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RENOINVEST
sustainable renovation of buildings

D2.3 Best practice handbook of sustainable building renovations

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Second version

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List of acronyms / abbreviations

Acronym	Original	Explanation
BM VIT	Bundesministerium für Verkehr, Innovation und Technologie	Federal Ministry for Transport, Innovation and Technology
CAPEX	/	Capital Expenditures (long-term investment costs)
CD	/	Cooling demand
CE	/	Central European
CED	/	Cooling energy demand
CHP	/	Combined Heat and Power
CSOK	Családi Otthonteremtési Kedvezmény	Family Home Creation Allowance
DHC	/	District Heating and Cooling
DHW	/	Domestic Hot Water
DSO	/	Distribution System Operator
ECA	/	Energy Consulting Austria
EE	/	Energy efficiency
EED	/	Energy Efficiency Directive
EIB	/	European Investment Bank
EKR	Energiahatékonysági Kötelezettségi Rendszer	Energy Efficiency Obligation System
ELENA	/	European Local Energy Assistance (Facility)
EPBD	/	Energy Performance of Buildings Directive
EPC	/	Energy Performance Contracting
ESCO	/	Energy Service Company
ETICS	/	External Thermal Insulating Contact System
EUR	/	European currency
EVB	/	economic value of the building
GHG	/	Greenhouse Gas
GIWOG	Gemeinnützige Industrie-Wohnungs-AG	Non-profit industrial-housing-association
GOLEA	Goriška lokalna energetska agencija	Goriška Local Energy Agency
HED	/	Heating energy demand
HEM	Hitelesített Energia-megtakarítás	Certified Energy Savings
HUF	/	Hungarian Forint
HUPX	/	Hungarian Power Exchange
LED	/	Light Emitting Diode
LTRS	/	Long-Term Renovation Strategy
MEKH	Magyar Energetikai és Közmű-szabályozási Hivatal	Hungarian Energy and Public Utility Regulatory Authority
MOK	Mestna občina Kranj	Municipality of Kranj
MOL	Mestna občina Ljubljana	Municipality of Ljubljana
MOM	Mestna občina Maribor	Municipality of Maribor
NECP	/	National Energy and Climate Plan

Acronym	Original	Explanation
NbS	/	Nature-based Solutions
OPEX	/	Operational Expenditures (ongoing operational and maintenance costs)
OSS	/	One-Stop-Shop(s)
PV	/	Photovoltaic cells/panels
PV/T	/	Photovoltaic thermal collectors
REAAL	/	Renewable Energy Across the Alpine Land
RES	/	Renewable energy source
ROI	/	Return on Investment
RRF	/	Recovery and Resilience Facility
SECAP	/	Sustainable Energy and Climate Action Plan
SIR	Salzburger Institut für Raumordnung und Wohnen	Salzburg Institute for Spatial Planning and Housing
SME	/	Small to Medium Enterprise
SWOT	/	Strenght, Weakness, Opportunity and Threath Analysis
TOP	Terület- és Településfejlesztési Operatív Program	Territorial and Settlement Development Operational Program
TWG	/	Thematic Working Group
ZBR	Zöld Beruházási Rendszer	Green Investment Scheme- Hungary National Housing Renovation Program
VAT	/	Value Added Tax
WNFL	Wohnnutzfläche	Usable living space
WUK	Wiener Werkstätten- und Kulturhaus	Culture centre Vienna

1 RENOINVEST PROJECT

The RENOINVEST project is co-funded by the European Union under the LIFE programme. The project intends to reflect cross-border challenges and opportunities for sustainable building renovation in the private and public sectors. The main aim of the project is to develop action plans on smart investments in sustainable renovation of buildings for 2025-2030 for Austria, Hungary and Slovenia by establishing three national roundtables building on the activities of the Sustainable Energy Investment Forums.

RENOINVEST provides a platform for open dialogue involving key financial, private and public experts through the green finance thematic working group activities to identify barriers to the upscaling of long-term financing instruments and propose improvements to support the development of large-scale investment programmes in existing private and public buildings. Three national policy briefs and a cross-border recommendation package will also be delivered.

Assessing the implementation of the Long-term building renovation strategies and documents and reviewing existing financial solutions and market conditions for stimulating financing of energy efficiency improvement of the existing building stock is an important starting point of the project.

Sharing knowledge among project partners, experts, national stakeholders and similar EU projects three international cross-border exchange events with site-visits will be organized in order to showcase collected 50+ good practices and elaborate six case studies to foster the roll out of smart financing possibilities.

The added value of RENOINVEST is that the consortium is providing specific technical knowledge by engaging key actors representing legislative advisory organizations, research institutes, large engineering manufacturers, SMEs and financial experts in three CE countries fostering sustainable investments.

Originating from a collective vision to address cross-border challenges and unlock opportunities for sustainable building renovation in both private and public sectors, RENOINVEST seeks to craft action plans for smart investments in sustainable renovation from 2025 to 2030. This project serves as a testament to collaborative innovation, bridging key financial, private, and public expertise through green finance thematic working groups. These platforms are instrumental in identifying barriers and proposing enhancements for large-scale investment programs, thereby revitalizing existing infrastructure with an emphasis on energy efficiency. The RENOINVEST project not only fosters and environment of knowledge sharing among its partners and stakeholders but also positions itself as a beacon for sustainable investment in the Central European region.

2 PROJECT CONSORTIUM

1. Institute for Transport Science and Quality Control in Building (KTI) legal successor of ÉMI Építésügyi Minőségellenőrző Innovációs Nonprofit Kft (ÉMI) - HUNGARY, coordinator

2. Solar Tech-Investment Tervezési Fejlesztési Tanácsadó Kft. (Archenerg cluster) – HUNGARY

3. Zavod za gradbeništvo Slovenije (ZAG) – SLOVENIA
Slovenian National Building and Civil Engineering Institute

4. Gospodarska zbornica Slovenije (CCIS) – SLOVENIA
Chamber of Construction and Building Materials Industry of Slovenia

5. RENOWAVE.AT e.G (RENOWAVE) – AUSTRIA

6. Institut für Immobilien, Bauen und Wohnen GmbH (IIBW) – AUSTRIA
Institute for Real Estate, Construction and Housing Ltd.

3 EXECUTIVE SUMMARY

The present document is a planned second version of a study on good practices in financing sustainable building renovations carried out in Austria, Hungary and Slovenia (Deliverable D2.2within the RENOINVEST project. The report provides a catalogue of best available examples from the three countries involved and contributes to a better understanding of how sustainable renovation investments are financed in practice.

The collection includes a total of 50 renovation examples of buildings or building complexes of various sizes, 16 from Austria, 17 from Hungary and 17 from Slovenia. The cases vary considerably in both size and structure, ranging from individual buildings to entire settlements, and from urban to rural areas. They also differ in origin, covering locations from large cities (including capitals) to small towns. The examples include both public and private building sectors and variety of fundings sources and a variety of funding sources.

The identification and analysis of the cases were carried out by the RENOINVEST project partners using desk research, analysis of available documentation and information provided by stakeholders involved in renovation projects. More than eighty potential renovation cases were initially screened from public databases, government and municipal sources, energy platforms and expert recommendations, from which the most relevant examples were selected for detailed analysis.

A major part of the study is dedicated to presenting each individual case: the data on the building, photography, information on the implementation of the renovation, financial data, and expected results. The examples are complemented by analyses of strengths, weaknesses, opportunities and threats (SWOT analysis). Finally, a curated list of 50 good practice examples is presented, showcasing buildings and other built structures that have been renovated through a range of innovative financing mechanisms and funding sources. For each case, the financial model applied, the origin of funding, the country, and the building sector are specified, providing a clear overview of how different financing approaches have enabled renovation projects in diverse contexts.

The research showed that examples of financing comprehensive, i.e. sustainable renovations are relatively rare. Investments in the renovation of public buildings are more widespread and are typically implemented on larger buildings or in projects that combine a larger number of buildings. The analysed cases also highlight that successful renovation projects often rely on a combination of financing sources, including public subsidies, private capital, commercial loans and, in some cases, innovative financing mechanisms such as energy performance contracting.

The study contributes to the understanding of the past and current uses of models, procedures and processes of financing the renovation of buildings or building complexes. This understanding may be important in highlighting possibilities for addressing existing challenges and for the further development of financial models. Questions raised by the analyses have been used in discussions at national thematic working group events and on national platforms. The results also supported discussions within the RENOINVEST project's national roundtables and international exchange events. The collection will also provide an opportunity for the three countries - Austria, Hungary and Slovenia - to learn from each other and to support the development of future policy recommendations and investment frameworks for accelerating building renovation.

4 INTRODUCTION

4.1 The structure of the study

The study was prepared by the team of RENOINVEST project partners with the aim of collecting existing best practices of financing energy and sustainable building renovations in all three partner countries, Austria, Hungary and Slovenia. The goal of the team was to analyse these cases and extract key findings that represent one of the starting points for consideration in TWGs, national round tables discussions, and international exchange events. They are also presented in detail in the form of a handbook and made available on the RENOIVEST online platform.

The current report represents an updated and enhanced version of the *Best Practice Handbook of Sustainable Building Renovations* (October 2024). It builds upon the previous publication by incorporating more recent case studies, deeper analyses and additional evaluations.

Section 4.2 outlines the common methodology applied for selecting and presenting the case studies included in the Best Practice Handbook, as well as the approach used for analysing and structuring the content of each individual case. It also provides an explanation of the understanding of the term “best practice”.

Chapter 5 is the main part of the Handbook, providing selected examples of financial models for building renovation in all three countries. Section 5.1 first offers a general overview of the cases with a map of their locations. This is followed by Section 5.2, which contains descriptions and analysis of best practices presented subsequentially: first the 16 Austrian cases, then the 17 Hungarian cases and finally the 17 Slovenian cases. Lastly, Section 5.3 provides a common list of best practices for financial models of sustainable building renovation in the three countries, indicating which cases refer to public building and which to private buildings, as well as the types of funding used.

Lastly, Chapter 6, is dedicated to presenting the common findings derived from the analysis.

4.2 Common methodology of the introduction of best cases

The common methodology for identifying best practices related to financing of measures that increase sustainability aspects during building renovations in Austria, Hungary and Slovenia is presented in Figure 1. The methodology itself is based on the previous experience and practice of the team participating in the research within the RENOINVEST project.

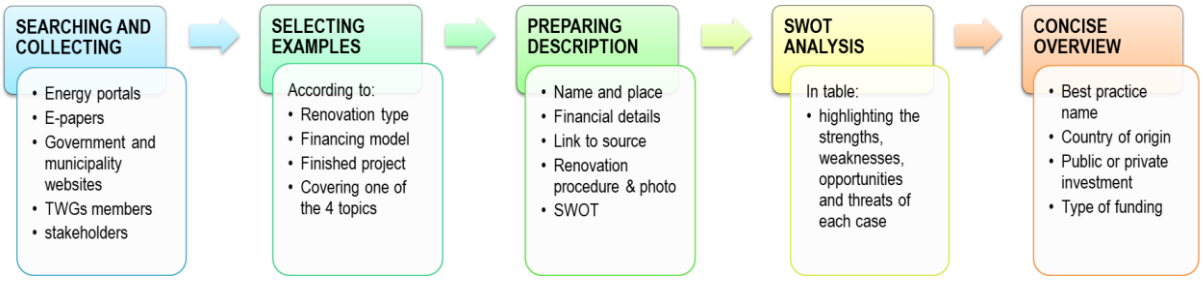


Figure 1: Flow chart of the common methodology for preparing best practices catalogue.

The process of identifying best practices and collecting detailed information about their technical implementation and funding was carried out using different methods depending on the availability of data. Names and sources for more than eighty energy renovation cases in the three project countries

were first collected through searches of energy web portals, news sources, government and municipal websites. Some best practices were highlighted by stakeholders and participants in thematic working groups. Additional information details were obtained directly from the organisations and beneficiaries responsible for the renovations. A significant segment of information about funding was only available online. Initially, this information (project name, type of funding, and funding source) was gathered in a separate spreadsheet to provide a clearer overview.

After completing the list, the next step was to filter the best practices and to exclude those that were not suitable for inclusion in the report. The next stage involved filling in the template created to ensure the best possible presentation of each individual best practice. Each case was described separately with as much information as possible, presented together with a photography and a SWOT analysis. The consortium made a deliberate effort to ensure a roughly equal number of case studies from both residential buildings and municipal buildings.

For each best practice, the financial details of the renovation - such as the type of financing, year, financier, beneficiaries, and source of information - were initially highlighted. This was followed by a detailed description of the entire energy or sustainable renovation process, accompanied by a picture where available. The case studies provide comprehensive information, including details about the building, renovation measures and methods, types and amounts of funding, and other critical aspects specific to each project. For each case study, a SWOT analysis was developed to provide a concise overview of the strengths, weaknesses, opportunities, and threats, with a primary focus on financial aspects influencing its implementation and replication potential. This adds value to the report, as the RENOINVEST project seeks to promote the enhancement of existing good financial practices.

The examples described were (or are still) considered good practices within their respective national contexts; however, there is always room for improvement. This includes more continuous financial programs, schemes, or renovation projects, as well as cases achieving higher standards in energy efficiency and greater use of renewable energy sources. Therefore, the task of searching for the executed good practices with interesting and successful financial models continued until the end of project.

Finally, the fifty selected best practices are listed in a table that offers a concise overview, highlighting best practice name, country of origin, type of renovated building (public or private), and source of funding.

5 EXAMPLES OF FINANCIAL MODELS OF SUSTAINABLE BUILDING RENOVATION

5.1 General description of the cases

With fifty case studies included in this report, a varied selection of renovation projects from urban and rural areas is compiled. Orange stars in the map below shows the locations of the best cases in each of the three partner countries: Austria, Hungary and Slovenia. In case where multiple case studies are located close to each other the location is marked with single orange star.

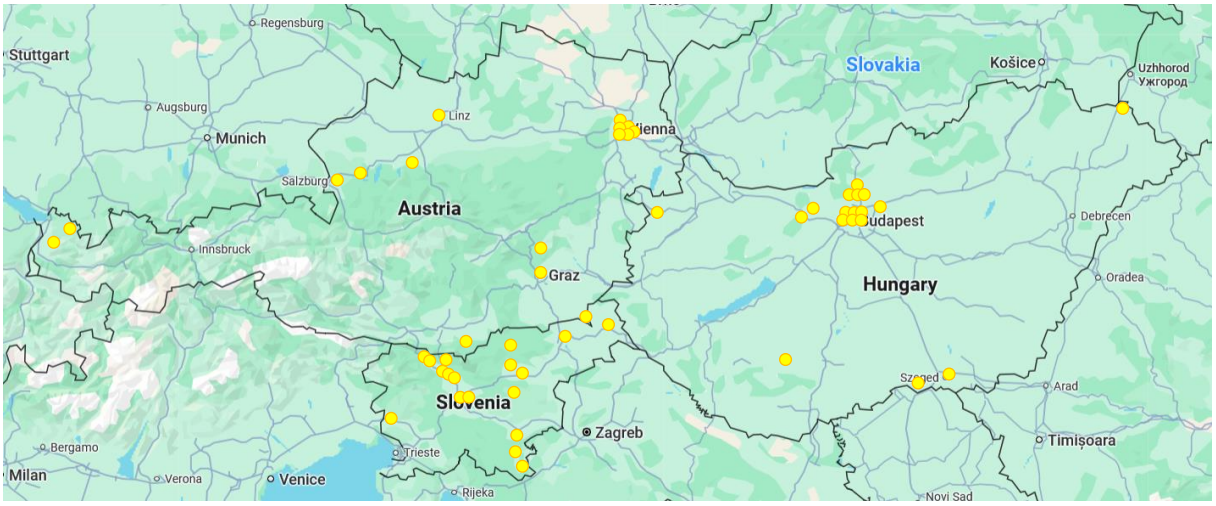


Figure 2: A map with locations of case studies marked with orange stars.

