly with a basement and a one-storey attic. The purpose of the reconstruction is the revalorisation and modernization of the existing building at Kościuszki Street 3b and giving it new functions residential and service building. On the ground floor, the Mediateka - Audiovisual Collections Department of the Płock Library will be located. On the first floor and attic there will be a residential part. The ground floor of the building will be adapted to the needs of disabled people. The media library will be a public utility, fulfilling a social function, providing music resources and other digital resources and offering an educational program. The usable area of Mediateka will be 481,9 m2.

PARTNERS INVOLVED

- Inwestycje Miejskie Spółka z o.o. - municipal company (100% ownership of Local Government Units)
- BGK (Bank)

Time period: 30.09.2018 – 31.03.2020

Success factors

- **The investor has a valid building permit and detailed designs**
- **The building is not an object entered into the register of monuments and is not covered by conservation protection**
- **The tenement house is currently out of service**

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

PŁOCK

RECONSTRUCTION AND EXTENSION OF THE TENEMENT BUILDING

Best Practice Factsheet #6

DESCRIPTION OF THE ACTION

The scope of work under this project includes:

- construction works - foundations of the ground floor, basements will be filled up
- electrical installations - power supply of the facility, main switch, electricity measurement, switchgears and electrical boards, power supply of fire devices, internal power lines, power supply and control of sanitary equipment, electrical installations on the ground floor, electrical installations in heat node, emergency lighting installation, installation of external lighting, installation of earthing and equipotential bonding, lightning protection installation, installation of protection against shocks, laying of cables in the ground
- sanitary installations - cold water, hot water and circulation installations with sanitary facilities, hydrant installation, central heating installation, technological heat installation, mechanical ventilation and air conditioning installation, sanitary sewage system; external sanitary plumbing installations
- teletechnical installation
- substation will supply the entire building
- investor supervision

Building view (state before demolition)

Visualization of the building after reconstruction and expansion

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

PŁOCK

RECONSTRUCTION AND EXTENSION OF THE TENEMENT BUILDING

FINANCING

Investment costs	**820.050,25 EUR**
- **Own sources**	-
- **Subsidies**	-
- **Loan**	-
- Loan under the RPO WM 2014-2020 (Jessica Initiative)	**639.636,80 EUR**
- Commercial loan	**180.413,45 EUR**
Lifetime (service life)	**10 years**
Annual operational cost incl. salaries, repairs, maintenance and other specific costs	**72 139,39 EUR**
Annual revenues – energy savings	**1.065.517,04 EUR**

Financial indicators	
Net present value - NPV	211.054,73 EUR
Internal rate ratio – IRR	7,7%
Evaluation year	2018
Lifetime period	20
Discount	4,00 %

Jessica loan

- **NPB reference rate 1,50%**
- **"Social indicator" at the level of 80%**
- **Resulting interest rate on the financial forecast (fixed) 0,3%**
- **Grace period for repayment of principal installments until 30/04/2020**
- **Repayment period 10 years from April 30, 2020.**
- **Quarterly installments**

Commercial loan

- **Floating interest rate - 3 p.p. above the reference rate**
- **Commission – 930,30 EUR (4,000 PLN).**
- **Repayment period - 10 years**
- **Quarterly instalments.**

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

PŁOCK

RECONSTRUCTION AND EXTENSION OF THE TENEMENT BUILDING

Best Practice Factsheet #6

BARRIERS ENCOUNTERED

- The building is located in the area of the old part of the city, the urban and architectural complex and cultural layers of the city of Płock, entered into the register of monuments under number 51/182 / 59W, the date of entry on November 16, 1959.
- A small risk of non-payment of the loan on time.

Ways to deal with barriers

- The developed plan took into account some flexibility in the implementation of the investment.
- The economic analysis and the investment concept have set appropriate prices for renting buildings.

Key results

- **Increasing the access of residents to various forms of spending free time, mainly related to culture.**
- **Project will create a place accessible to people of all ages and will be a place of social integration and self-development of the inhabitants of Płock.**
- **as a result, the project will contribute to the development of human and social capital, social integration and counteracting social exclusion as well as equalizing educational opportunities.**
- **improvement of aesthetics, land development and building in accordance with the needs of residents; implementation of the project will contribute to the improvement of the spatial order and aesthetics of this part of the city, as well as to save from the total degradation of the tenement building.**
- **improvement of the quality of the natural environment due to meeting current energy efficiency standards in the field of heat transmission and the use of LED lighting**
- **adaptation of the building to the needs of disabled people (wheelchair ramps, toilet etc.).**

CONTACT: http://www.inwestycjemiejskie.pl/kontakt
sekretariat@inwestycjemiejskie.pl

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

Interreg CENTRAL EUROPE
European Union European Regional Development Fund
BOOSTEE-CE

PŁOŃSK
MODERNIZATION OF THE HEATING SYSTEM OF PŁOŃSK

Best Practice Factsheet #7

Płońsk, Poland
Modernization of the Heating System of Płońsk
Combined generation of electricity and heat from biomass

DESCRIPTION OF THE ACTION

The modernisation of Płońsk's heating system is an example of a model solution, the target of which is to decrease emissions of CO2, ash and other combustion gases into the atmosphere, and the production of clean electricity is compliant with the guidelines in the Polish National Energy Policy, which promotes the production of energy from renewable resources.

The fundamental objective related to the erection of a combined heat and electrical energy production system based on biomass firing is to decrease the emission of greenhouse gases by replacing the type of fuel combusted from fine coal to biomass, that is wood cuttings. The most important element for the project implementation was the modernisation of the existing central heating source in order to convert it to become biomass fired, modernisation of the heat distribution networks and heating substations.

The financial resources from the National Fund were utilised to partly cover the cost of the delivery and assembly of the steam, biomass-powered boiler with nominal power of 10.2MW, delivery and assembly of the steam turbine and the costs of the majority of works and deliveries of devices used in the modernisation of CHP and the heating system. The combined heating and power station in Płońsk was adjusted to be wood cuttings fired. The Energy Globe awarded technology allows for the production of energy considered to be 100% ecological.

PARTNERS INVOLVED

- Ecofound
- National fund for environmental protection and water
- City municipality of Płońsk
- Heating System Company

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

PŁOŃSK

MODERNIZATION OF THE HEATING SYSTEM OF PŁOŃSK

Best Practice Factsheet #7

DESCRIPTION OF THE ACTION

The annual energy production will be equal to 11,000 MWE. The annual combustion will include 25,000 tonnes of biomass and the consumption of fine coal will decrease by 70%. The CHP Station will be able to manage and combust biomass from an area of around 800 hectares of cultivated energetic plants.

As part of the investment, about 8000 m of traditional networks were replaced with pre-insulated pipe networks and 15 single-function nodes and 14 dual-function nodes were built. This allowed to significant reduce of transmission losses and distribution of the heating medium. A biomass-fired boiler was installed, cooperating with the turbogenerator. Almost 80% of heat energy and 100% of electricity is produced from RES.

The heating network is one of the few effective networks in the country. The project of the municipal company consisting in the comprehensive modernization of the Płońsk heating system in 2007 was awarded the global Energy Globe award. The total investment cost was over 8,5 mln euro. Płońsk was the first town in the country to invest in such a modern and comprehensive renewable green fuel energy.

Time period: 15.06.2006- 31.12.2007

Success factors

Over the period of 10 years of operation of the Heating Power Plant, approximately 2.3 million GJ of heat were produced and approx. 60 thousand. MWh of electricity. Around 250,000 were burned tons of biomass. Burning biomass, the amount of burnt coal was reduced by 125 thousand tone. It allowed to reduce the emission of:

- **Carbon dioxide - 275,000 tons,**
- **Sulfur dioxide - 1530 tons,**
- **Nitrogen oxides o - 450 tons,**
- **Dust - 3250 tons,**
- **Ashes - 17,500 tons.**

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

PŁOŃSK
MODERNIZATION OF THE HEATING SYSTEM OF PŁOŃSK

FINANCING

Investment costs	**8.430.500 EUR**
- Own sources - Subsidies (Ecofund) - Loan - National fund for environmental protection and water management; 10 years, interest rate 2%	1.154.500 EUR 2.819.750 EUR 4.456.250 EUR
Lifetime (service life	**25 years**
Annual operational costs (incl. repairs, maintenance and other specific costs	**12.000 EUR** **180.413,45 EUR**
Annual operational cost incl. salaries, repairs, maintenance and other specific costs	**42.766.825,75 EUR**
Annual revenues	**44.274.191,00 EUR**

Financial indicators	
Net present value - NPV	23 066 650,35 EUR
Internal rate ratio - IRR	109,12%
Payback period - simple	1 years
Payback period - discount	1 years
Evaluation year	2007
Lifetime period	25 years
Discount	4,00 %

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

PŁOŃSK
MODERNIZATION OF THE HEATING SYSTEM OF PŁOŃSK

BARRIERS ENCOUNTERED

- Lack of qualified engineering staff - necessity of employing a substitute investor - increase of investment costs,
- Difficulties in familiarizing with a similar, working installation,
- Negotiation of the amount and quality of loan collateral from National fund for environmental protection and water management - necessity of joining the City,
- Conviction of the City Council to establish collateral for a preferential loan from the National fund for environmental protection and water management
- Difficulties with complete financial closure - the need to obtain a trade credit,
- Ensuring decent working conditions for the crew during the implementation of the investment, in particular during the winter,
- Significant increase in prices of materials at the turn of 2006/2007 - convincing the contractor to continue the investment on contractual terms from 2005
- The problem with choosing a turbine,
- The problem with obtaining a license for electricity production and start-up of a combined heat and power plant.

Ways to deal with barriers

- Efficient coordination of activities, development of a plan, taking into account some flexibility in the implementation of investments, compliance with the schedule, support of the city.

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

PŁOŃSK

MODERNIZATION OF THE HEATING SYSTEM OF PŁOŃSK

Best Practice Factsheet #7

Key results

- Reduction of pollutant emissions due to the increased efficiency of production and combined economy as well as the replacement of calm with biomass
- Reduction of CO2 - 35.000 Mg / year, ie 77.2%
- Reduction of SO2 - 144 Mg / year, ie 63.8%
- Reduction of NOX - 54 Mg / year, i.e. 63.3%
- Reduction of Dust - 151 Mg / year, ie 76.7%
- Reduction of CO - 29.8 Mg / year, ie 19.3%
- Reduction of soot - 4.8 Mg / year, ie 76.5%
- Reduction of the emission of the secondary pollination from stored calm, whose storage inventory has decreased by approx. 50%
- Reduction in the amount of noise emitted - as a result of a smaller number of devices emitting noise located outside the building
- Reduction of solid waste (slag and ash) by approx. 65%.

CONTACT: Przedsiębiorstwo Energetyki Cieplnej Sp. Z o.o.
kontakt@pecplonsk.pll

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

Jelenia Góra, Poland

KAWKA - liquidation of the local heat source fired with solid fuel - the city of Jelenia Góra

DESCRIPTION OF THE ACTION

The main objective of the program is to reduce people's exposure to the impact of pollution, in particular PM10, PM2.5 and benzo(a)pyrene, threatening the health and life of people in zones in which there are significant exceedances of permissible and target concentration levels of these pollution and for which air protection programs have been developed.

National Fund for Environmental Protection and Water Management (NFEPWM) allocated 400 million zlotys to subsidies granted for this purpose by the Voivodship Funds for Environmental Protection and Water Management (VFEPWM).

By implementing this program in their regions, VFEPWM determines the conditions of the contest and the types of final beneficiaries who qualify to co-funding. The total amount of subsidies may be up to 90 percent of eligible costs (the remaining 10 percent must be covered by the beneficiary), of which up to 45 percent comes from NFEPWM subsidies, and another 45 percent from VFEPWM.

The beneficiaries of the majority of projects are self-governments, which allocate funds for the elimination of coal-fired heat sources in municipal buildings and houses belonging to individuals and housing communities. In many projects, the partners were local heating companies.

In most cases, the projects concerned connecting consumers previously using coal-fired boilers and ovens to urban heating, and replacing coal (individual and central) heating with gas heating. In many cases, multi-family buildings have also been subjected to thermo-modernisation in order to achieve savings in energy consumption and reduce heating costs. In several projects was planned the installation of solar collectors as emission-free sources for the production of hot water.

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

JELENIA GÓRA

KAWKA - LIQUIDATION OF THE LOCAL HEAT SOURCE FIRED WITH SOLID FUEL

Best Practice Factsheet #8

PARTNERS INVOLVED

- National and Voivodeship Fund for Environmental Protection and Water Management
- Direct beneficiary - property owner
- Beneficiary of aid funds: City of Jelenia Góra

Time period: 2013 - 2016

Success factors

This is the only program also targeted at individuals. It allows for support and includes a package of incentives available where the individual heating system is the main source of low emissions. The beginning of the program was preceded by an information and promotional campaign, including: publishing a brochure, organizing meetings, broadcasts on local radio and television, advertisements in the local press and on the website of the city of Jelenia Góra.

FINANCING

Investment costs Jelenia Góra	**10.397.041 PLN = ca. 2.475.486 EUR**
- **Own sources** **- participation of program participants**	**3.269.342 PLN = ca. 778.415 EUR**
- **Subsidies** **- VFEPWM in Wrocław (15%)**	**1.425.550 PLN = ca. 339.416,67 EUR**
- NFEPWM (45%)	**4.276.650 PLN = ca. 1 425 500 PLN = ca.**
- **Loan - from VFEPWM in Wrocław (15%)**	**1.425.500 PLN = ca. 339.405 EUR**

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

JELENIA GÓRA

KAWKA - LIQUIDATION OF THE LOCAL HEAT SOURCE FIRED WITH SOLID FUEL

Best Practice Factsheet #8

BARRIERS ENCOUNTERED

- Insufficient funds. Due to the very large interest in participating in the program, had to be created waiting lists.
- The decisive criterion for inclusion in the relevant list was the date when the inhabitants submitted their declaration of participation in the program. City of Jelenia Góra created regulations setting out detailed rules for granting co-financing.

KEY RESULTS

- Estimated reduction of CO2 emissions
- Reduction of low emissions through the elimination of over 500 sources fired by solid fuels.
- Estimated reduction of CO2 emissions: 134,000 Mg / year

Liquidation of emissions	PM 10 [Mg/year]	PM 2,5 [Mg/year]	CO_2 [Mg/year]
EFFECT Proposal I	2,47	2,34	296,60
EFFECT Proposal II	1,41	1,34	144,70
EFFECT Proposal III	1,47	1,39	149,64
EFFECT Proposal IV	3,72	3,53	372,11
EFFECT Proposal V	2,84	2,70	295,71
EFFECT Proposal VI	5,39	5,11	1344,99
EFFECT Proposal VII	4,99	4,71	515,15
Sum	**22,28**	**21,12**	**3118,90**

One of the results of the project was the thermomodernization of the building of the social welfare house "Pogodna jesień". Thermomodernization works for the entire building was performed, the roof was insulated.

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

JELENIA GÓRA

KAWKA - LIQUIDATION OF THE LOCAL HEAT SOURCE FIRED WITH SOLID FUEL

Best Practice Factsheet #8

KEY RESULTS

	Number of units [pcs.]	Value of co-financing [PLN]	The number of decommissioned coal / coke furnaces [pcs.]
Proposal I	28	274 967,00	56
Proposal I - thermomodernisation of building DPS "Pogodna Jesień" st. Lesna 3	-	680 000,00	-
Proposal II	35	308 016,74	53
Proposal III	36	392 282,92	59
Proposal IV	102	1 043 246,51	155
Proposal V	79	795 748,33	128
Proposal V - thermomodernisation of building st. Chrobrego 9	-	54 129,81	-
Proposal VI	163	1 733 264,49	270
Proposal VI - connection to the heating network st. Grottgera 6	-	13 221,28	-
Proposal VI - thermomodernisation of building st. Boguslawskiego 26	-	76 798,38	-
Proposal VII	154	1 756 023,61	235
Sum	**599**	**7 127 699,07**	**956**

CONTACT: Investment and Public Procurement Department City of Jelenia Góra
http://jeleniagora.pl/content/kawka-likwidacja-lokalnego-%C5%BAr%C3%B3d%C5%82-ciep%C5%82-opalanego-paliwem-sta%C5%82ym-1

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

BEST PRACTICE IN POLAND – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Modernization of 12 Mazovia hospitals

Energy efficiency measures implemented in the building: reducing energy used for heating water

Location:

City: Ciechanów, Dziekanów Leśny, Ostrołęka, Płock, Radom, Siedlce, Warszawa, Zagórze

Region: Masovian Voivodeship

Country: Poland

GoogleMaps link

https://goo.gl/maps/iWk6JJmcMYw

Partners involved:

- Marshal's Office of the Masovian Voivodeship, Jagiellońska 26, 03-719 Warsaw, Web: http://mazovia.pl/ - leader
- Specjalistyczny Szpital Wojewódzki w Ciechanowie, Powstańców Wielkopolskich 2, 06-400 Ciechanów Web: https://www.szpitalciechanow.com.pl/ - partner and beneficiary;
- Samodzielny Zespół Publicznych Zakładów Opieki Zdrowotnej im. "Dzieci Warszawy" w Dziekanowie Leśnym, M. Konopnickiej 65, 05-092 Łomianki Web: http://szpitaldziekanow.pl/ - partner and beneficiary;
- Samodzielny Zespół Publicznych Zakładów Opieki Zdrowotnej im. dr Józefa Psarskiego w Ostrołęce, Jana Pawła II Avenue 120A, 07-410 Ostrołęka, Web: http://www.szpital.ostroleka.pl/ - partner and beneficiary;
- Samodzielny Publiczny Zakład Opieki Zdrowotnej „Meditrans Ostrołęka" Stacja Pogotowia Ratunkowego i Transportu Sanitarnego w Ostrołęce, Kościuszki 49, 07-410 Ostrołęka Web: http://www.meditrans.ostroleka.pl/ - partner and beneficiary;
- Wojewódzki Szpital Zespolony w Płocku, Medyczna 19, 09-400 Płock Web: https://www.wszplock.pl/ - partner and beneficiary;
- Wojewódzki Szpital Specjalistyczny w Radomiu, Aleksandrowicza 5, 26–617 Radom Web: http://www.wss.com.pl/ - partner and beneficiary;
- Samodzielny Wojewódzki Publiczny Zespół Zakładów Psychiatrycznej Opieki Zdrowotnej, Krychnowicka 1, 26-607 Radom, Web: http://www.szpitalpsychiatryczny.radom.pl/ - partner and beneficiary;
- Mazowiecki Szpital Wojewódzki w Siedlcach Sp. z o.o., Poniatowskiego 26, 08-110 Siedlce, Web: http://szpital.siedlce.pl/ - partner and beneficiary;
- Wojewódzki Szpital Chirurgii Urazowej św. Anny SPZOZ, Barska 16/20 02-315 Warsaw Web: http://www.szpital-barska.pl/ - partner and beneficiary;
- Międzyleski Szpital Specjalistyczny w Warszawie, ul. Bursztynowa nr 2, 04-749 Warszawa Web: http://www.mssw.pl/ - partner and beneficiary;
- Samodzielny Zespół Publicznych Zakładów Opieki Zdrowotnej im. Prof. Dr. J. Bogdanowicza, Niekłańska 4/24, 03-924 Warsaw, Web: http://www.nieklanska.pl/ - partner and beneficiary;

- Mazowieckie Centrum Neuropsychiatrii Spółka z o.o. w Zagórzu nearby Warsaw, 05-462 Wiązowna Web: http://www.centrumzagorze.pl/ - partner and beneficiary;

Implementation year: 2011 – 2014

Photo:

Source:https://www.szpitalciechanow.com.pl/index.php/aktualnosci/inwestycje/274-budowa-systemu-energii-odnawialnej-kolektory-sloneczne-w-zakladach-opieki-zdrowotnej

YSTEM CHARACTERISTICS

Brief Description:

The subject of the investment was the use of renewable energy sources in hospitals in the Mazovian Voivodeship. Project activities increased the use of energy from renewable sources in hospitals in the Mazovian Voivodeship. Replacement of thermal energy sources was performed in order to meet the demand for domestic hot water. In three years, the energy efficiency of 12 treatment units increased and the emission of pollutants to the atmosphere was reduced.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: *[in EUR]* **7 871 289,32 EUR**

Sources of financing: the Swiss Fund

Electricity savings *(MWh/year):* **-**

Or fuel savings *(kg or m3 or kWh or GJ):* 3 577 924 kWh/year

Cost savings *(EUR/year):* 107 244,55 EUR/year

PROJECT IMPLEMENTATION BENEFITS

- Reduced CO2 emissions,
- Diversification of energy sources and increase of energy security,
- Improved quality of life and health of the inhabitants of the region,
- Improved comfort of use of buildings being the subject of the project,
- Saving the cost of maintaining hospital buildings - saved money is used to support other purposes.