The national regulatory frameworks, market capacities, and sector-specific policies that support building renovations vary significantly across the three RENOINVEST countries. To address these differences, the RENOINVEST consortium conducted a comprehensive analysis of the national contexts. The findings are presented in the report titled "*Policy context and market capacities for sustainable building renovations*"[1].

The residential and municipal sectors present significant financing needs and opportunities for energy savings; therefore, this study addresses both building types. Given the distinct ownership structures within these sectors, a variety of financial options are required. Furthermore, national governments often implement divergent policy frameworks to encourage building renovations, shaped by each country's historical context and financial landscape.

For **Austria**, renovation cases from large cities such as Vienna (6), Linz and Graz are included, but smaller cities such as Vorchdorf and Semriach are also fairly well represented. Nine out of sixteen selected study cases are residential buildings or complexes. Of these, two were renovated by private owners using a mix of private funds and reserves. The remaining non-residential buildings presented in this study are municipal buildings, such as administrative buildings, schools and homes for seniors. Only three projects were implemented with the collaborations of ESCOs in the form of EPC, while the rest show a varied mix of municipal, governmental and European loans, subsidies and fundings.

Most of the projects from **Hungary** originate in the capital, Budapest, and other major cities. However, there are also several cases from smaller cities and towns. The selection of these projects was not

[1] Available at RENOINVEST website: https://www.archenerg.eu/en/renoinvest

based on their geographic location but rather on the financial structures involved, which are generally independent of location. Public buildings mainly include municipal buildings, where most of the renovation described were financed by non-refundable grants (70-100 %), or by a combination of grants and the municipality's own contribution. As municipalities have very limited access to loan financing and usually lack sufficient own resources, grants are often the only opportunity for them to implement investments in energy efficiency renovations and RES. The presented examples of renovation involving a financial combination of dedicated EU programmes (PIMES CONCERTO, Staccato), government grant programmes, and the own contributions of municipality or homeowners, and—to some extent third-party finances/ESCO—indicate that all funding sources had to be carefully planned, prepared, and coordinated. In private apartments within condominiums, renovation is financed either through a combination of grants and homeowners' contributions or solely by homeowners' contributions. In private single-family homes, renovations are financed either through combination of grants and homeowners' contributions, preferential loans and homeowners' contributions, or entirely through private resources.

Slovenian case studies are evenly distributed across the country, with only two cases located in the capital city of Ljubljana, while the rest are mainly located in other major cities, such as Maribor, Kranj and Novo mesto. It should be noted that some examples are very large in scale, practically at the municipal level (e.g. Kranj, Ljubljana), involving combinations of PPPs, and that they started relatively early, at the turn of the 21st century. They mostly cover public buildings such as schools, kindergartens, sports halls, and similar facilities. It should also be emphasized that support for municipalities from local energy agencies is very important when it comes to preparing tender documentation and organizing and managing the processes.

In terms of scale, the cases vary greatly in size, ranging from individual buildings to entire settlements with up to 250 or more residential units and additional business premises. The same applies to the scope of works or the comprehensiveness of renovation measures, which differ from case to case. However, what they all have in common is that they do not approach building renovations from a comprehensive sustainability perspective that beside the main three sustainability aspects considers also the entire life cycle of buildings.

In parallel with the analysis of the best practice cases, the project partners also worked on the development of "*National Action Plans in Austria, Hungary and Slovenia*".[2] These strategic documents were designed to translate the project's analytical findings and stakeholder dialogue outcomes into concrete policy and market recommendations aimed at accelerating sustainable building renovation investments. The insights derived from the analysed best practices provided valuable input for this process by highlighting successful implementation models, financing approaches and governance structures that could inform national-level measures. In this way, the lessons learned from practical examples directly contributed to shaping the proposed actions and recommendations included in the National Action Plans.

[2] National Action Plans are available on the RENOINVEST website: https://www.archenerg.eu/en/renoinvest

5.2 Description and analysis of each case

5.3 Austria

5.3.1 Presentation of Austrian cases

No. 1: Apartment block Markartstraße – Passive house renovation, Linz	
FINANCIAL DATA OF RENOVATION	
Building / Beneficiary	Apartment building for renting
Owner	GIWOG – Gemeinnützige-Industrie-Wohnungs AG (non-profit housing association)
Type of building	Private
Total investment cost	€ 2 446 000 (€ 787/m²per usable living space)
Type of financing	Reserves, funding & subsidised housing loan (5 years)
Financier	Oberösterreichische Landesbank AG, BMVIT (non-repayable subsidy)
Financing year	2006-2011
Specific / Comment	5 years loan with 40 % annuities subsidy (federal state of Upper Austria) and statutory maintenance and improvement contribution (EVB) 2006 = € 1.39/m² WNFL/month. This was first renovation to passive house standard, use of prefabricated façade modules.
DESCRIPTION	

The residential complex was built in 1957/58 and consists of 50 residential units, 5 storeys and the total usable living space (incl. balcony) is 2 981,92 m². This was the first time that an apartment building in Austria was renovated to Passive House standard; all the necessary steps were taken to achieve best air quality, comfort and low energy consumption even in an existing building. As part of this, heating energy demand was slashed from 179 kWh/m²a to 13.3 kWh/m²a which amounts to savings of approx. 455,000 kWh/a and a reduction in CO_2 emissions from 160 t/a to 14 t/a.

For the modernisation to a passive house standard the following construction measures were taken:

Prefabricated façade elements with built-in windows and ducting for controlled ventilation, a solar honeycomb façade was employed, living space is ventilated mechanically by means of single-room devices, the balconies were enclosed, which increased the usable living area in total by 317.43 m² and sun protection for windows and loggia was installed, thermal insulation of basement and attic ceilings and new roof covering completed the modernisation of the building envelope.

The modernisation of the energy system consisted of installation of controlled ventilation with a 70 % heat recovery in the apartments for each room, the existing district heating connection remained in place but instead

Picture 1: Front Side Apartment Building
©Gemeinnützige Industrie-Wohnungs-AG

of gas instantaneous water heaters, district heating instantaneous water heaters were installed and the existing radiators were supplemented with room thermostat which makes individual room temperatures and the heating operation during absence in the heating period possible. The renovation was carried out in quite a short period (thanks to prefabricated elements) and without much inconvenience for the occupants.

The cost increase involved in achieving Passive House standard was roughly 27 % compared to conventional renovation. The heating costs could be reduced by approx. 80- 90 %. Heating costs before average approx. 0.69 Euro/m² month incl. VAT, Heating costs after modernisation approx. 0.08 Euro/m² month incl. VAT.

The project won the Austrian Award for Architecture and Sustainability in the category modernisation in 2006. ***Architectur: Arch+More ZT GmbH, Velden/Wörthersee – Linz, DI Ingrid Domenig-Meisinger. Energy planning: E-Plus, DI Bernd Krauß***

INFO: https://www.giwog.at/projekte/referenzen/linz-1-passivhaus-sanierung

Higher construction costs for passive house standard for non-profit housing was only possible with enough reserves and the right subsidies. Through high renovation standards considerable decrease of energy demand (efficiency and savings) and comfort for tenants was achieved. Through prefabrication and good planning inconvenience for tenants can be kept to a minimum during renovation period. Industrial renovation has the potential to unlock new markets for large-scale renovation projects.

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ A mix of own funds/reserves + subsidies + (subsidized) loans reduces the actual interest-bearing capital portion and makes the project financially viable even with the additional costs of a passive house. ▪ Non-repayable grants (BMVIT) and annuity subsidies (State of Upper Austria) act as a buffer against interest/debt service risks and increase bankability.	▪ Reserves + bank loan + federal/provincial support means more coordination, compliance, reporting, and timing risk (funding decisions vs. construction cash needs). ▪ Non-profit housing context, the **Erhaltungs- und Verbesserungsbeitrag (EVB)** is **legally regulated** and capped (e.g., max **€ 2/m²/month** in the legal text), so there's a limit to how quickly additional investment can be recovered through this channel.
Opportunities / Possibilities	**Threats / Barriers**
▪ Good replicability and upscaling. ▪ A 5-year loan means: faster debt reduction, lower interest rate/refinancing risks, and a clear repayment schedule (2006–2011). ▪ In practice, the statutory maintenance and improvement contribution logic (EVB) supports regular liquidity (especially in non-profit housing construction), which makes repayment even more predictable.	▪ Regulation for non-profit housing subsidies (especially for high quality renovations) are volatile to political changes. ▪ In Austria's limited-profit / cost-rent setting, rents are designed to cover *eligible* costs under the WGG logic, which can constrain pricing flexibility if costs rise faster than permitted rent components.

No. 2: Residential complex Friedrich-Inhauser-Straße – Zero Carbon Refurbishment Wir InHAUSer, Salzburg

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Apartment building for renting
Owner	Heimat Österreich (non-profit housing association)
Type of building	Private, Residential complex of the non-profit housing association
Total investment cost	€ 20 million
Type of financing	Housing Subsidy Salzburg, 2021
Financier	Federal State of Salzburg, Climate and Energy Fonds Austria
Financing year	2015-2021
Specific / Comment	Payback renovation costs through densification/extension of buildings. The land belongs to the city of Salzburg, and the building was constructed by Heimat Österreich under building law.

DESCRIPTION

Picture 2: Inhauserstraße, WirInhauser
Author: @ Gabriel Portugaller

This residential complex of the non-profit housing association Heimat Österreich on Friedrich-Inhauser-Straße (in the city of Salzburg) dates back to 1985 – and its energy efficiency standard reflected this. Renovation work was needed: the complex was not barrier-free, the lighting was inadequate, and above all, the balconies, roofs, and moisture sealing urgently needed to be replaced.

At the heart of the project is an energy concept with an exhaust air heat pump and heat recovery from wastewater: heat that would otherwise be lost unused (from room air and wastewater) is recovered and covers a large part of the demand. In addition, electricity is generated on site: a photovoltaic system on the roof supplies up to 20% of the total electricity demand. In addition, there is a tenant electricity model that gives residents transparency about their consumption. Renovation was used to increase density and thus support sustainable urban development: instead of using new land, the existing site was expanded. Using timber construction, 24 additional subsidized apartments were added to the original 75 apartments, bringing the total to 99 units. The project thus combines climate protection with social impact: the city of Salzburg has the right of occupancy for all apartments, which ensures that they are allocated according to social criteria. A

Mobility Point offers sharing services, a bicycle garage, and e-charging stations; at the same time, the parking space ratio has been reduced from 1.2 to 0.8. Use of this mobility service is included in the rent.

Despite the technical complexity, the project was to remain affordable and within the guidelines of Salzburg's housing subsidy program. The total costs amounted to around € 2 250/m² GFA, with heating requirements of 28.6 kWh/m²a. Heating is no longer provided by gas, but by pellets; around 75% of the heat supply is provided by heat pumps that use waste heat from wastewater. As a non-profit housing association, Heimat Österreich only charges the construction costs, without any additional surcharges.

The financial and social benefits are clearly noticeable: while the average rent on the free market in Salzburg is around € 18.50/m², subsidies and redensification have made it possible to keep the rent here at around € 10.50/m² (reference value approx. € 10.05/m²). This was also made possible because the city granted the developer building rights on the property.

INFO: https://www.heimat-oesterreich.at/de/Unternehmen/Referenzen/Friedrich-Inhauser-Strasse_rf_1386

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Savings for tenants in energy costs through switch to renewable energy and recovery of heating energy. ▪ Lower operating costs reduce arrears risk ("warm rent" stability) ▪ Innovative tenant-electricity model strengthens value proposition: Public-sector partnership de-risks social occupancy	▪ High complexity + higher soft costs: deep retrofit + novel heat recovery + mobility package + PV/tenant-electricity requires coordination, engineering, monitoring, and stakeholder management- raising transaction costs. ▪ Limited financial headroom under subsidised rents: when rents are kept low by design, the model has less buffer to absorb capex overruns or higher-than-expected OPEX.
Opportunities / Possibilities	**Threats / Barriers**
▪ Access to green capital & further grants: the combination of deep decarbonisation + social housing aligns well with green/ESG funding and public programs (Smart Cities / Klima- und Energiefonds ecosystem). ▪ Asset resilience & reputation: awards & recognition improve institutional credibility and can lower perceived risk for partners	▪ Dependency on subsidy conditions. ▪ Construction cost inflation / contractor risk: cost spikes or claims hit hard when rents are capped and the project must stay within subsidy frameworks. ▪ Building-tech can trigger resistance- raising delays/costs and reputational risk.

No. 3: Liebenauer Hauptstraße, Passive House Renovation, Graz

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Apartment building for renting
Owner	GIWOG – Gemeinnützige-Industrie-Wohnungs AG (non-profit housing association)
Type of building	Private, Residential complex
Total investment cost	€ 10.75 million (excluding VAT)
Type of financing	Building's reserve fund, funding & subsidised housing loan, 2014
Financier	Giwog's own funds, subsidies from the Province of Styria, a special subsidy from Kommunalkredit Austria
Financing year	2013-2014
Specific / Comment	This special subsidy (2013/2014) amounted to € 5 500 per apartment – coupled with the agreement that there would be no rent increase due to the additional costs of the passive house. As is customary in non-profit housing construction, the statutory maintenance and improvement contribution (EVB) is used for refinancing (2013: € 1.62/m² WNFL excl. VAT). Prefabrication façade modules, in addition, it is fitting that the special subsidy (Kommunalkredit) is explicitly designated for 2013/2014.

DESCRIPTION

Picture 3: New Façade Elements, ©GAP Solution GmbH

This residential complex on Liebenauer Hauptstraße in Graz consists of seven apartment blocks arranged in two rows, slightly offset diagonally. It was built between 1979 and 1981 and that was also the original energy standard: uninsulated exterior walls, central gas heating, and electric boilers for decentralized hot water supply. After more than 30 years, renovation was urgently needed: the facade, windows, and especially the loggias were in dire need of renewal.

Since the structural conditions would either have resulted in very high additional costs or delivered inadequate results, the modernization was carried out using largely prefabricated wall elements in timber construction. Advantages: no expensive scaffolding, significantly less noise and dirt, and, above all, a greatly reduced construction time: the renovation was completed in around 10 months. And: This solution is more durable, with lower operating and maintenance costs. The building has been transformed into a passive housing complex that is virtually "self-sufficient in solar energy". Heating energy requirements have fallen from around 135 kWh/m²a to around 8 kWh/m²a – a reduction of over 90%. Savings in hot water consumption has been reduced by around 55%. The

137 apartments remained fully usable throughout the entire construction phase, and the tenants were able to remain in their apartments largely unaffected. A specially developed functional façade made of prefabricated panels contains passive solar elements (solar honeycombs), active air collectors in combination with ventilation units with heat recovery, and façade-integrated photovoltaic modules whose electricity is used directly for hot water preheating. The airtight connection of the new elements to the existing masonry and integrated air ducting and heat recovery directly via the facade are technically crucial.