ADDITIONAL INFORMATION

-

BEST PRACTICE IN POLAND – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Reconstruction of district heating system in Warka

Energy efficiency measures implemented in the building:
reducing heating demand: selecting efficient heating system;
reducing energy used for heating water;
installing smart metering system: controlling heat consumption, gas consumption

Location:

City: Warka

Region: Mazovia Region

Country: Poland

GoogleMaps link

https://www.google.pl/maps/place/Zakład+Usług+Komunalnych+w+Warce+Sp.+z+o.o./@51.7827251,21.1866149,17z/data=!3m1!4b1!4m5!3m4!1s0x4718e749d3ffffd3:0x856aa38417d71fd2!8m2!3d51.7827218!4d21.1888036

Partners involved:

- Zakład Usług Komunalnych w Warce Sp. z o.o. (Municipal Services in Warka Limited Liability Company)
  Farna 4 Street, 05-660 Warka
  http://zukwarka.pl/
  Role in the action: The Project Organizer (Representative)

Implementation year: 2013-2014

Photo:

Source: Zakład Usług Komunalnych w Warce Sp. z o.o. (Municipal Services in Warka Limited Liability Company)

SYSTEM CHARACTERISTICS

Brief Description*:*

The project scope comprises construction of double-duct heat distribution network built of D=50 - 200 pre insulated pipes (total length ca. 2400 m), reconstruction of existing 32 heat distribution units and construction of 6 new units, replacement of existing boilers with green boilers fitted with condensation economizers with efficiency 95-98%, construction of a solar system for domestic hot water purposes: 4 solar panels with absorber surface of 2,32 m^2, construction of a monitoring system.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 1 459 212,52 EUR

Sources of financing: internal funds, commercial banks

Electricity savings *(MWh/year):* 108,6 MWh/year

Or fuel savings *(kg or m3 or kWh or GJ):* 380 000 m^3/year

Cost savings *(EUR/year):* no information

PROJECT IMPLEMENTATION BENEFITS

Increasing the energy efficiency of the heating system

Reduction of primary energy consumption – 11 000 GJ/year

Reduction of CO_2, NO_2 and other pollutants by 619 Mg/year (about 15%)

Optimization of heat supply equipment service

ADDITIONAL INFORMATION

The installed system is also characterized by low thermal conductivity coefficient ≤ 0,024 W/m·K for pre-insulated pipes, high performance boiler station and heat distribution unit controls and monitoring system with wireless data transmission for unit and boilers performance data (temperature, pressure, flow, heat intake and gas consumption).

BEST PRACTICE IN POLAND – SMART METERING

BASIC INFORMATION

Title of the Best Practice

Energy Management System for Piastów Community

Energy efficiency measures implemented in the building: installing smart metering system: controlling electrical, thermal and room climate parameters.

Location:

City: Piastów

Region: Mazovian

Country: Poland

GoogleMaps link:

https://goo.gl/maps/JAf69km4v8C2

Implementation year: 2017

Photo: (of a smart metering components):

Source: PMG Sp. z o.o., al. Jana Pawła II nr 11/1018, 00-828 Warszawa

SYSTEM CHARACTERISTICS

Brief Description*:*

Before the implementation of the investment, a stocktaking was carried out. Stocktaking included energy consumption points, thermal centers, tariffs, large energy receivers, ventilation systems. The system is controlling electrical parameters (active power, reactive power, phase voltages, power frequency) with a frequency of 33 kHz, thermal parameters (supply and return temperature in heat centres) with a frequency of 5 Hz, room climate parameters (temperature, humidity and CO2 level) once per minute. As part of the energy management system, the customer has access to online measurement data (with 2-minute delay). The client receives reports in the chosen format (pdf, excel, html). Analyst at the Network Management Centre analyses the consumption profiles, quality parameters and performs operational activities towards the optimization of energy consumption.

Type of a building where a smart metering (SM) system is installed: schools, kindergarten, public offices, house of culture

Responsible person for monitoring consumption: Centrum Kompetencji Teraz Energia

Name of a company which installed the SM system: Teraz Energia sp. z o.o., Lisówek 20, 05-600 Grójec, https://terazenergia.pl/kontakt/

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: *[in EUR]* confidential

Sources of financing: confidential

Electricity savings *(MWh/year):* confidential

Or fuel savings *(kg or m3 or kWh or GJ):* confidential

Cost savings *(EUR/year):* 15% of invoice value for electricity and gas

PROJECT IMPLEMENTATION BENEFITS

This investment provides benefits such as monitoring, planning and control of electrical and thermal energy. The system enables better management of energy consumption and financial savings.

ADDITIONAL INFORMATION

-

BEST PRACTICE IN POLAND – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Ekowawer 100 kWp solar power plant supporting a system of heat pumps producing heat and cold for own purposes of storage and office halls

Energy efficiency measures implemented in the building: use of RES - installed PV panels

Location:

City: Warsaw

Region: Mazovia Region

Country: Poland

GoogleMaps link

https://www.google.pl/maps/place/Plastoma/@52.1941335,21.1401492,20.39z/data=!4m5!3m4!1s0x471ed2e6548b7d4b:0x9114dc9c62c53fad!8m2!3d52.1941867!4d21.1403544

https://www.google.pl/maps/place/Kol-Dental+Sp.+z+o.o.+Sp.k./@52.1942996,21.140672,17.31z/data=!4m5!3m4!1s0x471ed2e6e572ed35:0x4d3ed8dd5a53d9d7!8m2!3d52.194321!4d21.142487

Partner involved:

- Plastoma Michał Żydek
  Cylichowska 13/15 Street, 04-769 Warsaw
  Role in the action: The Project Organizer (Representative)

Implementation year: 2012-2013

Photo:

Source: Plastoma Michał Żydek

SYSTEM CHARACTERISTICS

Brief Description*:*

The objective of the project is the installation of PLASTOMA 100 kWp Photovoltaic System in Warsaw. The purpose this system is to produce electricity from renewable energy sources in order to reduce the operating costs of PLASTOMA storage building. The installation consists of 250 Wp photovoltaic modules.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 326 620 EUR

Sources of financing: internal funds, commercial banks

Electricity savings *(MWh/year):* 90,00956 MWh/year

Or fuel savings *(kg or m3 or kWh or GJ):* **-**

Cost savings*:* 8 400,69 EUR

PROJECT IMPLEMENTATION BENEFITS

Increasing energy efficiency

Reduction of emissions, respectively:

CO_2 – 90032,30 kg/year
SO_2 – 69,57 kg/year
NO_2 – 18402,68 kg/year
CO – 204,62 kg/year
Dust – 245,54 kg/year

ADDITIONAL INFORMATION

System efficiency is 37%, so the volume of limited energy was determined at 243 269,08 kWh/year.

BEST PRACTICE IN POLAND – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Thermo-modernisation of educational buildings

Energy efficiency measures implemented in the building: reducing heating demand: improving the insulation; reducing energy used for heating water

Location:

City: Warszawa

Region: Masovian Voivodeship

Country: Poland

GoogleMaps link

https://goo.gl/maps/uudypqaShb42

Partners involved:

- Capital City of Warsaw, Plac Bankowy 3/5, 00-950 Warsaw, Web: http://www.um.warszawa.pl/ - leader and beneficiary;
- Association „Towarzystwo AMICUS", Brukowa 28 lok. 8, 15-889 Białystok, Web: http://www.towarzystwoamicus.pl/ - partner in promotional and information matters under the project;
- Masovian Energy Agency Ltd., Bitwy Warszawskiej 1920 r. 3 lok. 300, 02-362 Warsaw, Web: http://www.mae.com.pl - partner in promotional and information matters under the project;

Implementation year: 2011 – 2014

Photo:

Source:https://www.geodruid.com/intl/es/place/2712381-technikum-fototechniczne-szkoa-warszawa-polska

SYSTEM CHARACTERISTICS

Brief Description:

The investment included thermal modernization of selected educational buildings in the Capital City of Warsaw. Warsaw. Through this undertaking, energy efficiency has improved in 4 educational facilities. During the investment, the sources of thermal energy were replaced for satisfying the needs for domestic hot water as well as thermo-modernization works aimed at reducing the energy consumption of buildings. There was an increase in the amount of energy generated from RES, as well as a reduction in the amount of greenhouse gas emissions.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: *[in EUR]* 1 754 976,77 EUR

Sources of financing: The European Regional Development Fund

Electricity savings *(MWh/year):* **-**

Or fuel savings *(kg or m3 or kWh or GJ):* 9 262,02 GJ/year

Cost savings *(EUR/year):* 51 299,95 EUR/year

PROJECT IMPLEMENTATION BENEFITS

- Reduced CO2 emissions,
- Diversification of energy sources and increase of energy security,
- Improved comfort of use of buildings being the subject of the project,
- Improved visual appearance of public buildings.

ADDITIONAL INFORMATION

-

BEST PRACTICE IN POLAND – SMART METERING

BASIC INFORMATION

Title of the Best Practice

Monitoring of energy consumption and costs of energy at the educational facilities of the capital city of Warsaw

Energy efficiency measures implemented in the building:

installing smart metering system: controlling electricity consumption, controlling heat consumption, gas consumption, water consumption

Location:

City: Warsaw

Region: Mazovia Region

Country: Poland

GoogleMaps link

https://www.google.pl/maps/dir//Urząd+Miasta+Stołecznego+Warszawy,+plac+Bankowy+3%2F5,+00-950+Warszawa/@52.2429011,20.9999671,19.17z/data=!4m8!4m7!1m0!1m5!1m1!1s0x471ecc63245124e7:0x3456bc63ac8f2fe6!2m2!1d21.00042!2d52.243016

Partners involved:

Name: Office of the capital city of Warsaw

Address: Plac Bankowy Street 3/5, 00-950 Warsaw

Website: http://www.um.warszawa.pl/

Role in the action: The Project Organizer (Representative) responsible for implementing the investment

Implementation year: 2009 (continuously developed)

Photo:

Smart meter from the monitored system. Source: Office of the capital city of Warsaw

SYSTEM CHARACTERISTICS

Brief Description*:*

The solution consists of obtaining electricity, district heat, gas and water metering devices from the operators, based on previously correlated operator databases with identification data provided by the local government. The system covers 1167 educational facilities with 900 power meters, 423 district heat supply agreements and 622 gas meters. The collected data is used for conducting studies on ordered power optimization, energy consumption and energy management evaluation.

Type of a building where a smart metering (SM) system is installed:

Educational buildings

Responsible person for monitoring consumption:

Maciej Dadun – main specialist in infrastructure development policy at the Office of the capital city of Warsaw

More information: edadun@um.warszawa.pl

Name of a company which installed the SM system:

Name: Office of the Infrastructure of the Office of the Capital City Warsaw

Address: Marszałkowska 77/79 Street , 00-683 Warsaw

Contact: phone: 22 443 35 96 , email: infrastruktura@um.warszawa.pl

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: *[in EUR]* 20 945 457,93 EUR

Sources of financing: internal funds (budget of the capital city of Warsaw) Monitoring is performed as part of the official duties of employees of the Infrastructure Office.

Electricity savings *(MWh/year):* approx. 17 586,21

Or fuel savings *(kg or m3 or kWh or GJ):*

Cost savings *(EUR/year):* 2 562 848,02

PROJECT IMPLEMENTATION BENEFITS

There are increased options for energy consumption analysis at educational facilities and overall energy management assessment at facilities with the same functionality. Innovative aspect of the method consists of data acquisition at source – minimizing error. Metering instrument status can be fully verified on an ongoing basis. The implemented solution eliminates inefficient and inaccurate acquisition of data from about 30 thousand invoices a year. The comfort of building use is improved. The energy consumption and CO_2 emission is reduced. Social impact of the project applies to knowledge for facility managers and district technical services, enabling them to compare energy consumption values for facilities with the same functions and raising awareness of efficient energy management in facilities.

ADDITIONAL INFORMATION

The implementation of the investment caused:

- sharing experiences on energy management in facilities,
- reasonable allocation of funds to overhauls and refurbishments,
- ability to accurately identify the savings potential in terms of assets and costs.