The bottom line is that the renovation significantly reduced energy consumption for heating and hot water: a total of around 1,350 MWh per year was saved, which corresponds to over € 100 000 in operating cost savings per year. At the same time, the project reduces emissions by around 378 tons of CO_2 annually – and shows how difficult existing buildings can be renovated quickly, in a tenant-friendly manner and to a very high energy standard using industrially prefabricated solutions.

INFO: https://www.giwog.at/projekte/referenzen/graz-giwog-passivhaussanierung

Prefabricated wooden facade modules/functional panels were used. These arrived at the construction site ready-made and were assembled instead of being built "on site layer by layer". This meant that little or no expensive scaffolding was required, there were fewer work steps, less drying time, less noise and dirt, and the construction time could be reduced to around 10 months.

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Blended financing reduces capital burden: GIWOG equity + Province of Styria major-renovation subsidies + Kommunalkredit "special subsidy" (€ 5 500 per flat) targeted to the passive-house upgrade. ▪ Tenant affordability protected: subsidy condition explicitly prevented rent increases for the passive-house extra costs. ▪ Predictable refinancing mechanism: use of statutory EVB (€ 1.62/m² WNFL, 2013) under WGG creates a stable, rules-based cashflow line.	▪ High CAPEX: total refurbishment costs € 10.75m (excl. VAT) → heavy upfront financing need. ▪ Dependence on specific, time-limited subsidy: Kommunalkredit special subsidy was only available 2013–201- for no increase in rents. ▪ Limited revenue upside: rent increases were contractually restricted; owner captures benefits mainly via lower lifecycle costs and economic value of the building, not higher rents.
Opportunities / Possibilities	**Threats / Barriers**
▪ Replication / scaling: proven template for 1970s–80s stock where conventional ETICS is difficult ▪ Access to green finance / ESG funding: measurable CO_2 and energy cuts strengthen eligibility for future climate/renovation programs and green lending. ▪ Lifecycle cost advantage: longer façade use cycle and lower maintenance/OPEX can improve long-run balance-sheet performance.	▪ Subsidy/policy risk: fewer or changed subsidies (or tighter conditions) can break the affordability equation. ▪ Energy price risks shift: higher electricity prices can hurt heat-pump economics (even with efficiency), reducing expected savings.

No. 4: Smart Block Geblergasse – refurbishment & district heating and cooling pilot project, Vienna

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Community of building owners – Geblergasse 11 and 13
Owner	Private: Geblergasse 11: Zeininger, Geblergasse 13: Fischer
Type of building	Private, Residential complex
Total investment cost	€ 2.8 million
Type of financing	Subsidy & ESCO, 2019
Financier	ESCO – Beyond Carbon Energy, the Smart Block Energy II research project was by the Climate and Energy Fund, the City of Vienna (MA 20 Energy Planning) and the European Union (Horizon 2020).
Financing year	2018-2021
Specific / Comment	Energy savings contracting

DESCRIPTION

Picture 4: Green Façade Geblergasse
Author: @ Isabel Mühlbauer

The 'Smart Block Geblergasse' pilot project demonstrates that a CO2-free energy supply across buildings is also possible in Gründerzeit-style buildings. The multi-storey residential building from the Gründerzeit, built in 1869 and 1875 has private Ownership, usable living space is 1,770 m2, and 16 and 9 new residential units exists. The in-depth study SMART BLOCK II Energy, funded by the Climate and Energy fund, focussed on a specific investigation block with a high population density and a need for renovation. In 2019, an energy supply based largely on geothermal and solar heating was realised for the first time across all properties in a typical Viennese block of Gründerzeit buildings in the 17th district, which had previously been heated with natural gas. Heating requirement (existing building): 36 kWh/m2a (previously 125) or 66 kWh/m2a (previously 160). The prerequisite for this was that the comprehensive refurbishment of the buildings enabled a corresponding reduction in the heating requirement. The initial situation of the energy supply posed some challenges: High heating requirement (125 or 160 kWh/m2a), no district heating network connection and gas floor heating with radiators. Through a comprehensive thermal renovation of the buildings **heating requirements were decreased by 60 to 70 %.** The centrepiece of the energy system is an expandable anergy network that connects buildings, heat sources and heat storage units and is set up and operated as part of an energy supply contract. The buildings at Geblergasse 11 and 13 form its starting cell; further neighbouring buildings are to follow in the course of upcoming renovations. After almost a year of exploration and negotiations with 4 energy companies, a contractor was found for the technical and

economic implementation of the energy concept in the block, who would take on this new task with entrepreneurial agility and a long-term contract (20 years). The economic objective was to keep the energy costs for heating and hot water for the tenants below the costs of Viennese district heating. Summer temperature control is included as a flat rate. A solar system and PV system on the roof further reduce the energy costs for the buildings The 30% subsidy from the state of Vienna for the pilot project to set up a decentralised anergy network made this goal possible. The thermal renovation of the two residential buildings was funded by the wohnfonds_wien (funding programs: "Sockelsanierung" and "Blocksonderförderung"). Both buildings were extended in timber construction and new living space was created. This makes it possible to refinance the refurbishment costs, even in the restricted rent segment. (Extension in existing buildings is treated as a new building and market rent can be demanded.)

INFO: https://www.zeininger.at/inhalt/textonly/gebT.html

What makes this project so special is that not only one building, but an entire block of Wilhelminian-style buildings (starting at Geblergasse 11 & 13) has been converted from gas to a shared, expandable energy network—meaning that despite being built in the 1870s, the buildings are now supplied with CO_2-free energy.

A Financing mix for comprehensive renovation and exchange of heating system: renovation + timber extension/addition → new space can be rented out at market rates (as "new construction"), helping to refinance the renovation even with limited existing rents. The pilot projects shows that Anergy networks in urban areas can be an alternative to district heating. Block roll-out: designed to grow from Geblergasse 11 & 13 to a wider block (target mentioned: ~18 properties), creating a repeatable "block energy" template for dense urban stock.

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ De-risked delivery via contracting: the expandable energy network is built/operated under an energy-supply contracting model, shifting key execution and operational responsibility to a specialised contractor. ▪ Subsidy leverage: 30% City/Vienna subsidy for the decentralised anergy network improves feasibility vs. tenant energy-cost targets. ▪ Public refurbishment support: building works supported via Sockelsanierung + Blocksonderförderung (wohnfonds_wien/Land Wien) and neighbourhood approach – shared investment cheaper than for single house.	▪ Pilot project with a lot of subsidies from City of Vienna, other federal states do not offer such good funding conditions. ▪ High coordination/transaction effort: it took ~1 year of exploration and negotiations with 4 energy companies to secure a contractor. ▪ Needs deep renovation first: the energy concept relies on major heating-demand reduction (~ 60- 70%). CAPEX-heavy and prerequisite-dependent. ▪ Long lock-in: a 20-year energy-supply arrangement can reduce flexibility if tariffs/technology shift.
Opportunities / Possibilities	**Threats / Barriers**
▪ Alignment with "Raus aus Gas" and climate programs strong fit for municipal decarbonisation agendas and future grant windows ▪ Value uplift through comfort: system includes summer tempering/cooling (flat-rate concept), which can increase tenant willingness-to-pay and reduce vacancy risk. ▪ Scalable economics: the network is explicitly expandable to additional neighbouring buildings, enabling future economies of scale.	▪ Incorrect assumptions about equipment life, energy prices, or savings can result in unmet cost savings. ▪ Federal guarantees for contracting companies have still not been implemented. ▪ Technical/geological execution risk: geothermal drilling and system integration failures can trigger delays, cost overruns, or performance gaps - especially in tight inner courtyards.

No. 5: KA 7 Kaiserstrasse- Innovative refurbishment of a listed Gründerzeit building with interior insulation, Vienna

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Monastery building/residential home with parish house at Kaiserstrasse 7 – used, among others, by the Lazarist Fathers and the organizations housed/affiliated with the building (e.g., refugee work/care).
Owner	Congregation of the Mission of St. Vincent de Paul (Lazarists).
Type of building	Private
Total investment cost	€ 5.16 million
Type of financing	Subsidies (2013)
Financier	City of Vienna, Ministry of Mobility, Innovation, Technology (BMVIT, now BMK)
Financing year	2011-2013
Specific / Comment	Listed building and mixed use (dorm, apartments…), Huge performance jump: heating demand cut from about 132 to ~26 kWh/m²a (≈ –80%), while keeping district heating.

DESCRIPTION

Picture 5: Monastry Building After Renovation @Schöberl & Pöll Gmbh

The four-story monastery building of the Lazarists at Kaiserstraße 7, constructed in 1904, is part of a heritage-protected ensemble surrounding the Church of the Immaculate Conception in the 7th district. In 2013, it was innovatively and sustainably renovated and subsequently monitored for two years by the Vienna University of Technology as a demonstration project for handling historical building fabric, to gather information for further renovations of protected buildings.

Due to heritage protection regulations, conventional thermal renovation was not an option. Instead, a highly efficient thermal renovation was achieved through an intelligent mix of measures: To avoid affecting the valuable brick facade with historical ceramic tiles and Viennese box windows, the thermal quality of the envelope was improved with a 5-centimeter-thick internal insulation (calcium silicate boards) and passive house standard wooden windows were installed behind the outer window sashes. Conventional external insulation with mineral wool was used on the firewalls and courtyard facades, where there are no decorative elements.

The roof structure was also thermally renovated, structurally improved, and converted for residential use while retaining the original slate roofing. The usable floor area was increased from approximately 1,935 m² before the renovation to around 2,750 m² after the renovation and attic conversion. Additionally, the entire building services system was renewed, and a comfort ventilation system with heat recovery was installed in all living and common areas. The existing district heating supply was maintained. The calculated heating energy demand was reduced by more than 80 percent through the implemented conventional and innovative efficiency measures.

The construction costs amounted to € 4.4 million (excluding VAT) and the total costs were € 5.16 million (excluding VAT) for the renovation of the existing building and the attic conversion. With a total usable living area of 2,750 m² in the existing building and attic, this corresponds to construction costs of 1 600 euros/m² of usable living area (excluding VAT) and total costs of € 1 876/m² of usable living area (excluding VAT). Incidental and planning costs accounted for nearly 15% of the total costs. The calculated heating energy demand was reduced from 132 kWh/m²a to around 26 kWh/m²a. Through conventional and innovative insulation measures, a highly efficient attic conversion, and a ventilation system with heat recovery, an 80% reduction was achieved. Including hot water, heat losses, and auxiliary energies, the reduction in heating energy demand was approximately 75%. Due to the existing district heating supply, no change in energy carrier was made. In terms of primary energy, the savings amounted to over 60% due to higher auxiliary energies and the poorer primary energy balance of electrical energy. Overall, the renovation and conversion measures resulted in specific savings of over 35%, ensuring that no more CO_2 was emitted despite the increased living space.

Awarded a nomination for the 2014 State Prize for Architecture and Sustainability.

INFO: www.nachhaltigwirtschaften.at (project report)

No exterior insulation on the historic façade and achieved high efficiency was achieved with smart internal insulation and a "window-in-window" passive-house solution, as well as more space without more CO_2: attic conversion increased usable area from ~1,935 m² to ~2,750 m². It was run as a demonstration and monitored project (TU Wien) and received major recognition/awards. This demonstration project shows that a significant reduction in energy demand can be achieved even with strict heritage protection requirements. Higher renovation costs due to historic preservation of façade. Ventilation with heat recovery increases electrical demand (hilfsenergie share rises), which can reduce net cost savings depending on electricity prices. Building-physics failure risk (moisture/condensation with internal insulation): could lead to expensive remediation and reputational damage, undermining lender confidence.

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Extra rentable/usable area helps refinance: creates additional income potential to amortize renovation costs. ▪ Operating-cost reduction supports affordability/viability: heating demand was cut roughly from ~132 kWh/m²a to ~26 kWh/m²a (order of magnitude reduction), improving lifecycle economics.	▪ Technology/operation depends on users & maintenance: internal insulation requires correct use/ventilation and careful moisture management-financial risk if misuse leads to damage or remediation.
Opportunities / Possibilities	**Threats / Barriers**
▪ Leverage densification logic: attic conversions are explicitly framed as a way to create more floor area in constrained cities—improves refinancing pathways in future projects. ▪ Access to green finance / ESG: strong energy and CO_2 reductions + demonstrator status can fit green-loan / impact-investment criteria (better terms, more capital sources).	▪ Without proper funding owners of listed buildings tend to set only refurbishment (cosmetic) measures instead of deep energy renovation. ▪ If subsidy programs/criteria change, the model becomes harder to replicate because the "innovation premium" may no longer be covered.

No. 6: "Gründerzeithaus" Kauergasse 2, Vienna

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Apartment building for renting
Owner	Blue Danube Immobilien GmbH
Type of building	Private
Total investment cost	€ 11.4 million
Type of financing	Subsidies, contracting
Financier	City of Vienna, Ministry of Mobility, Innovation, Technology (BMVIT now BMK), Owner
Financing year	2020-2024
Specific / Comment	Funding demonstration project, 2022-2024, Project name: Queen Gudrun II

DESCRIPTION

Picture 6: Kauergasse 2 After Renovation
©Trimmel Wall Architekten

The corner building at Kauergasse 2 (1150 Vienna), dating from the Wilhelminian period, was built in 1895 and consists of four-story street wings and two courtyard wings. From May 2022 to May 2024, the building underwent extensive renovation with the aim of making the old building climate-friendly and at the same time demonstrating that innovative, comprehensive renovation is economically feasible.

The project was based on a subsidized base renovation (City of Vienna/Wohnfonds_Wien): The building envelope was thermally upgraded (including insulation of street and courtyard facades, insulation above the basement, window replacement) and the building services were reorganized. An important step was the "get rid of gas" conversion: individual gas boilers were removed from all apartments and converted to a central district heating supply.

The QUEEN GUDRUN II research project by the Climate and Energy Fund also came into play as an "innovation package": This enabled measures to be implemented that now make the building a visible beacon and demonstration project—above all, a central grey water recycling system that recovers heat from shower/sink water (for hot water), provides water for toilet flushing and irrigation, and can even contribute to cooling the commercial ground floor area. In addition, there are green spaces (roof gardens in the courtyard and green panels on street-side balconies, connected to drip lines from the grey water system) and a 17 kWp photovoltaic system on the roof. The building was also significantly upgraded in terms of functionality: the attic was converted (including new apartments), the access routes were reorganized (pergolas in the courtyard), more open spaces were created, and an elevator was installed to ensure accessibility. In addition, the ground floor area with around 460 m² of commercial space was renovated (including for a bakery/manufacturing facility).

In terms of energy efficiency, the building achieved very low values after EnerPHit renovation (2023): According to Passive House Planning Package, the heating requirement is 24.2 kWh/(m²·a); the Wohnfonds Wien documentation shows a reduction in heating requirements of around 83% and an heating demand of the building (HWB) after renovation of 29.1 kWh/m²a (slightly different figures result depending on the calculation method/reference area).

Additional there is the advantages of a green façade: Better microclimate / less heat: Plants shade the surface and cool it through evaporation → less overheating on the facade and in the surrounding area. Protection of the facade: UV radiation, heavy rain, and temperature peaks have less direct impact on the plaster/surface → can slow down aging. Air & biodiversity: binds dust, provides habitat for insects/birds (depending on planting). Sound insulation (light): can dampen sound somewhat, depending on the system, especially in the high-frequency range. Appearance & acceptance: visible enhancement, often better identification of residents and "beacon" effect (good for image/ESG).

INFO: https://infothek.bmimi.gv.at/gruenfassade-grauwasser-so-innovativ-lassen-sich-heute-gruenderzeit-haeuser-sanieren/

The bottom line is that Kauergasse 2 is a prime example of how an old building from the Wilhelminian era can be renovated to be gas-free, highly energy-efficient, and at the same time improve the urban climate (greening) and how this is only made financially realistic in the first place by the combination of Viennese renovation subsidies and research/innovation funding. The demonstration ("lighthouse") effect improves bankability/replicability and stakeholder trust.

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Base renovation via Vienna "Sockelsanierung" funding + additional Climate & Energy Fund (QUEEN GUDRUN II) support grant for the innovation package. ▪ Operating-cost & carbon-risk reduction: "phase-out of gas", switch to central district heating, plus PV and major thermal upgrade ▪ With very low energy requirements, the building is much less susceptible to energy price spikes or future CO_2/regulatory costs. This makes cash flows more predictable.	▪ High total CAPEX: ~€ 11.4m total investment for the overall conversion/extension—large upfront financing need. ▪ Complex systems add Operations & Maintenance risk: greywater heat recovery + reuse (WC/irrigation) and decentral ventilation require careful operation/maintenance. ▪ Coordination burden: combining city refurbishment funding + heating swap + research grants increases planning/approval and reporting effort.
Opportunities / Possibilities	**Threats / Barriers**
▪ Access to future green capital: measurable outcomes (gas phase-out, PV, low HWB, microclimate greening) fit ESG/green-loan criteria. ▪ Additional revenue streams: communal PV/self-consumption models and upgraded commercial units can improve long-run cashflow.	▪ Funding volatility: if Vienna subsidy rules/caps or research-call support shrink, the same package may not pencil out. ▪ Electricity price risk: savings depend partly on electric auxiliaries (pumps/ventilation/controls); higher power prices reduce net benefit.

No. 7: Out of gas' showcase project Zwölfergasse 2, Vienna

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Apartment building for renting
Owner	Blue Danube Immobilien GmbH Private individual, homeowner Helga Brun. "Helga Brun Property Management and Agency"
Type of building	Private
Total investment cost	€ 4.1 million
Type of financing	Subsidies, Erste Green Housing Loan, 2023
Financier	City of Vienna, City of Vienna, Erste Bank der österreichischen Sparkassen AG
Financing year	2021-2023
Specific / Comment	Pilot project for Gründerzeithaus renovation with geothermal heating

DESCRIPTION

Picture 7: Courtyard View After Renovation
©Graf Holztechnik

The Gründerzeit building at Zwölfergasse 21 (1150 Vienna) is a four-story apartment building with a courtyard wing, which underwent extensive renovation to improve its thermal efficiency, modernize it, and, above all, convert it from gas to a central, climate-friendly heating system. The poor building fabric, the lack of a district heating connection and the limited space on the property posed challenges.

The building was structurally reorganized: four of the twelve existing apartments were combined into two renovated apartments, and four new apartments were created (three of them in the attic). All facades were given comprehensive thermal insulation (including 18 cm on the facades) and new windows; in the area of the structured facade, selective interior insulation was also used in some places, otherwise mainly classic exterior insulation. A new elevator makes all floors barrier-free, and the reinterpreted pergola concept connects the street and courtyard wings, creating direct open spaces for the apartments. But what makes it truly special is the energy system: instead of the previous gas-fired heating systems, heating and cooling are now provided by a brine-water heat pump (55 kW) fed by a geothermal probe field with a total of seven deep probes. Four probes are located in the inner courtyard (approx. 100–150 m), and three additional probes had to be installed to ensure full supply – in the sidewalk in front of the building. The use of boreholes in public spaces to supply energy to a private residential building is pioneering work in Vienna. To increase efficiency, the ground is "recharged" via a solar thermal system (100 kWp,

"HeatHarvest"/overgeneration), and a PV system (6.48 kWp) supports the heat pump's electricity requirements. Since April 2023, a CO_2-free full supply for heating, cooling, and hot water has been planned/provided.

The building has thus undergone a massive improvement in terms of energy efficiency: according to the City of Vienna, the heating requirement has fallen from 127 to 18 kWh/m²a (energy efficiency class A instead of D), and the structural measures have increased the (living) space from 1 040 m² to 1 375 m² – with a total of 14 instead of 12 residential units.

INFO: https://www.wien.gv.at/umwelt/vorzeigeprojekt-zwoelfergasse

A total of around € 4.1 million was invested; the payback period is estimated at around 20 years (through energy savings and improved yield potential). The project benefited from Vienna subsidies for basic renovation (a mix of non-repayable grants – depending on energy savings – and subsidized loans for approximately 40% of the renovation costs) as well as additional special block subsidies for urban development/structural improvements (as grants covering up to 100% of these structural costs). The remaining portion was financed through own funds and an "ERSTE Green Housing Loan" (EIB-refinanced) – 25 years, fixed interest rates. The project was supported by the Vienna renovation consultancy Hauskunft and is part of the flagship initiative "Raus aus Gas / 100 Projekte" (Get out of gas / 100 projects).

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Blended finance lowers cost of capital: Vienna "Sockelsanierung" (grant + subsidised loan ~40% of renovation costs) + "Blocksonderförderung" (structural improvement grant) + 25-year fixed-rate ERSTE Green Housing Loan (EIB-backed) + own funds. ▪ Clear payback logic: ~€4.1m investment with a stated ~20-year payback via energy-cost savings and higher achievable returns.	▪ Relatively high investment for deep drilling for geothermal energy. ▪ High complexity / high CAPEX: deep thermal retrofit + geothermal + solar thermal regeneration + PV + mixed heat emitters → higher planning, coordination, and commissioning effort. ▪ Long financial lock-in: 20-year payback assumption and 25-year debt horizon reduce flexibility if conditions change. ▪ Reliance on "special" enablers: the model depends on subsidies and on the feasibility of drilling (incl. public space).
Opportunities / Possibilities	**Threats / Barriers**
▪ More green funding access: strong alignment with municipal decarbonisation ("Raus aus Gas") and green-lending/ESG capital.	▪ High investment costs and long-term returns discourage many building owners. ▪ Electricity price / grid risk: heat pump economics depend on power prices and grid constraints. ▪ Technical/geological and O&M risk: drilling underperformance, system faults, or higher maintenance can erode the savings that the payback relies on.

No. 8: Smarter Together- Hauffgasse 37 – 47, Vienna

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Apartment building for renting
Owner	BWS-Gruppe , Gemeinnützige allgemeine Bau-, Wohn- und Siedlungsgenossenschaft
Type of building	Private
Total investment cost	€ 36.9 million
Type of financing	Reserves, Subsidies
Financier	City of Vienna's funding amounts to € 17.7 million. With EU funding from the 'Smarter Together' project as part of the EU's 'Horizon 2020' research programme, an additional € 1.3 million will be made available for innovation measures in the areas of energy, mobility and participation.
Financing year	2017-2022
Specific / Comment	Comprehensive renovation with participation of inhabitants

DESCRIPTION

Picture 8: Buildings Freshly Renovated ©GSD

The residential complex at Hauffgasse 37-47 in 1110 Vienna was completed in 1984. Within the framework of the "Smarter Together" project, the large housing complex owned by non-profit housing developer BWSG was comprehensively renovated and extended. The refurbished building is a social/subsidised housing complex with a total of 485 residential units and around 1,000 residents. During the refurbishment, 79 new residential units were created in the attic. A step-by-step renovation of the residential complex, which is divided into three separate blocks, was carried out. The thermal-energetic refurbishment with 2-storey extension at stairs 2-9 (79 new flats), revitalisation of the community centre, EU-funded urban regeneration initiative 'Smarter Together- Gemeinsam g'scheiter' and Innovative e-car sharing pilot scheme. Based on several feasibility studies by the energy supplier, for structural reasons it was decided to install a PV system on the roofs of block 1 and block 3, covering approximately 275 m2 and 80 m2 respectively, and able to generate a total of 69 kWp. The electricity produced on site is now also used to heat water with electric boilers. Additional funding of € 20/m² of usable floor area in the existing building (totalling over € 800 000 in non-repayable grants), energy performance indicator: 23kWh/m²a (119 kWh/m²a before renovation), Improvement: 80.67%

INFO: https://www.gsd.at/Home/projekte/hauffgasse

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Blended finance (City of Vienna funding + EU Horizon 2020 support) reduces pressure to refinance mainly via rents. ▪ Innovation co-funding (PV, e-mobility, participation) helps cover "extra" measures and boosts ESG visibility. ▪ intention that existing tenants are not financially burdened strengthens acceptance and political legitimacy.	▪ Dependence on subsidy schemes and programme rules; high administrative and reporting effort. ▪ Limited financial buffers typical for social/non-profit housing (regulated affordability), making overruns harder to absorb. ▪ High upfront capital needs and long duration in occupied buildings increase coordination and schedule sensitivity. ▪ Tenant support/communication needs add ongoing project-management costs.
Opportunities / Possibilities	**Threats / Barriers**
▪ Replication potential for similar 1980s housing stock: "deep retrofit + densification + subsidies" as a scalable template. ▪ Strong fit for ESG/green-finance instruments due to measurable efficiency gains. ▪ Policy tailwinds for "climate action without displacement" can unlock further funding in future programmes.	▪ Funding cuts or changes (municipal/EU) can undermine feasibility for comparable projects. ▪ Construction cost inflation and supply-chain shocks can create financing gaps.

No. 9: State care center, Bad Radkersburg, Carinthia

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Bad Radkersburg Regional Care Center
Owner	LIG – Landesimmobiliengesellschaft Steiermark
Type of building	Public
Total investment cost	€ 340 000 as an initial investment by Siemens for the heating system
Type of financing	ESCO Energy Performance Contracting (EPC)/Energy Savings Performance Contract (ESPC)
Financier	Siemens Österreich AG – Contractor, subsidies Kommunalkredit/KPC
Financing year	2009-2010
Specific / Comment	Switch from fossil to renewable heating through energy savings contracting model

DESCRIPTION

Picture 9: LPZ Bad Radkersburg, ©Pachernegg

The building is a state care centre in the centre of Bad Radkersburg, owned by LIG - Landesimmobiliengesellschaft Steiermark in 2009. The nursing home was completed and opened in 1964 and offers space for 128 nursing guests and 100 carers. At the beginning of 2008, LIG Steiermark decided to reduce greenhouse gas emissions by heating the state care centre in Bad Radkersburg without the use of heating oil as a primary energy source and to reduce energy requirements for heat, water and electricity through EE measures in parallel with the heating switch.

The greatest savings potential came from switching from heating oil to wood for space heating. 'Before the renovation, the heating was provided by an oil boiler. Now the state care centre has been connected to the biomass local heating network operated by the regional supplier "Quelle GesmbH". By connecting to the local heating network, the installed heating output of 1,860 kW from the oil-fired boilers could be reduced to 500 kW (or 320 kW in the final expansion). A solar thermal system with a collector area of 143 m² was installed for hot water consumption. The storage capacity of the system is twice

3,000 litres and is designed for 128 nursing patients and 100 employees. Electricity consumption was also reduced by approx. 12 per cent through modernisation and conversion of the energy distribution system using speed-controlled circulation pumps, energy-saving lamps instead of light bulbs and electronic ballasts instead of conventional ballasts. To safely operate the low-temperature system for heating and hot water a water treatment system to prevent legionella was also installed. In a further expansion stage, the thermal building envelope was also modernised.

Together with the Graz Energy Agency, LIG Styria developed the **'Integrated Energy Contracting'** model, in which the energy source conversion, efficiency measures and the price for energy supply, operational management and plant refurbishment were the award criteria for selecting the best bidder. Following an EU-wide tender, the contract was awarded to Siemens Österreich AG for heat distribution in the Bad Radkersburg state nursing home. In this energy contracting model, the contracting partner Siemens made the initial investment, which totalled

€ 340 000 for the heating system. The contract period is 15 years. Overall, a positive cash flow of € 260 000 including investment and annual costs was forecasted for the state care centre over 15 years. Through the involvement of Siemens AG as ESCO the necessary investments can be amortised from the energy cost savings, which are made up of future savings and rising energy prices. In addition, subsidies from Kommunalkredit (environmental investment promotion) were utilised to cover the additional environmental costs for the switch from fossil to renewable energy. As part of the renovation, 47 per cent of consumption was reduced through targeted energy-saving measures (regarding space heating and hot water) and the switch to low temperatures. The calculated energy savings amount to 35 per cent or 364 MWh for heat consumption and 12 per cent or 51 MWh for electricity consumption per year and have been verified by Siemens during the annual audit.

INFO: https://www.soziales.steiermark.at/cms/dokumente/11350033_52077529/feae4985/lpz%20ra.pdf

Project information states that heat and hot-water consumption fell substantially through the combined effect of demand-side measures and the system switch, and that electricity use also declined- savings that form the core "repayment source" in the contracting structure. The public-sector benefit is that modernisation can be delivered without large upfront public capital, while transferring key implementation and performance responsibilities to a specialised partner under a long-term contract. Performance verification reduces public-sector performance risk. Baseline and usage sensitivity: in care settings, occupancy levels, hygiene requirements (e.g., hot-water and legionella prevention), and operating schedules can shift- making savings harder to predict or compare year to year. Disagreements about baselines, comfort levels, or operational changes (common in 24/7 facilities) can lead to conflicts over whether savings targets were truly met.

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ No (or very low) upfront capital burden for the public owner ▪ Clear long-term business case and predictability: a 15-year term is used to model payback and lifecycle costs ▪ Tender evaluated fuel switch + efficiency measures + energy supply price + operations/management + refurbishment as a package, encouraging an optimized whole-system solution rather than isolated measures. Leverages grants to "bridge the green premium": additional support (Kommunalkredit/KPC environmental promotion) helps cover the extra cost of switching from fossil fuel to renewable supply.	▪ The model of energy-saving slow to establish itself as an alternative financing instrument for energy renovations in the Austrian market. ▪ Long-term lock-in and reduced flexibility: a 15-year contract can limit the facility's ability to change operators, redesign systems, or renegotiate energy supply conditions without penalties. Savings are shared/"priced in": because the ESCO recovers its investment and margin through the operating/service model, the public owner may not capture 100% of the savings immediately.
Opportunities / Possibilities	**Threats / Barriers**
▪ Stronger ESG/green-finance positioning: verified energy and CO_2 reductions support sustainability reporting and can improve access to climate-related funding or green lending conditions. ▪ Demand-side savings create durable budget relief: the documented reductions (e.g., heat and electricity savings cited in the project reporting) can free operating budgets for care quality improvements.	▪ Lock-In effect if not paired with thermal renovation of building envelop. ▪ Conflict potential over performance guarantees. ▪ Energy-price and tariff risk can weaken the "savings engine ▪ If the ESCO's service quality declines or the contractor changes strategy, the facility may face operational risk—especially because heating and hot water are mission-critical in a care home. ▪ New rules for procurement, energy efficiency, district heating, or hygiene/legionella requirements can force additional investments not covered by the original contract.