4.7 Slovenia

Loški Potok, Slovenia
Wood Cooperative Loški potok: District heating with wood biomass in Hrib center

DESCRIPTION OF THE ACTION

The area of the municipality of Loški potok is 134.5 km2 and has less than 2.000 inhabitants, 88% of the area is covered with forest.
Objective: By the year 2025, the municipality of Loški Potok should become energetically self-sufficient, with all the energy gained from renewable sources.
Planed activities:

- District heating with wood biomass (cooperative)
- Exploitation of wind potential (cooperative)
- Public transport with electric vehicles

The reason for the establishment of a wood co-operative:

There are several reasons, but the most important one is that Wood cooperative Loški Potok should work for the benefit of the locals, carrying out activities that encourage the use of renewable energy sources and the development of the green economy.

Time period: 2016 onwards

Barriers encountered:

- **The most difficult problem in the construction was the changing karst terrain, since it was necessary to place storage for chips (approx. 150m3) under the boiler room.**

Excavation for wood chips storage

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

LOŠKI POTOK

DISTRICT HEATING WITH WOOD BIOMASS IN HRIB CENTER

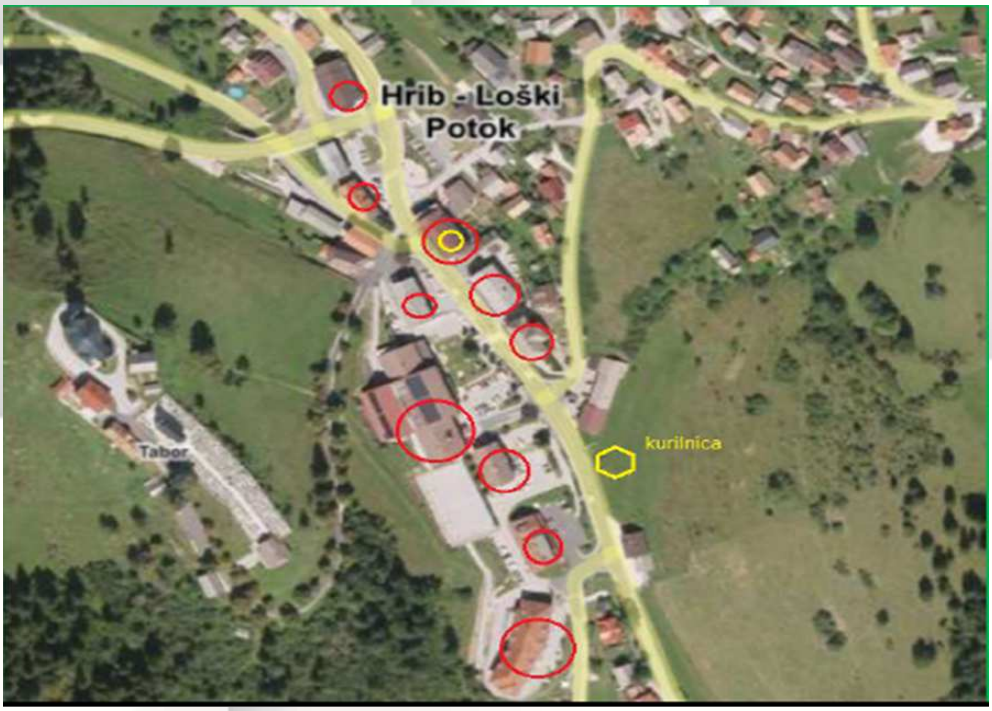
Best Practice Factsheet #4

DESCRIPTION OF THE ACTION

The settlement Hrib is in the middle of a forest area, with a lot of poor quality wood that foresters can not use. The harvest costs more than the wood, so usually this wood remains in the forest. But it can be used for wood chips and in this way energy money remains in the local environment, thus following the commitments of Slovenia to the EU on the transition to renewable sources. Since combustion causes a problem with hard particles, the Institut "Jožef Stefan" developed the particle filter for small combustion plants – also the district heating with wood biomass will be equipped with such a filter.

The Wood Cooperative Loški potok acquired in 2016 a concession for the construction of the district heating with wood biomass for the center of Hrib and then successfully applied to the public tender of the Ministry of Infrastructure for subsidies for the use of renewable resources DO OVE 2016.

At the end of November 2017, district heating on wood biomass (chips) for the center of Hrib started to function. Currently the heating is used for 11 buildings, most of them are public (an elderly home, 2 shops, a health center, a school, a municipality building, office building with post office, Cultural and tourism center, the Pri Birtku Inn, the Marin Inn and the multi-apartment building Hrib 7). The investor is the Wood Cooperative Loški Potok, which invested some 800,000 euros in this project, 70% were grants. The cooperative was given a concession for 15 years, after which the entire system will be passed to the municipality Loški potok.



Municipal facilities connected to district heating with biomass

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

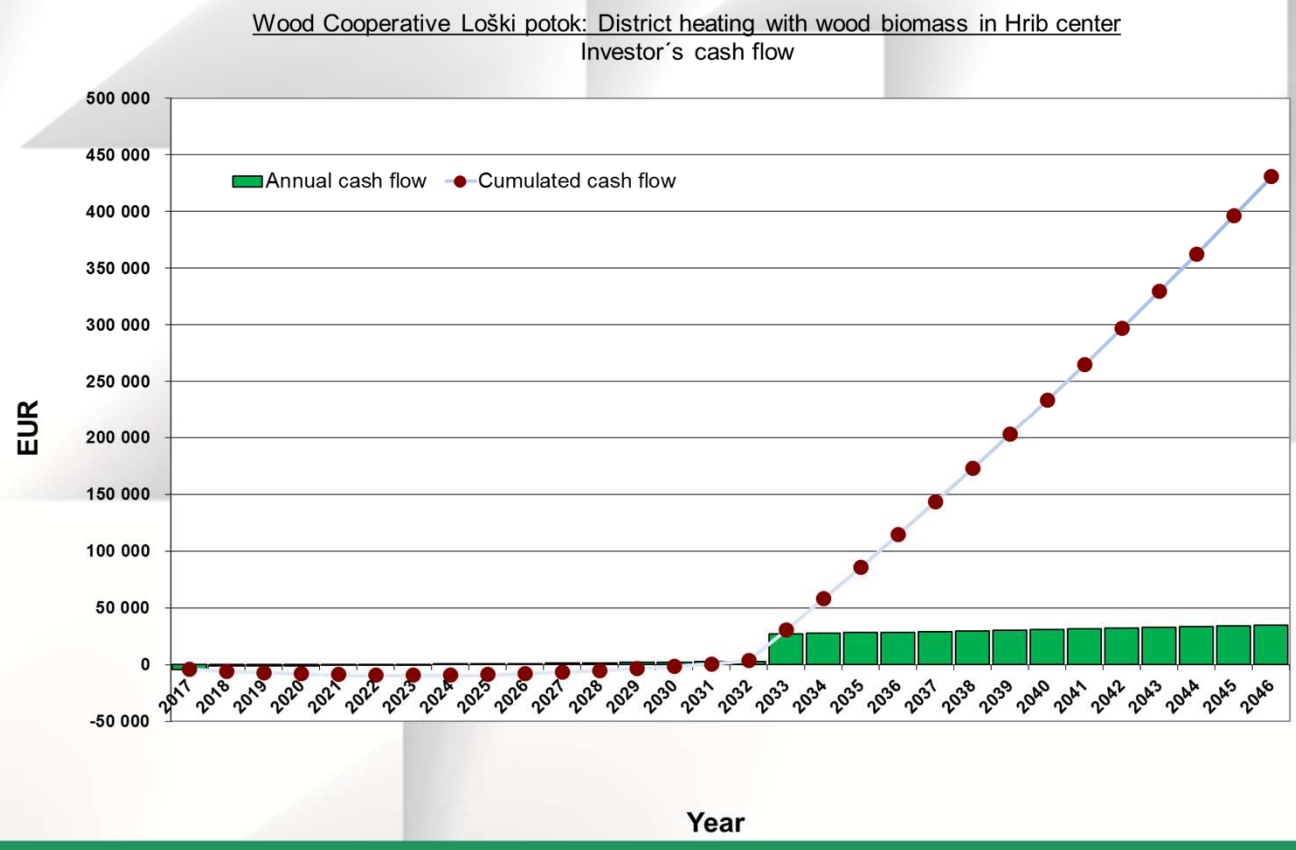
LOŠKI POTOK

DISTRICT HEATING WITH WOOD BIOMASS IN HRIB CENTER

FINANCING

Investment costs	**798.000 EUR**
- Own sources	**10.000 EUR**
- Subsidies (Ministry of Infrastructure) - 65%	**518.000 EUR**
Loan - payment period 15 years, interest rate 3,75% + 3 month Euribor rate	**270.000 EUR**
Lifetime (service life	**30 - 50 years**
Annual operational costs (incl. energy, maintenance and operating costs	**43.200 EUR**
Annual revenues – sale of heat	**65.000 EUR**

Financial indicators	
Net present value - NPV	219 193,72 EUR
Internal rate ratio - IRR	21,93%
Payback period - simple	14 years
Payback period - discount	16 years
Evaluation year	2017
Lifetime period	30 years
Discount	3,00 %



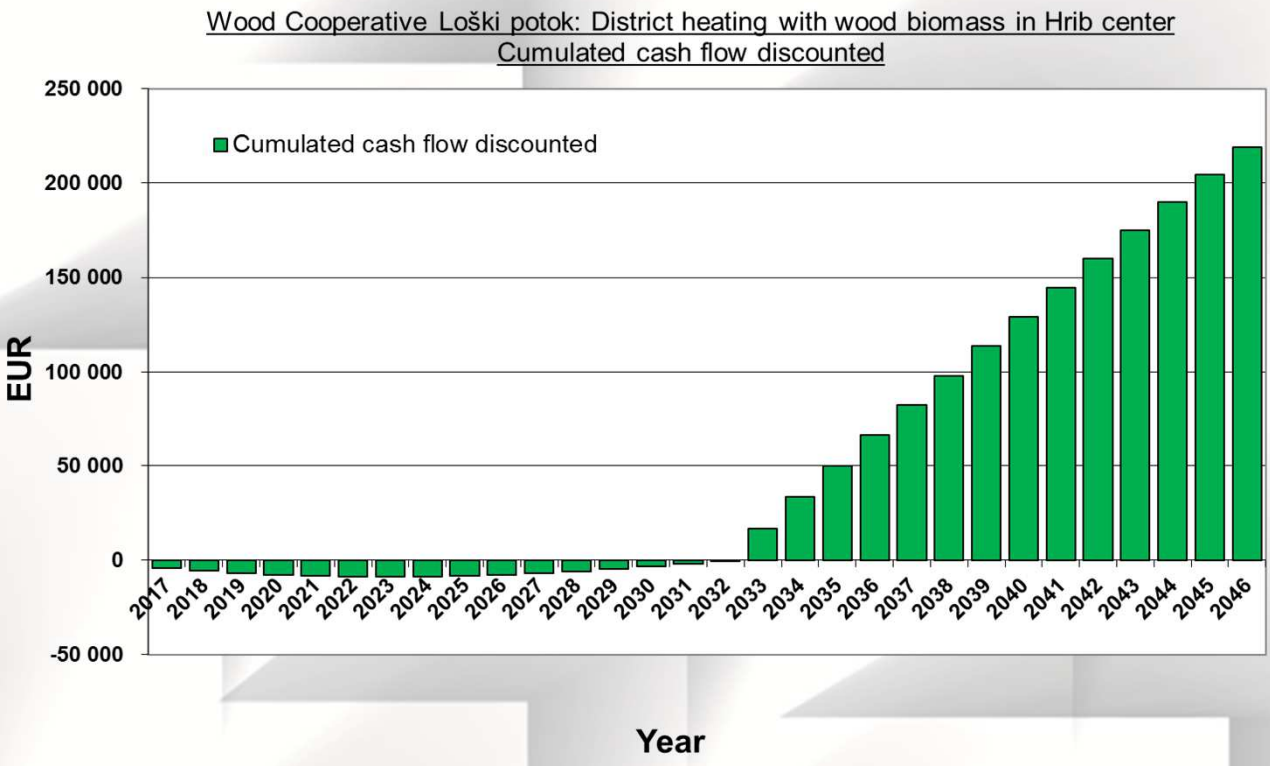
Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