No. 10: **Schoolcenter Vorchdorf, Upper Austria**

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Schoolcenter Vorchdorf – Upper Austria
Owner	Marktgemeinde Vorchdorf
Type of building	Public
Total investment cost	€ 295 000
Type of financing	ESCO Energy Performance Contracting (EPC) or Energy Savings Performance Contract (ESPC)
Financier	Cofely Gebäudetechnik GmbH (Contractor) – since 2021 EQUANS Austria GmbH
Financing year	2014 – 2021, Contract term: 8 years
Specific / Comment	Energy-saving refurbishment with contracting supported by Upper Austria

DESCRIPTION

Picture 10: School Centre Vorchdorf
©Energiegruppe Vorchdorf

The school centre of the municipality of Vorchdorf is home to the primary school, the new secondary school, the polytechnic school, the regional music school and the after-school care centre of the Almtal municipality. Around 550 pupils attend school there, taught by around 100 teachers. The school centre was the largest consumer of heat and one of the largest consumers of electricity in the market town of Vorchdorf. Inspired by courses organised by the Upper Austrian Energy Saving Association, the idea was born to finance energy-saving refurbishment measures through contracting. The savings potential revealed by the detailed energy analysis and the risk-free financing convinced those responsible.

A key part of the project was the modernisation of the control system and the installation of the new building management system, which coordinates the building's entire heating and ventilation system via a bus system. In addition, inefficient heating pumps were replaced with speed-controlled ones, balancing valves were newly installed or replaced and thermostatic heads were installed. Hydraulic balancing rounded off the package of measures. In addition to optimising the heating system, silicone rubber seals were fitted to more than 450 windows to reduce the heating requirement.

Energy contracting is a service contract in which a contracting party (the municipality of Vorchdorf) commissions a contractor (such as the company Cofely) to carry out refurbishment measures to save energy. The contractor (Cofely) pre-finances the measures and the contracting party (the municipality) refinances the repayment from the energy savings. On top of this, there exists a subsidy from the province of Upper Austria.

These measures have reduced the building's heat consumption by 21% and electricity consumption by 14%. Saving energy in public buildings requires more than just technical measures. It is equally important to train

building users so that energy-efficient technology and user behaviour complement each other to achieve the greatest possible success. 280,000 kWh/year could be saved and 72 tonnes of CO2/year.

INFO: https://egruppe-vorchdorf.jimdofree.com/projekte/schulzentrum-heizung/

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Whole-system optimisation via bundled tender criteria ▪ Predictable long-term planning: the business case is calculated over 15 years, aligning payback with operation and refurbishment responsibilities. ▪ Savings are tracked and checked through ongoing energy management and (per reporting) regular audits, reducing "promise vs reality" risk for the owner.	▪ Long-term lock-in: a 15-year contract can reduce flexibility (changing suppliers, reconfiguring systems, renegotiating terms) and may create exit/variation costs. ▪ Transaction and complexity costs: EU-wide tendering, baseline definition, and measurement & verification require expertise, time and governance capacity. ▪ Savings may be "shared" rather than fully captured immediately: because the ESCO is repaid through the service model (often via margins embedded in O&M/service fees), the client typically realises full savings only over time.
Opportunities / Possibilities	**Threats / Barriers**
▪ Especially for municipalities with low budgets and high energy costs attractive. ▪ Replicability across public building portfolios: ▪ Contracting can start with systems (heat, distribution, controls) and later extend to envelope or additional efficiency measures while keeping payments linked to verified performance. ▪ Stronger ESG / climate reporting: verified savings and CO_2 reductions support sustainability targets and can strengthen access to green/public funding where available. ▪ Operational quality improvements: continuous energy management plus user motivation/training can reduce waste, stabilise performance and improve internal capability.	▪ Lock-In effect if not paired with thermal renovation of building envelop. ▪ Performance disputes: disagreements about baselines, comfort levels, or operational changes can trigger conflicts about whether savings targets were met (common in contracting). ▪ Counterparty and service continuity risk: heating/hot water are mission-critical in a nursing home; any ESCO underperformance, staffing issues, or strategic changes can create operational risk. ▪ Reputational risk: if stakeholders perceive the project as "too expensive," "unclear," or disruptive, political/media pressure can complicate contract management- especially when investment figures are reported differently.

No. 11: **School Campus, Hittisau, Vorarlberg**

FINANCIAL DATA	
Building / Beneficiary	School Campus Hittisau
Owner	Municipalities of Hittisau, Riefensberg and Sibratsgfäll
Type of building	Public
Total investment cost	€ 15 million
Type of financing	Municipal Loan
Financier	HYPO NÖE – Federal bank für Lower Austria and Vienna AG
Financing year	2020-2035, 15 years
Specific / Comment	Three municipalities jointly cover the costs as a school maintenance association. The project is a mix of renovation and new construction

DESCRIPTION

Picture 11: School Campus Hittisau Opening
© VS Hittisau

Hittisau school maintenance association carried out a general refurbishment of the school site in the centre of Hittisau. The school maintenance association is run by the municipalities of Hittisau, Riefensberg and Sibratsgfäll. The project includes a reorganisation of the site, the construction of a new secondary and polytechnic school, a community building housing an event hall with underground car park and 2 gymnasiums, as well as the renovation of an existing building for the primary school.

The existing primary school from the 1980s was renovated to make it more energy-efficient and upgraded with silver fir and a great deal of design flair. The three school buildings are heated with district heat, and ventilation is provided by a moderately designed controlled ventilation with heat recovery. To keep an eye (and ear) on the air quality each class is equipped with a CO_2 traffic light with green, yellow and red. The low-tech approach was pursued right from the planning stage with building services and control components as well as highly energy-efficient maintenance and operation. The selected components are assessed according to their behaviour over the entire life cycle, automation is only used sparingly and after a thorough examination of alternatives. The result is an extraordinarily efficient, climate-friendly building with maximum comfort, low energy requirements and above-average long-term value retention.

HYPO NOE is acting as lender for this project through a municipal loan. The total investment costs amount to € 15 million with a term of 15 years for the municipality of Hittisau. After considering the funding commitments already

made by the federal state and the financial advance payments made to date (approx. € 1.2 million), a debt financing requirement of approx. € 18 million will remain.

Without the subsidies still to be expected or further contributions of own funds, the following loan requirements are calculated for the individual municipalities: Hittisau € 15.6 million, Riefensberg € 2.1 million and Sibratsgfäll €264 000. After the contribution of the planned own funds, the loan requirement will be around € 15 million. Further expected subsidies under the Education Investment Act, from the federal government and for energy-efficient construction are also not yet included.

INFO:https://www.klimaaktiv.at/bauen-sanieren/staatspreis/nominierungen-staatspreis-architektur-und-nachhaltigkeit/schulkomplex-hittisau.html

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Clear municipal-finance structure: a municipal loan ("Kommunaldarlehen") provided by HYPO NOE ▪ Jointly covering costs through 3 municipalities, cost and risk sharing across municipalities	▪ Multiple funding bodies lengthen the deciding and planning processes for financing investments in public buildings (how much funding, when, from whom). ▪ High absolute capital requirement for small municipalities: even after subsidies ▪ Reliance on subsidies not fully locked in (timing/amount risk) ▪ No "savings guarantee" mechanism: this is classic municipal borrowing (not ESCO/EPC), so performance risk (whether energy savings actually materialise) largely stays with the municipalities.
Opportunities / Possibilities	**Threats / Barriers**
▪ Strong Energy performance, PV production, and recognised sustainability positioning can help unlock further grants or preferential "green" financing ▪ Operating-cost relief strengthens debt service capacity ▪ Revenue options from multi-use assets: the community building/event hall and underground parking can potentially generate recurring income (rentals/fees) that supports operating costs and improves overall project economics. ▪ Reputation and talent attraction: award nominations and sustainability visibility can support community attractiveness	▪ The need for multiple funding can discourage smaller communities and postpone renovation projects. ▪ Construction cost inflation is vulnerable to cost overruns ▪ Interest-rate and refinancing risk: if parts of the municipal loan are variable-rate or refinancing becomes necessary, higher rates can strain municipal operating budgets over a 15-year horizon. ▪ District-heat tariff risk: while district heating supports decarbonisation, rising tariffs could reduce expected operating-cost benefits and pressure budgets.

No. 12 Kindergarten Bad Eisenkappel, Vellach, Carinthia

FINANCIAL DATA

Building / Beneficiary	Kindergarten Bad Eisenkappel - Vellach / Carinthia
Owner	Municipality of Bad Eisenkappel- Vellach
Type of building	Public
Total investment cost	€ 2 068 305
Type of financing	Subsidies & Transfers, 2020
Financier	Climate & Energy Fund's Mustersanierung grant, Federal State of Carinthia, KLIEN, Kommunal Kredit Community Investment program (State of Austria): € 44 667 EUR (2019)
Financing year	2017-2020, 15 years 2017- 2032
Specific / Comment	Mix of different fundings and transfer from federal estate and State of Austria, Model renovation funded by Climate and Energy Fund

DESCRIPTION

Picture 12: Kindergarden Eisenkappel
© Paul Ott

The existing building was constructed in the late 1960s and provided space for two kindergarten groups. Around ten years ago, there was a need for additional childcare places and a crèche, but the building was too small for this. Following a discussion about the location, it was decided to carry out a general refurbishment of the kindergarten and to increase the number of places by adding an extension. The existing, filigree wooden roof structure was made of reinforced concrete and insulated. The existing roof was built over with the new ceiling construction. The façade and roof structure from the late 1990s was retained, insulated and provided with a uniform covering. All window constructions were replaced with new wooden windows with triple glazing. The floors in the group rooms were made of wood, while the common areas on the ground floor were covered with linoleum or tiles. On the upper floor, the existing parquet flooring was retained and replaced. The building products used bear the Austrian Ecolabel.

A crèche is now also housed in the kindergarten building. Care was taken to allocate separate, accessible areas to the different users, i.e. kindergarten teachers and nursery visitors. The east-west orientation of the building offers each group continuous units with the possibility of playing according to the position of the sun. The flat roof areas serve as movement areas for the children. Barrier-free access is provided by a ramp, which also creates a connection to the green space at ground level.

Widely projecting canopies provide shade for the windows and glazing on the ground floor. At the same time, they form shaded terraces for the children to spend time on. There are also external venetian blinds with electronic controls.

Heating is provided by biomass district heating. All electrical wiring in the building has been replaced. Economical LED lighting enables considerable savings potential. The kitchen is equipped with energy-efficient appliances. The Bad Eisenkappel kindergarten is run bilingually and, following the renovation, offers space for 65 children in three groups and a crèche. The building fulfils the basic objectives of the municipality: increasing energy efficiency and living climate protection. Expected CO_2 savings: 103.39 t/a, corresponding to a 77% reduction

INFO: https://www.klimaaktiv.at/bauen-sanieren/gebaeude-in-oesterreich/objekt-des-monats-9-2020.html
https://mustersanierung.at/projekte/kindergarten-eisenkappel-vellach/

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Blended public finance- combines municipal funding with multiple public subsidies ▪ Klimaaktiv Gold certification (914/1000 points)	▪ High administrative complexity / eligibility risk ▪ Grant share may be limited relative to total capex ▪ No built-in "savings guarantee": unlike ESCO/EPC models, municipalities largely keep performance risk (if actual savings fall short, debt service still has to be paid).
Opportunities / Possibilities	**Threats / Barriers**
▪ Better access to future "green" funding ▪ Budget resilience through lower energy intensity ▪ Awards/public recognition can increase local acceptance for future investments and make it easier to secure co-funding.	▪ Cost overruns or planning changes can trigger strong public criticism and formal audit findings, increasing governance burden and reputational risk. ▪ Reliance on (biomass) district heating reduces fossil exposure, but tariff increases can erode projected operating-cost benefits.

No. 13: Elementary school Semirach - Model Renovation, Semirach, Styria

FINANCIAL DATA

Building / Beneficiary	Elementary school Semirach
Owner	Marktgemeinde Semirach
Type of building	Public
Total investment cost	€ 2 802 063
Type of financing	Subsidies and transfers, Raiffeisen Bank Passail, Federal Estate of Styra: KIP (Community Investment program), Subsidy for Model Renovation (Climate and Energy Fund)
Financier	Climate and Energy Fund (KLIEN), Raiffeisen Bank Passail, Federal Estate of Styra
Financing year	2019 – 20244, 25 years
Specific / Comment	Ecological renovation. long loan term – 25 years instead of 15 years as usual for renovation projects.

DESCRIPTION

Picture 13: New Façade Primary School
© Arch+More Architekten

The market town of Semriach (ST) has carried out a thermal renovation of the school building constructed in 1892. The three-story building is used exclusively for educational purposes. In addition to the renovation, the school building was expanded on the upper and attic floors.

The comprehensive renovation included extensive thermal insulation, the installation of a ventilation system with heat recovery, external shading, optimization of the lighting system, and the installation of a photovoltaic system. The building was predominantly insulated with materials certified by the Austrian Eco-label and natureplus. The building meets the klimaaktiv Gold Standard. Building service was renewed and some components were newly installed: Heating is provided via an existing district heating connection (biomass). External shading elements were installed to reduce cooling demand. A ventilation system with heat recovery was installed. Hot water is now supplied through an existing district heating connection (biomass). The lighting was upgraded to efficient LED lighting as part of the renovation. A photovoltaic system with a module area of around 125 m² and a capacity of 20.00 kWp was installed, generating approximately 14,690 kWh of electricity annually. The remaining electricity demand of the renovated building is covered by green energy.

Raiffeisen Bank Passail with a loan of € 2.8 million (term 25 years), Federal Estate of Styra: Subsidy in form of repayment grant: € 2.1 million in total and KIP (Community Investment program) – Subsidy: ~ € 70 000. Subsidy for Model Renovation (Climate and Energy Fund). Basis for subsidy: € 953 945 (environmental-related additional costs), Subsidy State of Austria: € 200 486.79, Subsidy EU: € 195 967.21.

INFO:https://www.klimafonds.gv.at/mustersanierung-rueckblick-auswertung-projekte/projekte/volksschule-semriach/

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Strong grant stacking lowers the real budget burden: model-renovation subsidies (Climate and Energy Fund + EU) plus additional public transfers reduce the share that must be debt-financed. ▪ Long-term bank loan improves affordability ▪ Debt-service support increases bankability: the project is reported with a repayment grant from the Province of Styria	▪ Small school buildings in Austria, each renovation is a highly individual and expensive process (no standardization). ▪ Long debt horizon (25 years) locks in budget flexibility: future councils inherit repayment obligations and reduced fiscal room for other investments.
Opportunities / Possibilities	**Threats / Barriers**
▪ Better access to future climate/education funding ▪ proven delivery under demanding programmes (Mustersanierung/klimaaktiv) can improve credibility in later funding rounds. ▪ Potential to refinance or optimise debt later: parts of the long-term financing could potentially be optimised (subject to contract terms).	▪ Without the high transfer and subsidy from other public bodies most municipalities could not afford comprehensive energetic renovation. ▪ If financing is variable-rate (or refinancing is needed), higher rates can increase lifetime costs-especially over 25 years. ▪ Construction price spikes can outpace fixed subsidy bases, pushing more cost onto municipal debt/equity. ▪ If actual energy savings fall below expectations (behaviour, operation, maintenance), the economic case weakens and payback stretches.