LOŠKI POTOK

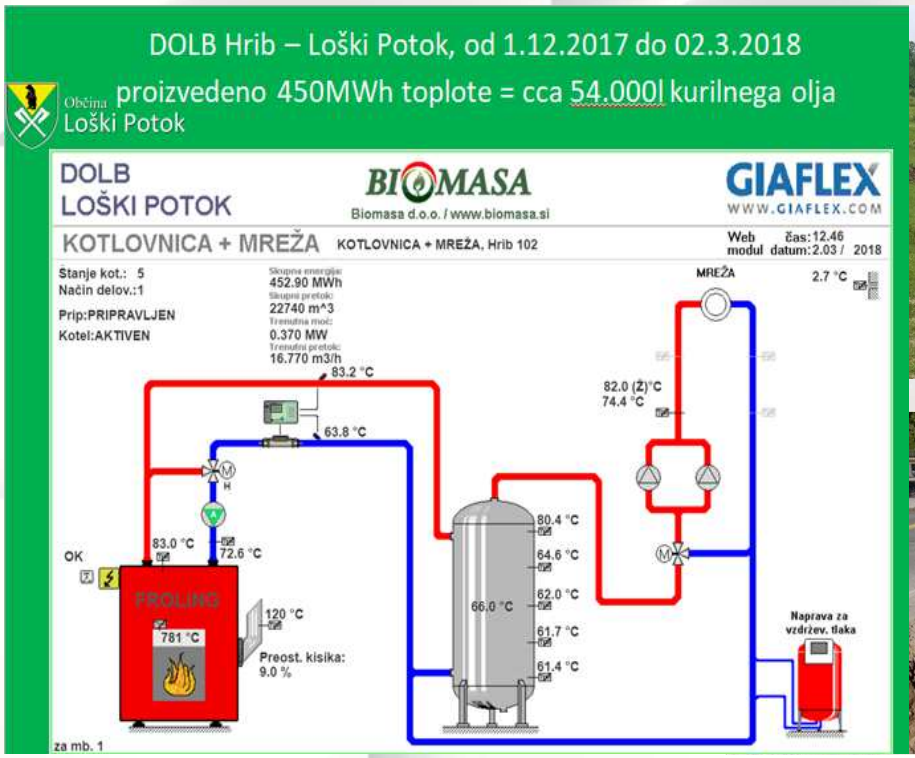
DISTRICT HEATING WITH WOOD BIOMASS IN HRIB CENTER

Best Practice Factsheet #4

FINANCING



PICTURES



Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

LOŠKI POTOK

DISTRICT HEATING WITH WOOD BIOMASS IN HRIB CENTER

Best Practice Factsheet #4

KEY RESULTS

- 11 facilities are connected to the district heating system, the largest heat consumers are public buildings (both shops and restaurants are privately owned).
- Since October 2017, the cooperative also manages the local post office 1318 Loški Potok, which would otherwise be closed.
- The Wood Cooperative successfully applied for a public tender for cutting wood in state forests for the period until the end of 2018.

Success factor

- **The heating season lasts 300 days a year and 90 000 liters of heating oil is used for municipal facilities**

PARTNERS INVOLVED

- Municipality of Loški potok
- Ministry of infrastructure
- Members of the cooperative

CONTACTS: Director Darko Šega
darko.sega@gmail.com

Project supported by the Interreg CENTRAL EUROPE Programme and funded under the European Regional Development Fund.

BEST PRACTICE IN SLOVENIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Energy renovation of 7 buildings of Kindergarten Ptuj with the co-financing share of 85% from the European cohesion fund

Energy efficiency measures implemented in the building:

Aim of reducing energy consumption for heating: to reach foreseen savings, measures on the buildings envelope were implemented – windows, façade, attic.

Location:

City: Ptuj

Region:

Country: Slovenia

GoogleMaps link:

https://www.google.com/maps/@46.4204869,15.8799756,15z

Partners involved:

LEA Spodnje Podravje, Prešernova ulica 18, 2250 Ptuj; info@lea-ptuj.si: Responsible for the Slovenian pilot action "Energy renovation of 7 buildings of Kindergarten Ptuj" in the project ZEROCO2 https://www.interregeurope.eu/zeroco2/

Implementation year: 2013 to 2014

Photos:

(Source:

https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1499847144.pdf)

SYSTEM CHARACTERISTICS

Brief Description*:*

Kindergarten Ptuj comprises 10 buildings. In the implemented action were renovated 7 buildings with the total heating surface of 4,408 m2. High consumption of energy for heating and a bad condition of

the buildings envelope (windows, ceilings, and facades) were the reasons for the renovation. Implementation of measures on the buildings envelope: Windows (935 m2)
Façade (2323 m2)
Attic (4408 m2)

Duration: October 2013 – August 2014.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 1.028.130 EUR

Sources of financing:

Co-financing 749.712 EUR (European cohesion fund)

Other funding's Local community – own sources

Electricity savings (MWh/year**): 544.5 MWh/year**

Or fuel savings (kg or m3 or kWh or GJ): **-**

Cost savings (EUR/year): NA

PROJECT IMPLEMENTATION BENEFITS

It's a remarkable case of a good practice (on a municipal level) in terms of improving and ensuring environmentally friendly and energy-efficient spatial conditions for children in the context of educational process and improving working conditions for employees. These renovations can be easy transferred into other regions.

ADDITIONAL INFORMATION

This best practice is part of the Interreg Europe project ZEROCO2 and is included together with other best practices in the report "Regional Policy Reports: Regional Policies and Best Practices COMMON STUDY".

BEST PRACTICE IN SLOVENIA – SMART METERING

BASIC INFORMATION

Title of the Best Practice

Smart metering system in public building "Music Scholl Fran Korun Koželjski Velenje"

Energy efficiency measures implemented in the building: installing smart metering system: controlling electricity consumption, heat consumption, water consumption

Location:

City: Velenje

Region: Savinjsko-Šaleška region

Country: Slovenia

GoogleMaps link:

https://goo.gl/maps/9YGipfGnHpF2

Partners involved:

- Municipality of Velenje, Titov trga 1, 3320, Velenje, www.velenje.si; role: partner in BOOSTEE project, owner of the building, investor
- *ADESCO d.o.o., Koroška cesta 37a, 3320 Velenje;* www.adesco.si*;* role*:* external expert for implementation of smart metering in the public building
- SI Jernej Britovšek s.p.; Topolšica 94; 3326 Topolšica, role: external expert for preparation of initial, second phase and final study of the results DT1.3.3_Preliminary energy audit with integrated measures and inventories to address the identified deficiencies

Implementation year: 2018

Photos:

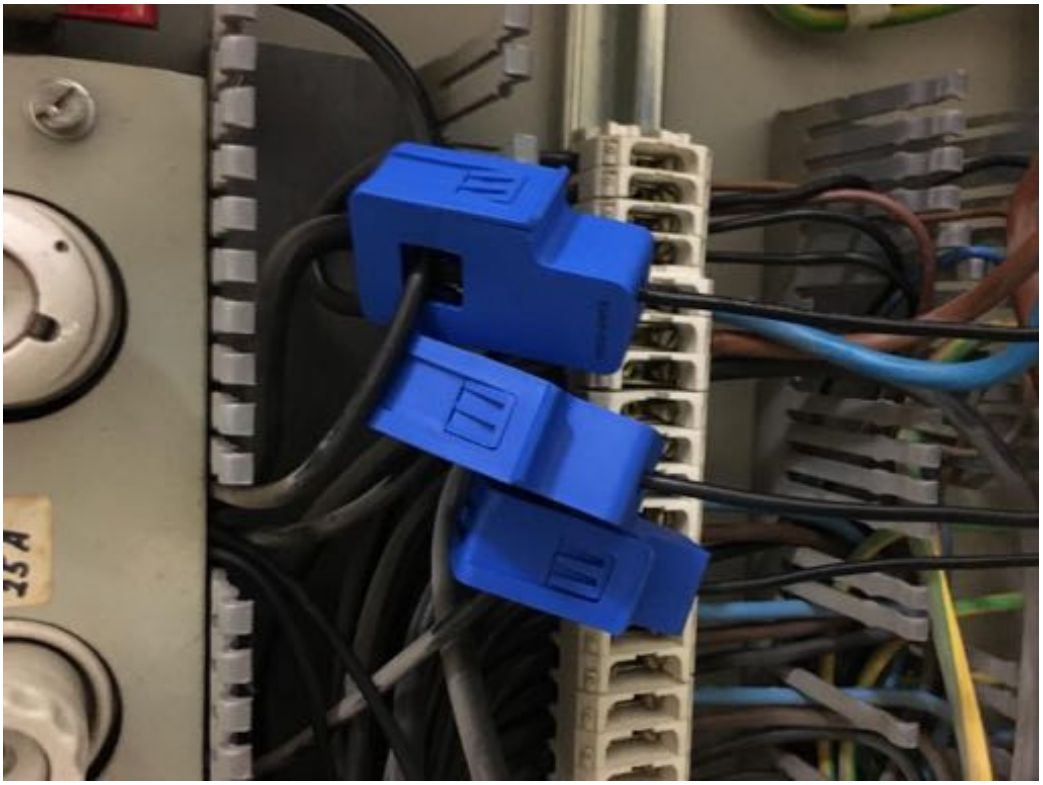
- **of a smart metering components:**


CF Echo II
2018 - 18763260
interreg


CF Echo II
ENERKON
2018 - 18764154
interreg
CENTRAL EUROPE
BOOSTEE-CE


CF Echo II
ENERKON
2018 - 18763260
interreg
CENTRAL EUROPE
BOOSTEE-CE


CF Echo II
interreg



[Source: ADESCO d.o.o.]

SYSTEM CHARACTERISTICS

Brief Description*:*

Within the pilot action, Municipality Velenje with help of selected external experts, installed the smart meters in the Music Scholl Fran Korun Koželjski Velenje. 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. The partnership is also developing a web-based platform called OnePlace, which will help other municipalities, and building operators to finance, develop and use such solutions in the future.