No. 14: Town hall Mondsee - Model Renovation, Upper Austria

FINANCIAL DATA

Building / Beneficiary	Municipality of Mondsee
Owner	Municipality of Mondsee
Type of building	Public, Town hall
Total investment cost	€ 4.5 million
Type of financing	Model Renovation, Transfers (2022)
Financier	Climate & Energy Fund Austria
Financing year	2021 – 2024, 25 years 2021 – 2046
Specific / Comment	Public listed building, instead of standard ETICS, the project relies heavily on **renewable insulation materials** (e.g., hemp fibre on the facade, cellulose in the roof/ceilings) and explicitly mentions eco-label/natureplus-oriented material selection as a "special solution."

DESCRIPTION

Picture 14: Frontview Town Hall (Front) ©Steiner-Watzinger

The municipality of Mondsee carried out a comprehensive thermal renovation of the town hall, which was built in 1774.

The gross floor area of the building was 1,001.5 m² and was expanded to 1,062.2 m² as part of the renovation. The heating of the existing and renovated building was provided by biogenic district heating. The electricity supply continued to be provided by a conventional electricity supplier. As an additional measure of the model renovation, the lighting was also converted to LED.

The building was renovated by applying hemp fiber insulation board to the exterior walls, insulating the roof with cellulose insulation, insulating the ground floors. Additionally, the wooden windows were replaced. The heating of the existing building was already provided by biogenic district heating. During the renovation, the district heating connection was reduced from 135 to 50 kW. Ventilation units with heat recovery (efficiency of 88% and 82%) and energy consumption monitoring were installed. The existing halogen spots, halogen rods, fluorescent tubes, and incandescent bulbs for interior lighting were entirely replaced by LED systems with intelligent light control. Heating energy demand reference- Reduction: approx. 62%

What is particularly noteworthy from a financial perspective is that the majority (according to your data set) is covered by budget reserves/internal loans from the municipality (~€ 3.2 million), supplemented by targeted funding components: Upper Austria needs-based allocation/transfer ~€ 916 000, Model renovation (Climate and Energy Fund) ~€ 412 600

This is a typical "lighthouse" financing logic: high equity ratio + subsidies specifically for additional climate/quality requirements (monitoring, heat recovery, ecological insulation materials, LED control, etc.). In practice, it is precisely this combination that makes ambitious renovations in public buildings realistic. Financing, costs, savings. Federal Estate of Upper Austria: Transfer (allocation of needs): 916 000 EUR , Subsidy for Model Renovation (Climate and Energy Fund): € 412 600, Budget reserves municipality (inner loan): ~ € 3.2 million.

INFO: https://www.klimafonds.gv.at/projekt/gemeindeamt-mondsee/

What makes the Mondsee town hall renovation so special is not a single component, but rather the unusual combination of historic preservation, very consistent energy optimization, and a financing strategy that makes such a project feasible for a municipality in the first place.

The estimated costs of € 4.8 million were met and even reduced thanks to good collaboration, professional planning, and site management. Clear delivery milestone framing (project run-time and public "opening" communication) can help maintain stakeholder support during disruptive works. Model renovations are well documented, that makes it easier for replication. Better access to future climate/efficiency funding: documented performance, monitoring, and programme participation can strengthen eligibility for subsequent national/EU calls.

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Blended public + municipal financing: combines municipal own funds ("internal loan"/budget reserves) with upper-level public support (province transfers + Climate & Energy Fund "Mustersanierung"). ▪ High municipal equity share = low financing dependency: which reduces exposure to bank interest-rate shocks. ▪ Cbeing a Mustersanierung project helps with political legitimacy, benchmarking, and future grant applications.	▪ Municipalities could not stem the costs from their earnings budget without transfer and subsidies from federal states and Austrian State. ▪ Large opportunity cost of using reserves: heavy reliance on budget reserves ties up municipal liquidity and reduces room for other investments. (Implied by the described high municipal share.)
Opportunities / Possibilities	**Threats / Barriers**
▪ Operational savings + reduced peak heat demand protect future budgets: the project reduced heating connection capacity (135 → 50 kW) and improves consumption control, which can cushion long-term operating costs (even if tariffs move). ▪ Public acceptance / reputation effects: public "open day" communication and visible results can build support for further investments.	▪ The project history shows that "high costs" and "financing not secured" can stop or delay decisions – this remains a risk for similar heritage retrofits. ▪ Heritage constraints can drive unforeseen costs: strict requirements (materials, façade constraints, special detailing) increase uncertainty and can inflate budgets. ▪ If reimbursements come late (common in programme-based funding), the municipality must bridge cash flow. ▪ Energy-tariff risk: even with biogenic district heating, tariff increases can reduce the net financial benefit of efficiency gains.

No. 15: Künstlergasse 14-16 – Puba Foundation, Vienna

FINANCIAL DATA

Building / Beneficiary	Housing group "Wohnraum Künstlergasse"
Owner	The Private Foundation for the Support and Education of Employees (PUBA)
Type of building	Private
Total investment cost	€ 1.9 million
Type of financing	Private capital & Subsidies, 2015, Vienna Urban Renewal/Wohnfonds Wien program
Financier	Puba Foundation, City of Vienna
Financing year	01/2013 – 05/2015
Specific / Comment	Private Foundation meets co-housing association

DESCRIPTION

Picture 15: Courtyard View Künstlergasse ©raum & communications

The Private Foundation for the Support and Education of Employees (PUBA) realized the "Wohnraum Künstlergasse" housing project in the 15th district of Vienna, focusing on artistic and educational activities within the group and the living environment. Following a successful project in the Grundsteingasse in the 16th district and growing demand for communal living forms, PUBA also provided rental apartments for a housing project at Künstlergasse No. 14. The housing group consists of young people aged 0 to 39 – children, students, professionals in arts, culture, education, and social research – and from this group, the "Wohnraum Künstlergasse" association was founded.

The renovation faced challenges due to the building's poor condition and several vacant apartments. During the process, a one-story and a four-story building in the courtyard were demolished, and another four-story building was reduced to two stories, now housing three maisonette apartments and a rooftop terrace. Two elevators were added for barrier-free access, and the attic was developed to create additional housing units, reducing heating demand per Wohnfonds Wien criteria.

A piggyback renovation was carried out for existing tenants, who moved to interim apartments during the process. The initial vacancies allowed co-housing apartments to be concentrated in one part of the building. Commercial and shared spaces on the ground floor and basement were also renewed. The renovation resulted in 29 housing units, 14 of which are leased to co-housing group members. The shared spaces are collectively rented by the co-housing association Verein KulturLeben Künstlergasse, while the apartments are individually rented from the PUBA foundation.

Renovation Costs: Funded by PUBA with public subsidies from the City of Vienna, repaid through cost-covering rent during the subsidy period. Purchases for additional equipment for the rooftop terrace and communal room are covered by the housing group's association. Larger expenses are discussed and shared among members. The association applied for a subsidy to cover rent losses for the communal room due to COVID-19. PUBA is not only the landlord, but also acted as a subsidy applicant and acquired the properties back in 2008 – this is "patient capital" (long-term capital), which is well suited to a complex renovation of old buildings: Secure, indefinite individual rental contracts with a deposit, Commercial lease for the communal room, Cost-covering rent according to WWFSG for the 15-year subsidy period, followed by guideline rent according to Austrian tenancy law (MRG) for existing units and In the attic, rent is based on the guideline with a terrace surcharge.

The association has the right to propose tenants for the group's apartment quota to the owner. It is also agreed with PUBA that apartments can be exchanged if needed. The project was carried out as a base renovation and attic conversion as part of the Vienna Urban Renewal/Wohnfonds Wien program. Base renovation is explicitly designed as a thorough renovation of an inhabited building and promotes, among other things, decarbonization, maintenance and improvement work, and the adaptation of ground floor/basement areas into commercial premises. This is a funding logic that cushions renovation risks in existing buildings. The funding is refinanced through cost-covering rent during the funding phase. What is special about this is that the rent follows the financing logic (repayment/interest on the loans/funding instruments used), which makes cash flow more predictable.

INFO: https://www.kuenstlergasse.at/

Governance as a factor in financial stability: The fact that the association has rights of proposal for the "group quota" and that apartment exchanges have been agreed upon is not only socially relevant, but also financially relevant: lower fluctuation, fewer vacancies, a more stable community = lower rental risk.

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Blended "patient capital + public subsidy" structure: a private foundation (PUBA) as long-term owner combines its own capital with City of Vienna / Wohnfonds Wien subsidised refurbishment ("Sockelsanierung + attic conversion"), which lowers financing risk compared with purely market-funded rehab. ▪ Housing and commercial units (6 "Lokale"), reducing dependence on a single revenue stream – Mixed use (living, commercial) – makes repayment of renovation costs easier.	▪ Not highly replicable for large-scale projects, but good solution for "Zinshäuser" in urban areas. ▪ "Sockelsanierung framework" includes allocation obligations (every 2nd/6th/10th/… renovated vacant/new unit must be offered to the City) and cost-covering rent constraints, which can limit flexibility and pricing power. ▪ Post-subsidy revenue uncertainty (regulated rent regimes) ▪ Higher capex and execution risk typical for deep renovation
Opportunities / Possibilities	**Threats / Barriers**
▪ Especially in larger cities with scarce housing and high apartment prices/rents alternative housing associations offer affordable living for young families. ▪ Additional revenues from the communal/event space – a potential income stream that can support community functions and resilience. ▪ Portfolio/partnership potential: the project is, and new project opportunities.	▪ This kind of project needs individuals who feel highly responsible for the project. ▪ Rent-regulation risk (Austrian tenancy law-MRG/ Vienna housing subsidy law-WWFSG): reforms or reinterpretations of regulated rent rules (incl. surcharges for features/areas) can alter allowable rent levels and reduce predictability. ▪ Co-housing models depend on stable group dynamics

No. 16: Bludenz- Model Renovation, Vorarlberg - "SüdSan project"

FINANCIAL DATA

Building / Beneficiary	South Tyrolean Settlement in Bludenz
Owner	Alpenländische Gemeinnützige Wohnbau GmbH
Type of building	"Private" – pilot project involving two model buildings in the Südtirolersiedlung in Bludenz, not to the entire housing development.
Total investment cost	€ 4.3 million
Type of financing	Subsidies from the FFG (Research) and the federal government: € 714 556. The state of Vorarlberg was providing € 1.9 million in renovation loans and energy subsidies, as well as € 1.5 million in one-time special state funding.
Financier	FFG – Austrian Research Promotion Agency (as part of the "Energy of the Future / City of the Future" program); State of Vorarlberg
Financing year	2022 – 2026 (FFG funding)
Specific / Comment	**Project Name:** SüdSan – Socially Compatible, Climate Goal-Compatible Renovation of Two Multi-Family Houses in the South Tyrolean Settlement in Bludenz, Project Lead: Energieinstitut Vorarlberg, Part of the logic is to benchmark renovation against demolition and new construction in financial and climate terms (including emissions from production and operation as well as investment and life cycle costs).

DESCRIPTION

Picture 16: South Tyrolian Settlement
©Walser Fotografie, Hohenems

The South Tyrolean Settlement in Bludenz comprises about 400 apartments, currently housing around 650 people. Owned by Alpenländische Gemeinnützige Wohnbau GmbH, these small multi-family houses were built between 1942 and 1962 and remain largely in their original state, except for windows renewed in the 1980s.

The buildings have poor thermal insulation, with decentralized heating systems like wood stoves, pellet stoves, and some gas or electric heaters. Hot water is provided by electric boilers. While the base rent is low, high energy costs make these buildings some of the "worst performing" in Vorarlberg. Many residents report poor thermal comfort in winter and excessive heat in summer, with winter temperatures in some apartments dropping to 13°C. The buildings are representative of smaller multi-family houses from the 1920s to 1960s, which make up about 13% of Austria's housing stock.

The **SüdSan project** developed optimized renovation concepts focusing on energy, ecology, and economy, implemented in two model buildings. Challenges included the poor condition of the buildings, their classification as worth preserving, and the requirement to renovate while occupied. It collects reliable data on the additional costs of efficient renovations, focusing on lifecycle costs rather than just investment costs. Additionally, methods for energy-economic optimization are promoted. Both buildings had their roofs renewed, creating additional attic apartments. Roofs, walls, and windows were upgraded to high energy standards.

The smaller building used a traditional insulation system, while the larger one used a **prefabricated wood construction**. Basements were insulated from both outside and inside. The improved building envelopes resulted in very low heating demand (29 and 23 kWh/m²BGFa) and excellent airtightness. Both buildings feature central ventilation systems with heat recovery, ensuring good air quality and reduced ventilation heat losses. Heat is distributed via a 4-pipe system with heat transfer stations in each apartment. The smaller building uses new radiators, while the larger one features a new wall heating system. Both buildings have nearly full-coverage photovoltaic systems on one side of the roof, and external blinds prevent summer overheating. Project added attic apartments, creating additional usable area (and potential rental income)

INFO: https://www.energieinstitut.at/forschung-und-projekte/suedsan-beispielhafte-sanierung-von-2-gebaeuden-der-suedtirolersiedlung-bludenz

From a financial perspective, what makes the SüdSan project (Südtiroler settlement in Bludenz) particularly special is that it is not "just" a renovation, but a subsidized research/demonstration renovation—with a financing logic that explicitly aims to enable scalable, socially acceptable renovations for a large, poorly performing building stock. The project is intended to serve as a practical example of the compatibility between climate protection and social compatibility. Even for older, unrenovated multi-family houses, it is technically possible to achieve climate goal-compatible energy demands and greenhouse gas emissions. Project concludes that the incremental cost of a high-quality package vs minimum code can become small when current subsidies are considered, which is a powerful argument for funding bodies and owners. Variant planning, modular tendering, monitoring, and "renovation while occupied" require significant management capacity and specialist partners- harder to replicate at scale without standardisation.

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ "Research + demonstration" financing reduces risk for first movers ▪ Final solution was selected based on lifecycle costs (investment + expected maintenance + energy), improving long-term affordability and reducing the risk of "cheap now, expensive later." ▪ Cost benchmarks + monitoring outcomes are explicitly intended to become the basis for the energy and urban-development concept of the whole settlement (77 houses / ~400 units), i.e., the financial model funds a "blueprint," not only two buildings.	▪ Not "self-sustaining" without strong support: the owner's refurbishment reserves for the settlement were reportedly ~€1 million negative before measures - showing that many similar stocks cannot finance deep retrofits from reserves alone. ▪ Research funding, not full portfolio financing ▪ Project notes major non-energy repairs (moisture, structural issues), meaning total refurbishment costs can approach new-build levels- this strains affordability even when energy upgrades are efficient.
Opportunities / Possibilities	**Threats / Barriers**
▪ The life-cycle approach shows not only investment costs for renovation, but also possible savings of energy cost thereafter. ▪ Credible cost benchmarks and measured performance (energy, comfort, air quality) can support more targeted subsidies and reduce lender/owner uncertainty for future rounds.	▪ To high requirements for future subsidies and technical requirements could lead to either no renovation at all or to take down the old buildings and built new ones ▪ Heritage/preservation constraints increase uncertainty: buildings had "worth preserving" status, which can limit technical options and raise detailing costs- making budgets harder to control at scale.

5.3.2 Main findings for Austrian cases

A clear strength in Austria is the ability to make deep renovation financially feasible through layered public funding. In Vienna (e.g., large social housing retrofits like **Hauffgasse**, and subsidised "Sockelsanierung" models like **Künstlergasse**), the model is designed to keep projects socially compatible: existing tenants are protected from major rent shocks, while the investment is refinanced through cost-covering rents during subsidy periods and, later, regulated rent regimes (e.g., guideline rent logic).

Outside Vienna, federal and provincial instruments (e.g., **Mustersanierung / klimaaktiv, provincial transfers**, **KIP/municipal investment programmes**) play a similar role: they reduce the "green premium" and enable higher-quality packages (better envelope, ventilation with heat recovery, renewables, PV, LED, monitoring). In short: the subsidy stack is the enabler of ambition.

A second recurring strength is risk reduction through governance and standard-setting. Several projects are anchored in Austrian quality frameworks (klimaaktiv Gold / Mustersanierung), which function as a quasi-financial tool: they force better planning, documentation, and performance orientation, which improves credibility for funders and decision-makers. In projects like **SüdSan (Bludenz),** this becomes explicit: the financing is not only for construction, but for methodology, monitoring, and lifecycle-cost optimisation, producing data meant to unlock replication across a large stock segment.

A third strength is the use of "financing levers" that are typical for constrained public/non-profit settings:

- Densification (attic/rooftop additions) to add usable area and improve feasibility (Hauffgasse; SüdSan; Künstlergasse).
- Bridge/interim financing to manage the timing mismatch between construction cash outflows and subsidy inflows (common logic; explicitly mentioned in Semriach).
- Municipal borrowing (long tenors) and/or internal municipal reserves ("inner loan") when bank debt is undesirable or limited (Hittisau, Mondsee).

On the weakness side, Austrian deep-renovation financing is often administratively heavy. Multi-source funding means eligibility rules, documentation, audits, procurement constraints, and timing risk. This increases transaction costs and can slow delivery—especially for small municipalities. Another recurring weakness is limited revenue flexibility where rents are regulated or politically constrained (Vienna subsidised housing; limited-profit housing; guideline rent regimes). This limits buffers for overruns and shifts more importance onto subsidy certainty and cost control.

Opportunities cluster around replication and institutional learning. Many presented models are "designed to be copied": Mustersanierung/klimaaktiv projects provide best-practice templates; SüdSan is explicitly a pilot to scale to an entire settlement and to a broader national building type; municipal association models (Hittisau) show how small municipalities can co-finance shared infrastructure. There is also a growing opportunity to align these models **with ESG/green-finance narratives, because the cases provide measurable CO_2 and energy reductions plus verified quality labels.**

Threats are strikingly similar across cases. The biggest is **dependency on subsidy stability**: when subsidies shrink, end, or are delayed, the economics can break quickly. Next is construction cost inflation and scope creep, especially in old buildings with significant maintenance backlogs (a repeated theme: total costs can approach new-build levels).

Finally, there is **operational/tariff uncertainty**: district heating tariffs, heat pump performance, PV yield, and real-life usage patterns can erode projected benefits. Social risk also appears repeatedly: renovations "while occupied" and community-led models depend on tenant acceptance, interim housing solutions, and stable group governance.

Taken together, the cases show an "Austrian signature" in renovation finance:

- Public co-financing is not a nice-to-have - it is structural.
- Deep retrofits in Austria's municipal, social, and limited-profit context are typically not financed by expected energy savings alone. They are made feasible by public grants and transfers, often combined across levels (federal/province/city/EU).
- Rent regulation and social policy shape the repayment mechanism.
- In Vienna in particular, the financial model is tightly linked to subsidy-period cost rents and later regulated rent regimes, aiming to protect tenants and keep housing affordable. This creates stability, but also caps upside and reduces buffers.
- Quality programmes act like financial instruments.
- Klimaaktiv/Mustersanierung do more than certify performance—they enable funding, structure decisions, and reduce perceived risk for public decision-makers. In some cases, they are the reason high-quality packages (ventilation with heat recovery, monitoring, ecological materials) are politically and financially acceptable.
- "Add area" is a recurring viability tool.
- Attic conversions and rooftop additions appear repeatedly because they improve feasibility without needing new land, and they can support the economics of expensive envelope and systems upgrades.

Two different logics exist side-by-side:

- Cost/rent-based refinancing (social housing, subsidised refurbishment, foundation-led rental models).
- Savings-based repayment (energy contracting / ESCO in the care centre example).

Main risks are predictable and systemic: subsidy volatility, cost inflation, backlog repairs, long-term fiscal lock-in for municipalities, and tariff/performance uncertainty. These risks repeat because they are rooted in how Austrian public building stock is owned, regulated, and funded.

WEGs (Wohnungseigentümergemeinschaften) - associations of apartment owners in condominium buildings - represent a particularly important case type in the Austrian context. Their renovation financing is often less a purely financial question and more a coordination and liquidity challenge. Unlike a single owner (municipality, non-profit housing company, foundation), a WEG must first reach workable majority decisions on scope, timing, and quality level - often the real bottleneck. Financially, WEG projects typically rely on a mix of maintenance reserves (Rücklagen), bank loans, and/or special owner contributions, with subsidies acting as a frequent "deal maker" to close the gap for deeper energy measures. This structure makes WEG refurbishments feasible, but also more fragile: many older buildings have insufficient reserves for deep retrofits, and owners differ widely in their ability to pay, which can trigger conflicts and delays. In the Austrian context, that means WEGs are a huge scaling lever for climate-compatible renovation - yet the success of the financial model depends heavily on clear governance, fair cost allocation, and predictable subsidy rules and payment timing.

5.4 Hungary

5.4.1 Presentation of Hungarian cases

No. 17: Multi-apartment building at Hamvas Béla street 2-10, Szentendre	
FINANCIAL DATA OF RENOVATION	
Building / Beneficiary	Tenants & Apartment owners
Owner	Municipality of Szentendre & private owners
Type of building	Mixed: 18 % shops, library & 82 % residential
Total investment cost	Renovation: € 626 374, Solar (PV & PV/T): € 245 850
Type of financing	EU Grant (CONCERTO III. call), National Grant (ZBR[3]), ESCO, Municipality, private financing
Financier	EU for renovation: 39%, for PV: 50% Hungarian State/National Grant for renovation: 35.5%, for PV: 19.7 % ESCO (contractor) for PV 30.3% Municipality of Szentendre for renovation: 12.9 %, Apartment owners 12.7%
Financing year	2014
Specific / Comment	Multi Apartment building (80 dwellings) + shops on the ground floor PIMES CONCERTO project (flat rate) + ZBR National Grant + Own contribution + ESCO type financing
DESCRIPTION	

Picture 17: Condominium with photovoltaic thermal panels
@PIME'S Concerto project

The four-story apartment building with ground-floor shops was constructed in the late 1970s, and it was one of the first buildings near Móricz Zsigmond High School and the new swimming pool at the Püspökmajor Housing Estate. The renovation was part of the PIMES CONCERTO project and also benefited from support through the parallel National Housing Renovation Program (ZBR).

As part of the renovation, the flat roof was upgraded and transformed into a 'solar field' featuring hybrid Photovoltaic Thermal (PV/T) systems. The building's façade was enhanced with External Thermal Insulation Composite Systems (ETICS), and an 8 kWp photovoltaic system was installed on the south-facing side to generate renewable energy.

The windows, entrance doors, and glass walls in the stairwell were all replaced with modern, energy-efficient alternatives.

[3] ZBR: Green investment Scheme

The previously unused transparent areas in the shop fronts were converted into solid, well-insulated walls to improve energy performance. On the east-facing façade, 40 new balconies were added, providing shading and improving fire safety. Additionally, new adjustable ventilation elements were installed to allow for better airflow and comfort. Under the CONCERTO program, the PIMES project utilized flat-rate financing for both energy efficiency measures (per square meter) and renewable energy installations (per kWp). In both cases, the EU provided 50% of the funding. The Hungarian grant, however, was tied specifically to achieving primary energy savings.

Picture 18: Renovated building with PV @PIME'S Concerto project

The difference between the total installation costs and the combined EU and national grants was partially covered by the apartment owners through the 'Lakástakarék' savings scheme. Meanwhile, the solar energy system was financed by the General Contractor through an ESCO-type (Energy Service Company) financing model, also known as energy contracting, which allowed for cost recovery through the energy savings generated over time.

INFO: https://szentendre.hu/atadtak-az-elso-concerto-hazat-szentendren/

http://www.emi.hu/webadatbazisok/Rendezvenyek.nsf/EventsPreviewHTMLByDate/6DB5DE11A897EEF4C1257DD500401A79/$FILE/2014-11-14-EMI-PIMES-Conference-Vitoria-Gasteiz-MK.pdf

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Mixed and balanced finance. ▪ Outstanding funding rate. ▪ Clear and valuable flat rate financing. ▪ Value added renovation with multi purposes new balconies. ▪ Good cooperation among the stakeholders: Community of owners, Municipality, General Contractor, Designer, Project management (ÉMI).	▪ Lack of reserve in the implementation. ▪ Late decision on the National Grant caused delay in the implementation as well. ▪ Low budget and interest on fine tuning of the solar-thermal and the domestic hot water system. ▪ Change of the leadership and in consequence lower the interest by some key stakeholders.
Opportunities / Possibilities	**Threats / Barriers**
▪ As best practice example it has been replicated in several other renovation projects without EU funding. ▪ Other value-added extra activities beyond the energy focus measurements (Painting the staircase). ▪ Good reference of the key stakeholders.	▪ Lack of interest or losing the interest over the time. ▪ Insisting on old and useless solutions for no reason, just because "we are used to it". ▪ Administration burden could kill the initiatives.

No. 18: Multi-apartment building at Kassai u. 8-16., Budapest

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Condominium of Kassai u 8-16, Budapest 1043. (330 dwellings)
Owner	The owners of the 330 apartments, i.e. members of the condominium
Type of building	Private
Total investment cost	€ 3 800
Type of financing	Subsidized loan
Financier	OTP Bank Nyrt (90 %) + Apartment owners (10 %)
Financing year	2024
Specific / Comment	Subsidized loan focused on condominiums

DESCRIPTION

The condominium at Kassai u. 8-16., Budapest, 4th district operates a multi-apartment house of 330 dwellings (five staircases with 11 floors in each of them). The house is a 10-storey concrete panel building, built between 1983-1987. This specific project is part of a staged renovation, the project aims at the retrofit of the ventilation system of the house. The house ventilation system is responsible for circulating the air in a number of large tubes connecting the kitchens, bathrooms, staircases and other common parts of the building. The ventilation system is operated by old, out-dated motors placed on the roof of the multi-apartment building. The project was about changing the old motors to new, efficient ones including the necessary installation works as well. The ventilation system is operated by 40 pcs ventilator motors of 375 W each. The electricity bill for the operation of these motors is paid by the condominium. These ventilator motors are to be changed to new, energy-efficient ones: 20 pcs of 80 W motors and 20 pcs of 115 W motors. Together with the automatic control system that is to be also built in during the project, the quantity of the circulated air can be controlled, the performance of the system can be fine-tuned according to the needs of the apartment owners. Based on the efficiency of the new motors and the control system considerable energy savings can be achieved: according to the feasibility calculations, a reduction in electricity consumption of between 48 – 74 % can be achieved depending on how much a day the system operates (between 24-12 hours).

The investment is financed by a subsidized loan given by OTP Bank: “Thermo/Stílus loan” facility, which is available to condominiums, the interest rates are more favourable than the market rates as a consequence of the subsidy element. Maturity of the loan is 7 years; the loan will be taken out and paid back by the condominium. The condominium has to pay 10 % of the investment costs from own resources (payments by the apartment owners), 90 % will be financed by the loan. The collateral for the loan is a cash flow collateral given by the condominium, the basis of which are on one hand the condominium cost covered by payments of the apartment owners and on the other hand the savings on the condominium´s electricity bill. No mortgage will be registered to the individual apartments in the house. Based on the feasibility calculations the expected return of this investment is between 3,5-5,5 years.

INFO: https://www.otpbank.hu/portal/hu/tarsashaz/hitelek/thermo-stilus

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Very considerable savings on electricity consumption, which is accepted by the financing bank as part of the cash flow collateral. ▪ No mortgage is registered to the apartment owners. ▪ The savings on the electricity bill help to pay back the loan.	▪ This project is only one of the several renovation stages. ▪ The condominium's existing debt status might be hindering the financing of future projects. ▪ State subsidy interest support is only available for the renovation of common property areas.
Opportunities / Possibilities	**Threats / Barriers**
▪ The financing can be used as best practice to other condominiums if their cash flow position is similar.	▪ Financing of further renovation stages is unknown yet; the level of indebtedness might hinder the financing of further retrofits.

No. 19: "Faluhaz project" (Village Block)

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Multi apartment building in District III. of Budapest (Óbuda)
Owner	The condominium of 884 apartment owners
Type of building	Private
Total investment cost	€ 4.36 million
Type of financing	Grant, preferential loan, private financing.
Financier	EU grant (Concerto program Staccato project), Municipality of Óbuda-Békásmegyer (40%) + National Fund (33%) + self-contribution of the residents (27%)
Financing year	2006-2009
Specific / Comment	The largest residential building in Hungary

DESCRIPTION

The Faluház multi-apartment building is located in Budapest's Óbuda district and is the largest residential building in Hungary: 884 apartments, 43,500 m2 floor area, 5,600 m2 of windows, 24,000 m2 facade surface, about 3000 people. The building was built in 1970.

Picture 19: Faluház multi-apartment building during renovation @Staccato project

History of the renovation: In 2004 and 2005, the building's nine different heating systems were consolidated into a unified system. This transformation involved upgrading the original one-pipe heating system to a two-pipe configuration and installing thermostatic valves on the radiators, allowing for individual temperature regulation in each apartment. The heating centre for buildings with district heating is owned by the service provider, which is responsible for necessary repairs and maintenance. Consumers pay the provider continuously for these services, typically as part of a basic fee. Following the modernization of the heating system, heat consumption in the Faluház gradually decreased. By 2008, the building's heat consumption was approximately 10% lower than in 2004.

Modernisation: In 2006, the local government of Óbuda-Békásmegyer, in collaboration with Amsterdam and Sofia, applied to the European Union's "Concerto" program to implement a model project. This complex investment aimed to enhance energy efficiency and promote the use of renewable energy, while also monitoring its technical, environmental, and social impacts.

The mega-project was launched in the summer of 2009 and was completed in just six months, by December 2009. The total cost of the project was approximately HUF 1.3 million per apartment, amounting to nearly HUF 1.2 billion[4] (~ € 4.36 million) for the entire building. This initiative was part of the Staccato project, which was financed by the Concerto program. Panel-building retrofitting scheme and local funding were combined with EU-funding. Inhabitants had to contribute a small percentage to the overall cost but were able to receive a subsidized loan for this.

Technical Solutions allowed residents to stay in their flats during refurbishment, requiring only minimal access by builders. The information campaign continued after the general assembly's decision, keeping residents informed throughout the project since they remained on-site during the works.

Technologies of the refurbishment consisted of 10 cm thick Styrofoam thermal insulation on the facade, the roof and the basement ceiling, rockwool was installed on the walls above doors and windows for fire safety purposes; approximately 90 percent of the total window surface area was replaced. The old windows were replaced by more modern plastic windows. The domestic hot water generation in the "The Village" was separated from the conventional district heating system and connected to a new grid, supplied by solar thermal collectors with a total surface of 1,515 m². The modernisation resulted in approx. energy savings of 355 MWh/y electricity and 2,188 MWh/y heating; approx. 726 MWh/y energy generated from RES for heating; windows transmit around 50% less heat.

The project was nominated by the European Commission for the Sustainable Energy Award 2010 in the category "Dissemination and Demonstration".