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. In September 2018, the first intermediate results were identified within the 2nd study. …More in chapter PROJECT IMPLEMENTATION BENEFITS.

Type of a building where a smart metering (SM) system is installed: Public- Educational

Responsible person for monitoring consumption: Mr. Bogdan Jug, head of maintenance

Name of a company which installed the SM system: ADESCO d.o.o., Koroška cesta 37a, 3320 Velenje; Contact 00386 590 79 962, info@adesco.si, www.adesco.si

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 14.823,00 €

Sources of financing: 15% - internal- municipal; 85% -EU funds –project BOOSTEE-CE Interreg Central Europe. Project BOOSTEE aims to increase energy efficiency in public buildings through smart energy management.

Electricity savings (MWh/year):

-

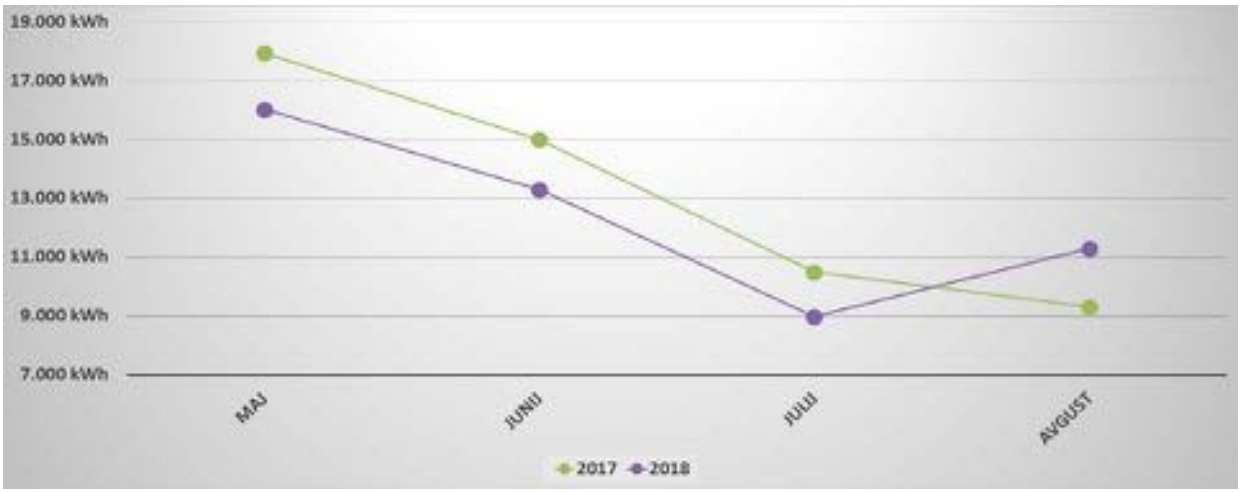
Or fuel savings (kg or m3 or kWh or GJ):

-

Cost savings (EUR/year):

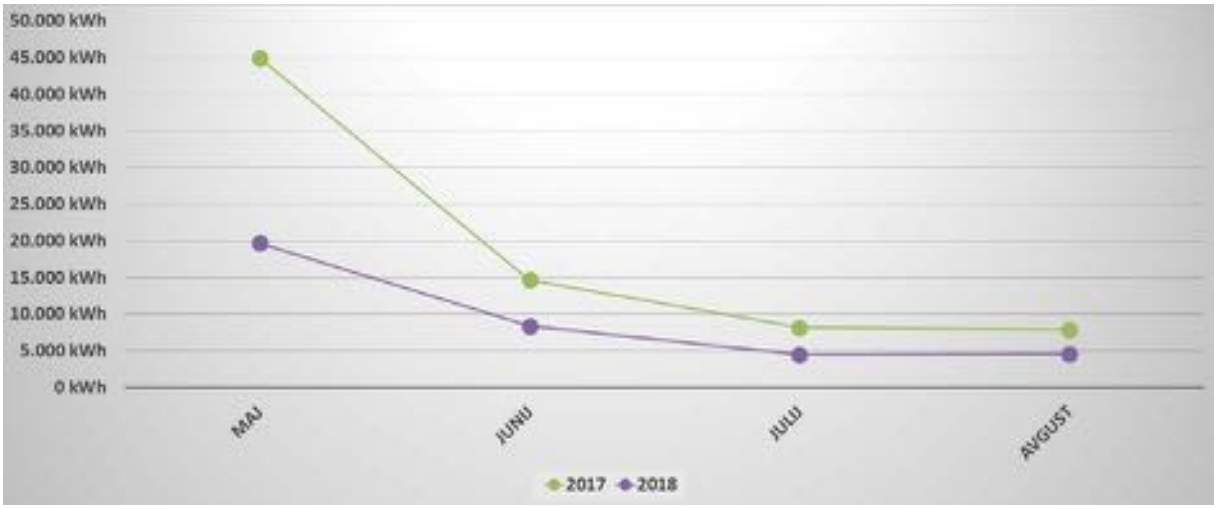
Comparison of ELECTRICITY consumption (period May –August 2017; May-August 2018)

	2017	2018	Comparison
	(kWh)	(kWh)	%
May	17.945	16.020	-10,7%
June	14.997	13.295	-11,3%
July	10.505	8.982	-14,5%
August	9.323	11.298	+21,2%
Total	**52.770**	**49.595**	**-6,0 %**



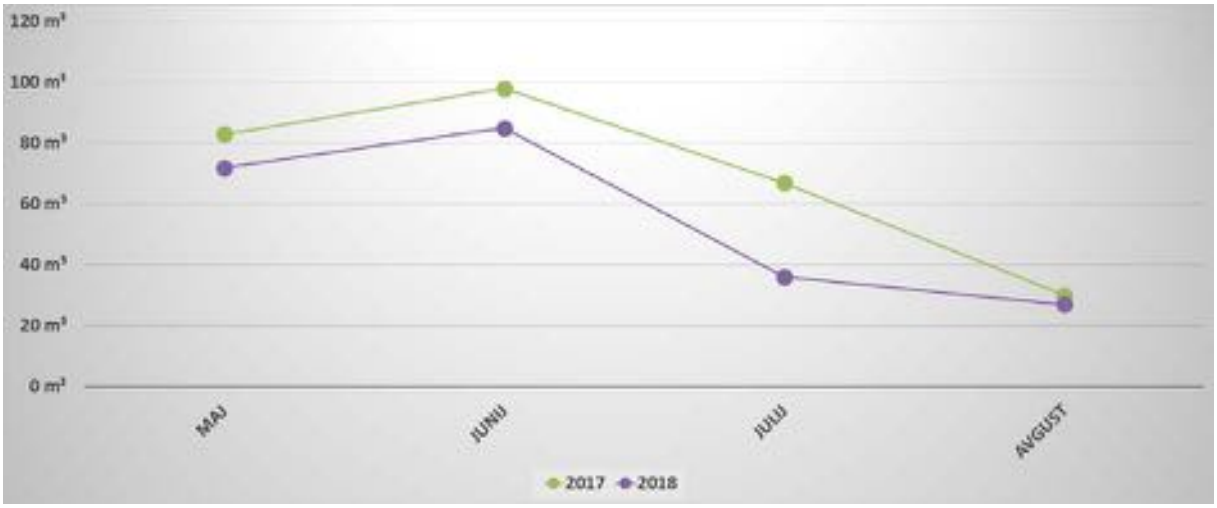
Comparison of HEAT consumption (period May –August 2017; May-August 2018)

	2017	2018	Comparison
	(kWh)	(kWh)	%
May	45.000	19.700	-56,2%
June	14.700	8.400	-42,9%
July	8.200	4.500	-45,1%
August	7.900	4.600	-41,8%
TOTAL	**75.800**	**37.200**	**-50,9%**



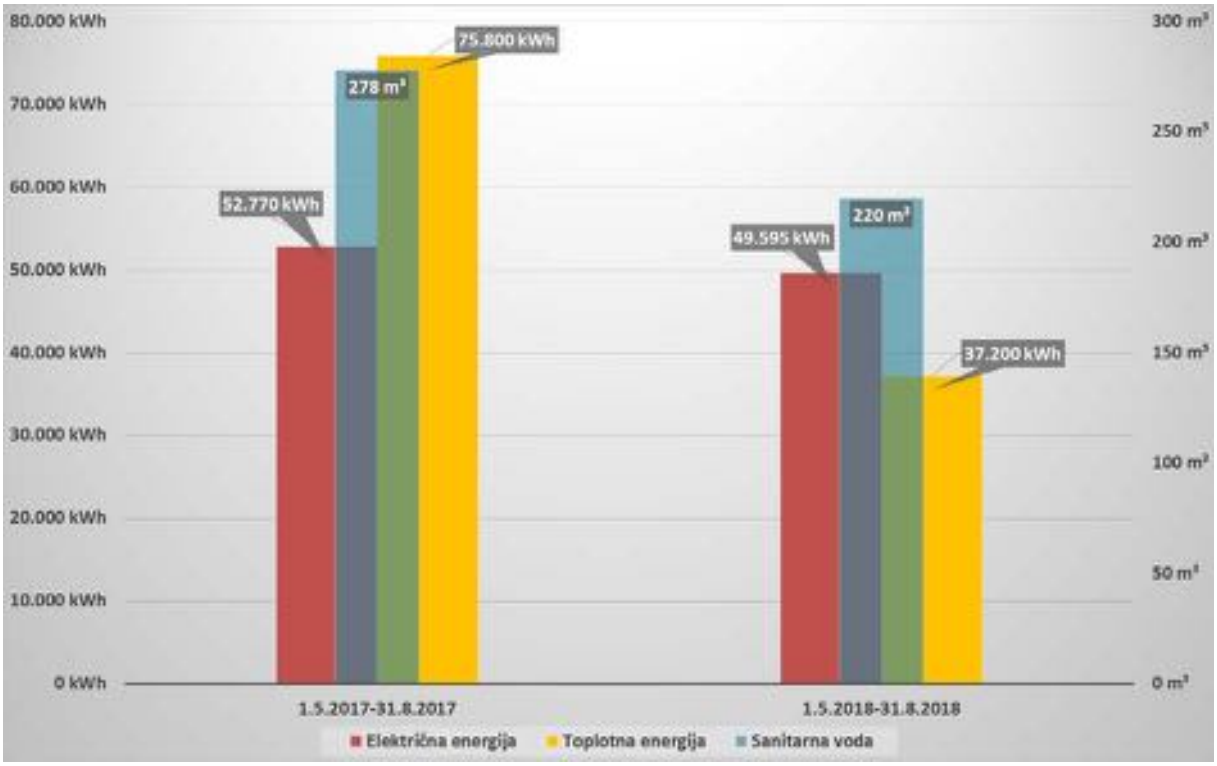
Comparison of WATER consumption (period May –August 2017; May-August 2018)

	2017	2018	Comparison
	(m^3)	(m^3)	%
May	83	72	-13,3%
June	98	85	-13,3%
July	67	36	-46,3%
August	30	27	-10,0%
TOTAL	**278**	**220**	**-20,9%**



ENERGY CONSUMPTION INDICATORS

	Electricity	Heat	Water
	(kWh)	(kWh)	(m^3)
1.5.2017 - 31.8.2017	**52.770 kWh**	**75.800 kWh**	**278 m^3**
1.5.2018 - 31.8.2018	**49.595 kWh**	**37.200 kWh**	**220 m^3**
Reduction of consumption in %	**6,0%**	**50,9%**	**20,9%**



PROJECT IMPLEMENTATION BENEFITS

The activities of pilot action to improve energy efficiency were implemented in the public building Music school Fran Korun Koželjski Velenje built in 1987 (newer part of building built in 1998). Municipality of Velenje is the owner of the building and responsible for the implementation of pilot action. The school has 47 classrooms and five halls on 6360 m2. Due to its large spatial dimensions, it is extremely suitable for conducting major concerts, competitions, instructions and summer schools. The building is supplied with heat from the municipal heating network. The energy consumption of the building has been identified at 758 970 kWh/year for heating, while the electricity consumption is 201 629.10 kWh/year.

Main benefits and positive impacts of the pilot are:

- improvement of the energy performance, saving and efficiency of the building
- monitoring buildings data
- increasing the comfort of the building use
- easier operation of the building
- promoting and disseminating knowledge about energy efficiency measures in building

In September 2018, the first intermediate results were identified within the elaborated study. The results of the reduction of electricity and heat consumption are shown in the chapter FINANCIAL SOURCES AND FINANCING DETAILS

BEST PRACTICE IN SLOVENIA – SMART METERING

BASIC INFORMATION

Title of the Best Practice

Transnational Holistic Ecosystem 4 Better Energy Efficiency Through Social Innovation – THE4BEES project

Energy efficiency measures implemented in the building: installing sensor system to upgrade and expand existing energy management systems to stimulate virtuous energy behavior amongst students

Location:

City: Velenje

Region: Savinjsko-Šaleška region

Country: Slovenia

GoogleMaps link:

https://www.google.com/maps/place/Šolski+center+Velenje/@46.3617418,15.1114242,793m/data=!3m1!1e3!4m5!3m4!1s0x476566d5a87c506f:0x96dc8aaac2424d48!8m2!3d46.3617381!4d15.1136129

Partners involved:

- Zavod Energetska Agencija za Savinjsko, Šaleško in Koroško (Zavod KSSENA), Koroška cesta 37, 3320 Velenje; http://www.kssena.si/; role: partner in THE4BEES project

- E-Zavod, zavod za projektno svetovanje, raziskovanje in razvoj celovitih rešitev, Čučkova ulica 5, 2250 Ptuj; https://www.ezavod.si/; role: partner in THE4BEES project

- Municipality of Velenje, Titov trga 1, 3320, Velenje, www.velenje.si; role: observer in THE4BEES project

Implementation year: 2017 - 2018

Photo:

- **of a smart metering components:**

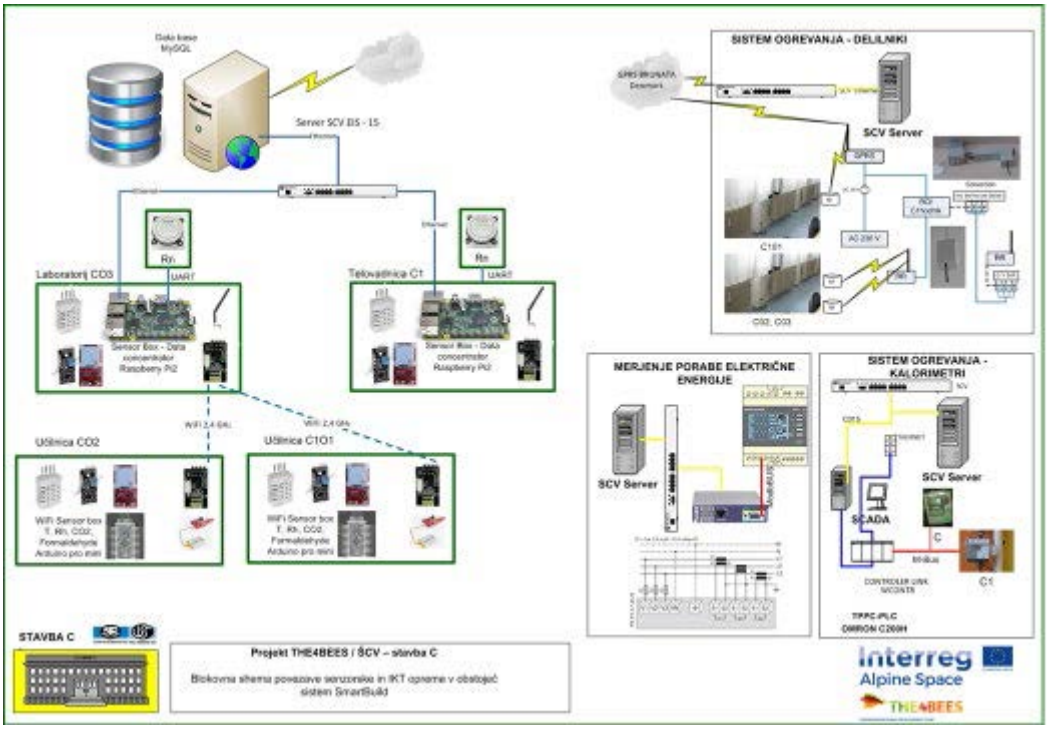


Figure 1: Schematic presentation of the sensing network used in ŠCV [Source: THE4BEES archive]

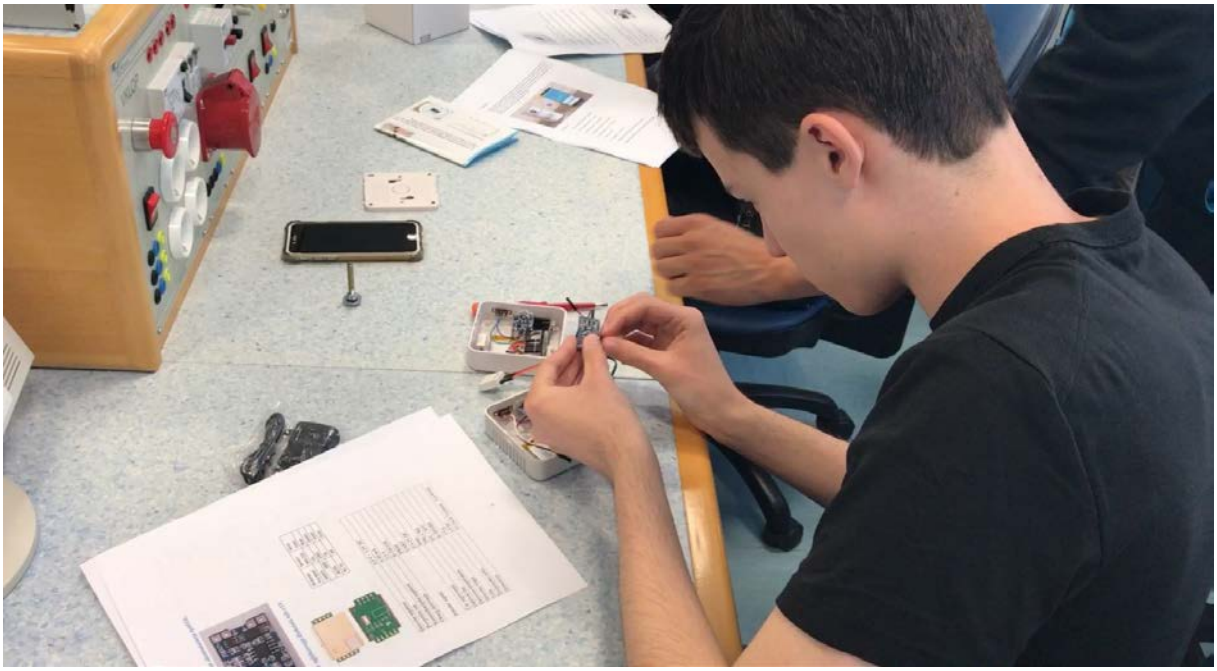


Figure 2: Building sensor box [Source: THE4BEES archive]

Figure 3: ENIoTOR sensor box-Arduino (left) and data concentrator-Raspberry Pi (right) [Source: THE4BEES archive]

Figure 4: Testing sensor system [Source: THE4BEES archive]

Figure 5: Testing sensor system [Source: THE4BEES archive]

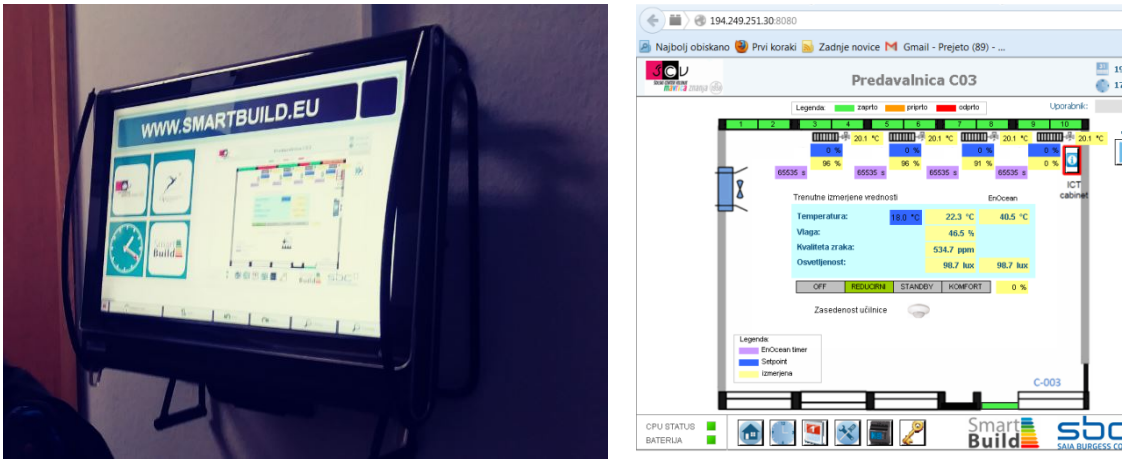


Figure 6: Graphical display of sensor and actuator equipment in classroom [Source: THE4BEES archive]

SYSTEM CHARACTERISTICS

Brief Description:

In the Slovenian pilot, carried out primarily within the premises of 6 buildings of the School center Velenje (ŠCV), the focus of the measurements were microclimate parameters and indoor air quality in general. The sensor network monitored:

- Indoor air temperature
- Humidity
- CO2
- Radon
- Formaldehyde

The sensor equipment was installed in 6 classrooms, 2 rooms used primarily for sport education and occasional cultural events and 2 offices.
For providing the data on energy use, the pilot utilized the capacities of the existing energy monitoring system of the ŠCV, which was established in several past projects and initiatives and was repurposed within THE4BEES. In this respect, the sensor network also provided data on the consumption of energy for heating as well as electrical energy consumption in several rooms. The monitored data was collected on several levels and interfaces. For example both energy for heating and electricity were provided on the level of the individual buildings, as well as for individual classrooms, either with a sampling rate of one read-out per 5 minute interval (electricity) or on a weekly basis (heat).

Type of a building where a smart metering (SM) system is installed: Public- Educational

Responsible person for monitoring consumption: Cveto Fendre, School center Velenje (ŠCV)

Name of a company which installed the SM system:

The sensor equipment was primarily installed and calibrated at the Interbussiness educational center (MIC) Velenje, located at Koroška cesta 62a, 3320 Velenje, the location of Co-creation lab events.

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 25.000 €
Equipment approx. 12.500 €
Development, manufacture, installation, calibration and operation of sesor system and mentoring of students approx. 12.500 €.

Sources of financing: Project THE4BEES Interreg Alpine Space

Electricity savings (MWh/year): Considering the unreliability of the schools energy management system to provide on regular basses data on energy use, it was not possible to claim a quantifiable reduction of energy use. Some specific cases documented a reduction of up to 20% (combined heat and electricity).

Or fuel savings (kg or m3 or kWh or GJ): -

Cost savings (EUR/year): -

***Pilot in Sondrio, Italy:**
Savings in electricity consumption, related to behavior, were about 15-20% and consumption shift in the cheaper time

***Pilot in Fribourg, Switzerland:**
Lighting consumption 23% to 56% decrease
Electricity savings 12% to 37 %

PROJECT IMPLEMENTATION BENEFITS

THE4BEES was focused on the behavioural changes of users in public buildings needed to achieve reduction of energy consumption originated by the use of innovative ICT applications.
A wide array of monitoring equipment has been installed that included adequate measuring devices, a control system in heat stations, a personal computer with a connection to the web and electronic energy info points which were used to display different types of data. This sensing network was placed within a pre-existing energy management system in buildings of the ŠCV and MIC. This existing capacity allowed for the introduction of additional measurements, focused particularly on indoor air quality and microclimate parameters (thermal comfort) to be installed within THE4BEES project.
Direct feedback to pupils and teachers was available via info point system and mobile app.

The users were informed about correct procedures connected to the measured parameters:
Excessive temperature of indoor air quality
☐action: reduce heating, switch of/reduce energy flow by thermostatic valves

Poor indoor air quality
☐Brief Natural ventilation
☐Activate ventilation system

Project impact:
Improved air quality in rooms:
- Reduced levels of CO2/reduced time exposure to high CO2 concentrations
- Avoid increased levels of radon gas
- Avoid increased levels of formaldehyde gas

Improved microclimate parameters in rooms:
- Increased levels of relative humidity/avoid dry air in winter
- Decrease levels of air flow/draft (when windows open/tilted for a prolonged period)

Decreased/optimized energy consumption
- Optimized ventilation (natural) should improve the efficiency of the heating system and reduce energy consumption

Both sensor boxes and the data concentrators failed to work on several occasion. Also the schools energy management system stopped to send data on energy use on several occasions.
Considering the limitations described above it was not possible to claim a quantifiable reduction of energy use. Some specific cases documented a reduction of up to 20% (combined heat and electricity).

ADDITIONAL INFORMATION

Measurement of different parameters and monitoring results proved to be very useful, as it pointed out problems to be solved, such as high level of radon in certain classroom.

Students felt very engaged and excited about the project, especially because they were involved in all activities from its beginning. They were very enthusiastic that they build sensors boxes by themselves and for that reason they were more motivated to monitor the performance of the sensor system as well as to present project to their classmates and impact on their behavioural changes.

The physical presence of monitoring equipment has been positively experienced as a continuous solicitation to pay attention to the energy saving issue.

BEST PRACTICE IN SLOVENIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Utilization of low temperature excess heat from hydro-power plant Fala, for space heating at the on-site technical museum.

Energy efficiency measures implemented in the building:

The implemented system enables low temperature waste heat recovery from plants cooling processes, using heat pumps. The captured heat is then used for heating the on-site Fala museum premises.

The implementation process involved research, planning, design and technical implementation and monitoring phases.

First a feasibility study was developed utilizing decision support system and waste heat calculator developed as part of Interreg CE HEAT project, to assess technical and financial feasibility of the envisaged project. Based on positive results, project plans were prepared, followed by the technical implementation of the system.

Since this kind of system is one of the first in the sector a monitoring system was also implemented that will enable better insights into the operation of the implemented measures, help identify potential additional improvement and provide evidence for further implementation of such systems.

Location:

City: Fala

Region: Podravje

Country: Slovenia

GoogleMaps link:

LINK HERE

Partners involved:

Dravske Elektrarne Maribor, Obrežna ulica 170, 2000 Maribor, info@dem.si

Implementation year: 2018/19

Photos:

(Source: DEM)

SYSTEM CHARACTERISTICS

Brief Description*:*

The Drava Hydropower company (DEM) have identified the opportunity to exploit the excess heat to improve the heating system in the 100-year-old hydro powerplant museum Fala, via recovery of low-temperature waste heat produced as part of the cooling process in the adjacent hydro powerplant.
The heat is recovered via water/water heat pump, operated via low temperature heat from cooling liquid during the operation of the aggregator, and with river water during periods when the aggregator is not in operation. According to technical calculations the optimal heat pump capacity is 130 kWth with average COP of 3,66 (based on heating system power and temperature regime; Q_{hp} = 130 kW, $T_{source,ref}$ = 24 °C, T_{sink} = 60 °). In addition, a small storage tank for water is installed for water based calorific heating.

WH source potential (aggregate 1):

Amount of waste heat available	*800 MWh/annum*
Temperature	*Temperature range of heat vector : 10.0 - 24.0º C*
Availability over time - Months in year	*3.500 hours/annualy*
Amount of reduced CO2 emissions	130.612,8 kgCO2/annually

The initial economic forecast for replacing this outdated heating system with waste heat recovery-based system, suggests 60% reduction in costs for heating and investment payback period of around 8 years, which is in line with investment requirements of the company.

Duration: planning and procurement 2018 –works and commissioning 2019

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: cca 130.000 EUR (VAT exclusive)

Sources of financing:

Co-financing	20% Min for Environment (public call; European cohesion fund)
Other funding's	Own sources

Electricity savings (MWh/year**):** 144.946,5 kWh/year

Or fuel savings (kg or m3 or kWh or GJ): **-**

Cost savings (EUR/year): approx. 8-year payback

CO2: reduction of 135.612,8 kg/CO2

PROJECT IMPLEMENTATION BENEFITS

The project is a case of good practice both in terms of developing and testing decision support tools developed as part of CE HEAT project with the purpose to accelerate waste heat uptake on the one hand, and demonstrating innovative uses of low temperature on-site waste heat that can be further deployed and scaled in this sector.

ADDITIONAL INFORMATION

This best practice is in part a result of Interreg Central Europe project CE HEAT.

BEST PRACTICE IN SLOVENIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Energy renovation of Swimming pool Velenje

Energy efficiency measures implemented in the building:

Swimming pool Velenje

- Energy management system (installation of a central control system for monitoring the energy use of the building and the main consumers)
- Thermal insulation of external walls, roof and ceiling
- Building furniture replacement
- Renovation of pool water heating
- Renovation of preparation hot sanitary water
- Indoor lighting renovation
- Installation of an ultra-filtration system for the preparation of pool water

Location:

City: Velenje

Region:

Country: Slovenia

GoogleMaps link:

Swimming pool Velenje
https://www.google.com/maps/place/Bazen+Velenje/@46.358045,15.1170208,17z/data=!3m1!4b1!4m5!3m4!1s0x476566d16f91b04f:0x6da1399ff6c12183!8m2!3d46.358045!4d15.1192095

Partners involved:

Public partners:
Republic of Slovenia, Ministry of Infrastructure, Langusova ulica 4, 1000 Ljubljana; gp.mzi@gov.si
Municipality of Velenje, Titov trg 1, 3320 Velenje; info@velenje.si;

Private partner:
RESALTA družba za upravljanje energetskih storitev d.o.o., Šlandrova ulica 4b, 1231 Ljubljana – Črnuče; info.si@reaalta.com;

Implementation year: 2019

Photos:

Swimming pool Velenje

[Source: Municipality of Velenje]

SYSTEM CHARACTERISTICS

Brief Description*:*

Renovation of Velenje Pool is a project that represents a complete energy renovation of building in accordance with sectoral laws, guidelines and rules. The measures were select in the light of the current state of building and the potential energy savings.
Duration: April 2019 –October 2019

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 1.100.000,00 € (tax excluded)

Sources of financing:
Public partners:
Municipality of Velenje: 85.062,25 € (tax excluded) - own sources
RS, Ministry of infrastructure: 373.824,00 € (tax excluded) - European cohesion fund
Private partner:
RESALTA d.o.o.: 641.013,75 € (tax excluded)

Electricity savings: 189.421,02 kWh/year

Reducing CO_2 emissions: 50.745,00 t/year

PROJECT IMPLEMENTATION BENEFITS

Energy renovation of the Velenje Pool is an example of good practice of comprehensive energy renovation of publicly owned facilities implemented in the Municipality of Velenje. The financing method for renewal includes co-financing of the European Cohesion Fund and a public-private partnership. The project pursues the goal of efficient use of energy with reduction of heating, electricity and water costs. This good practice example can also be implement on other objects and other cities or regions.

BEST PRACTICE IN SLOVENIA – ENERGY EFFICIENT CITIES

BASIC INFORMATION

Title of the Best Practice

Energy renovation of Primary school Plešivec

Energy efficiency measures implemented in the building:

Primary school Plešivec:

- Energy management system (installation of a central control system for monitoring the energy use of the building and the main consumers)
- Thermal insulation of external walls and attic ceiling
- Building furniture replacement
- Modernization of the heating system
- Indoor lighting renovation

Location:

City: Velenje

Region:

Country: Slovenia

GoogleMaps link:

Primary school Plešivec:
https://www.google.com/maps/place/Osnovna+%C5%A1ola+Mihe+Pintarja+Toleda,+PO%C5%A0+Ple%C5%A1ivec/@46.4100322,15.1047233,17z/data=!3m1!4b1!4m5!3m4!1s0x47656066db2c8337:0x618be3d1a967b7fd!82!3d46.4100322!4d15.106912

Partners involved:

Public partners:
Republic of Slovenia, Ministry of Infrastructure, Langusova ulica 4, 1000 Ljubljana; gp.mzi@gov.si
Municipality of Velenje, Titov trg 1, 3320 Velenje; info@velenje.si;

Private partner:
RESALTA družba za upravljanje energetskih storitev d.o.o., Šlandrova ulica 4b, 1231 Ljubljana – Črnuče; info.si@reaalta.com;

Implementation year: 2019

Photos:

[Source: Municipality of Velenje]

SYSTEM CHARACTERISTICS

Brief Description*:*

Renovation of Primary school Plešivec is a project that represents a complete energy renovation of building in accordance with sectoral laws, guidelines and rules. The measures were select in the light of the current state of buildings and the potential energy savings.
Duration: April 2019 –October 2019

FINANCIAL SOURCES AND FINANCING DETAILS

Total investment value: 1.100.000,00 € (tax excluded)

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