INFO: https://smart-cities-marketplace.ec.europa.eu/projects-and-sites/projects/staccato/staccato-site-obuda

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ The municipality was fully committed to making this project a demonstration model to foster further energy efficiency initiatives.	▪ Heating cost allocation systems were installed in each apartment to measure thermal energy usage, which led to disputes.
Opportunities / Possibilities	**Threats / Barriers**
▪ This prominent demonstration project in Óbuda kick-started other refurbishment activities. Before the Faluház project many doubted the benefits of energy efficiency retrofitting, but now they can see proof of the benefits, especially that energy bills are lower. ▪ The building became an icon. Having the funding in place, which constituted a large proportion of over-all cost, made it easy to convince owners, who voted 75% in favour. ▪ The participation of the municipalities together with the private house owners was exemplary in this project.	▪ 50% of the heating costs were expected to be saved; however, due to technical problems only 20-25% were saved. ▪ Harmonising the combination of funding caused problems.

[4] **Exchange rate:** HUF275/€ on 18 Dec. 2009

No. 20: Multi-apartment building at Pázsitos sétány 1-3. Budapest

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Condominium of Pázsitos sétány 1-3, Budapest, XX.
Owner	Condominium apartment owners
Type of building	Private
Total investment cost	€ 50 000
Type of financing	Private financing
Financier	100 % inhabitants of the condominium
Financing year	2018 and 2021
Specific / Comment	Financed from own resources (savings) of the owners

DESCRIPTION

Picture 20:Condominium at Pázsitos sétány 1-3. @ Szilber Ingatlan Menedzsment Kft.

The condominium at Pázsitos sétány 1-3., Budapest, 20th district operates a multi-apartment house of 100 dwellings. The house is a 4-storey traditional building. This specific project aimed at the replacement of the condominium´s gas boiler for a modern condensing boiler and installing the necessary heat quantity controllers and control valves. The condominium paid a gas bill amounting to HUF 7.3 M million in 2019, before the change of the boiler took place and the aim was to reduce the gas bill with changing to an up-to-date gas boiler and control system. At the end of 2019 the heat quantity controllers were changed to efficient controllers and in a next step the old boiler was changed to a modern condensing gas boiler with the instalment of the necessary control valves (2021). The total investment amounted to HUF 16 million[5] (~ € 50 000). After the investment the gas bill paid by the condominium went back to HUF 4.6 million (in the year 2023), which means a reduction of 37 % in costs paid for gas. The return of the investment is therefore 6 years based on the savings in costs paid for the gas.

The investment was financed by the inhabitants of the condominium themselves, based on the decision of the condominium´s general assembly, the inhabitants paid for the investment according to their share in the condominium. The proportional share of each inhabitant was paid to the account of the condominium by the inhabitants and the investment was prepared, organized and implemented by the condominium.

[5] **Exchange rate:** HUF330/€ on 28 Dec. 2019

The strength of the project is demonstrated by the fact that the condominium owners elected to finance the project even without any state subsidy and availability of concessional loans.

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Considerable savings in gas consumption, reducing the future operational costs of the condominium facilitated the quick return on the investment. ▪ The inhabitants of the condominium understood that it is in their own interest for the reduction of the gas consumption.	▪ This project is only one element in the renovation stages, there are several stages remaining. ▪ The financing was based on the individual payments of the inhabitants only.
Opportunities / Possibilities	**Threats / Barriers**
▪ Based on the successful implementation of this project further building renovation stages can be implemented.	▪ The condominium cannot borrow as it not a legal entity. ▪ There is no savings available.

No. 21: Implementation of smart cost-sharing systems and radiator replacement in a condominium located in the 3rd district of Budapest

FINANCIAL DATA OF RENOVATION	
Building / Beneficiary	Multi apartment building owners in district III. of Budapest
Owner	A condominium of 240 apartments
Type of building	Private
Total investment cost	€ 287 000
Type of financing	Subsidy and private financing
Financier	ÉMI Non-profit LLC. (Hungarian State)
Financing year	2020
Specific / Comment	Promotion of smart cost-sharing applications and radiator replacement program (ZFR-ÉMI-TÁV/2020) Source: Green Economy Financing System 50 % National fund program + 50 % own contribution

DESCRIPTION

The project's goal was to support investments aimed at reducing carbon dioxide emissions through heating system modernization in residential cooperatives and condominiums involved in district heating services. This initiative targets enhancing energy efficiency in existing residential properties for the benefit of the public. The building affected by the investment consists of 4 stairwells and contains a total of 240 apartments.

Total investment cost was HUF 103 582 497[6] (~ € 287 000), out of which the non-refundable grant covered 50% and the rest had to be financed by the owners.

The project's technical content includes the following activities:

- **Installation of Smart Heating Cost Allocation System**: This involves setting up a system for smart measurement and cost-sharing, which allows fee payers to access consumption data daily or at least weekly. This will include installing smart cost-sharing devices and data collectors associated with the system.
- **Upgrade of the Piping System**: Conversion of the existing single-pipe system to a two-pipe system or at least an intermediate connection layout, including modernization and/or insulation of the pipes.
- **Hydraulic Balancing Fixtures**: Installation of devices to ensure hydraulic balance in the building's heating system, particularly including riser regulators.
- **Hydraulic Adjustment of Heating Risers**: Fine-tuning the hydraulic settings of the heating risers.
- **Installation of Individual Radiator Controls:** Installation of radiator valves (thermostatic radiator valves) and automatic adjustment mechanisms (e.g., "thermo heads") for individual control of radiators in apartments.
- **Installation of Return Valves or Ball Valves:** For two-pipe heating systems, installation of return valves; for single-pipe systems, installation of ball valves.

[6] Exchange rate: HUF361/€ on 26 Dec. 2020

- **Replacement of Radiators:** Replacement of existing radiators with new aluminium radiators, ensuring that the new radiators maintain or reduce the necessary heating water temperature.

The modernization and renovation of heating systems involved in district heating must result in measurable energy savings and a reduction in CO_2 emissions. For this project, it is planned to achieve an expected annual reduction of 69.8 tons of CO_2. This commitment will be verified through data provided during the monitoring and maintenance period.

Among the objectives of the condominium building was a commitment to a 10% reduction in energy consumption, which is supported by the heating energy consumption (district heating) data provided by the district heating suppliers. The project's completion date was December 1, 2022. The project is currently in the maintenance period, and during the first year of monitoring, an actual reduction in energy consumption resulted in a decrease of 283.1 tons of CO_2 per year.

INFO: https://www.emi.hu/EMI/web.nsf/Pub/6RVPIN.html

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Implementation of heating modernization for the entire building/building complex by achieving energy savings and reducing carbon dioxide emissions, which also leads to reduced expenses.	▪ Difficulties in the cooperation among the condominium/residential cooperative owners and achieving quorum for general meetings. ▪ Securing personal financial resources.
Opportunities / Possibilities	**Threats / Barriers**
▪ Implementation of complex technical content supported by mixed financing.	▪ Uncertainty about the willingness and financial capability of property owners.

No. 22: Multi-apartment building at Budapest, 1068 Benczúr street 43.

FINANCIAL DATA

Building / Beneficiary	Owners of Benczúr street 43. Condominium
Owner	The condominium of 46 apartment owners
Type of building	Private
Total investment cost	€ 85 000
Type of financing	Private financing
Financier	100 % owners of the condominium
Financing year	2018 & 2023
Specific / Comment	extraordinary contribution by the owners of the condominium

DESCRIPTION

The condominium at Benczúr utca 43 in Budapest, 6th district operates a multi-apartment house of 46 dwellings. The house is a 6-storey traditional building. This specific project aimed at the replacement of the condominium´s gas boiler for a modern condensing boiler and replacement of the central cooling system. The condominium paid a gas bill amounting to HUF 5.9 million in 2018, before the change of the boiler took place and the aim was to reduce the gas bill with changing to an up-to-date gas boiler and control system. The total investment amounted to HUF 9.5 million[7] (~ € 30 000). After the investment the gas bill paid by the condominium went back to HUF 4.3 million (in the year 2023), which means a reduction of 27 % in costs paid for gas. The return of the investment is therefore 6 years based on the savings in costs paid for the gas.

The central cooling system became unreliable and replaced in 2023. The old 71.5kW system was replaced for a heat pump enhanced unit which resulted in 20% in energy saving. The new unit cost was HUF 21 million[8] (~ € 55 000) and resulted in HUF 1.4 million reduction in energy bill. The payback time is about 15 years. After

Picture 21: Multi-apartment building at Benczúr street 43 @ Árpád Petrovszky, condominium manager

[7] Exchange rate: HUF 320/€ on 28 Dec. 2018
[8] Exchange rate: HUF 380/€ on 30 Dec. 2023

switching to green tariff this payback time will be reduced significantly.

There was no subsidy or concessional loan available for energy efficiency improving; therefore, the whole investment was financed by the inhabitants of the condominium themselves, based on the decision of the condominium´s general assembly, the inhabitants paid for the investment according to their share in the condominium. The proportional share of each inhabitant was paid to the account of the condominium by the inhabitants and the investment was prepared, organized and implemented by the condominium.

Picture 22: New gas boiler and central cooling system
@ Árpád Petrovszky, condominium manager

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Considerable savings in gas consumption reduces the future operational costs of the condominium. ▪ The inhabitants of the condominium understood their interest in reduction of the gas consumption.	▪ The cooling unit needed to be replaced in the attic, which required craning at a high expense. ▪ The condominium could not borrow and due to lack of funds the switching to geothermal tariff had to be postponed.
Opportunities / Possibilities	**Threats / Barriers**
▪ Switching to green tariff system for geothermal energy use reduces the payback time.	▪ The condominium is not creditworthy. ▪ The common property cannot be taken as collateral.

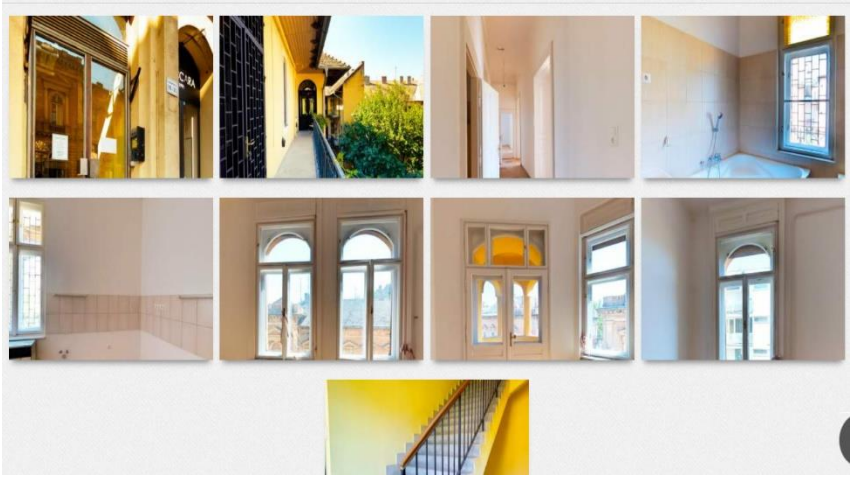
No. 23: Municipal multi-apartment building renovation in Szeged

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	6720 Szeged, Feketesas u. 19-21. 2/18.
Owner	The municipality of Szeged
Type of building	Public
Total investment cost	€ 4 000
Type of financing	Savings and commercial bank loan (free-to-use) Private financing
Financier	Tenants
Financing year	2024
Specific / Comment	An apartment with 4 rooms (178 m2) on the third floor in the more than 100 years old building (20 dwellings) + shops on the ground floor.

DESCRIPTION

The Szeged Real Estate Management and Asset Management Ltd. (IKV Zrt) is the leading property management company in terms of the number of managed units. This activity has a nearly 20-year history. Since the end of 2015, IKV manages buildings with majority or minority municipal ownership, as well as entirely privately-owned condominiums. For properties that are 100% municipally owned, renovation decisions are made by the municipality based on available financial resources. In contrast, for multi-apartment buildings with mixed or entirely private ownership, renovation decisions are made by the condominium's general assembly.



Picture 23: Vacant municipal apartment on Feketesas Street, Szeged @ IKV Zrt.

Renovation of vacant municipal apartments is partially carried out by IKV and partly completed by the future tenant through a tender process.

IKV home renovations

During apartment renovations, worn-out flooring, doors, windows, and built-in furniture are repaired or replaced. Gas appliances, heat emitters, and utility meters are inspected and fixed or replaced if needed.

Electrical work includes updating plugs, switches, and wiring. These apartments, ranging from 28 to 68 square meters, are mainly rented as social housing, with rents between HUF 9 500[9] (€ 23.17) and HUF 23 000 (€56.10).

IKV handles some renovations through indefinite-term lease agreements, particularly for costly repairs in older, mostly listed buildings. The IKV does not set strict energy standards for the renovation, but it is in the future tenant's interest to improve energy efficiency. These apartments often have an interior height of more than 3 meters, so the insulation of the trenches and the modernisation of the heating are important in their own interest. These apartments are often in listed buildings. The IKV primarily expects hygiene and safety aspects; aesthetic aspects are secondary.

Tender conditions for vacant municipal properties requiring renovation

Any adult Hungarian citizen can apply for multiple apartments. The winning applicant signs an indefinite-term rental contract and must complete the required restoration within a year (or after obtaining permits for listed buildings). Failure to meet this deadline may result in contract termination.

Tenants are responsible for carrying out restoration and modernization as specified by the lessor. The cost, up to 50%, can be deducted from the monthly rent. The restoration budget for the apartment consists of the name of the minimum restoration work to be performed by the tenant in the apartment by type of work, as well as the cost of performing the work. The winning applicant is obliged to carry out the restoration and modernisation work specified by the lessor at his own expense, with the allowance indicated above, at least at the technical level determined by the lessor.

Renovation cost for the apartment with 4 rooms (178 m2) is calculated to be HUF 1 163 231 (€ 2 837). The winning applicant paid HUF 153 792 (€ 375) as renting cost, if the renovation is carried out.

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Value of the property increases. ▪ Non-municipal funds are used for the renovation.	▪ No clear plan neither for the intended overall performance, nor the detailed expected works and its real value. ▪ No energy requirements are expected; therefore, the payback time of the investment is not clear. ▪ They do not require the use of renewable or environmentally friendly materials. ▪ Unclear, how the common part of the renovation is working and how it is financed.
Opportunities / Possibilities	**Threats / Barriers**
▪ In the case of applicants with own resources good quality renovation can be carried out.	▪ Uncontrolled, low-quality renovations and insufficient technical expertise can lead to higher lifecycle costs and additional financial risks.

[9] Exchange rate: HUF 410/€ on 28. Dec. 2024.

No. 24: Single-family house refurbishment in Gödöllő

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Owner family with two children
Owner	Young couple
Type of building	Private
Total investment cost	€ 53 500 € + € 13 500 for solar panel & storage
Type of financing	Grant, preferential loan, private financing
Financier	National Refurbishment Program, PV installation National Program, prenatal loan ("babavaro hitel"), own contribution, family housing allowance ("CSOK")
Financing year	2023- ongoing
Specific / Comment	National refurbishment and PV program and child support program

DESCRIPTION

Picture 24: Single family house in the city of Gödöllő after refurbishment
@ with the building owner's permission

After the change in ownership, a staged renovation process began, including the addition of a new extension. The goal was to transform the house into a low-energy building by utilizing a national renovation subsidy available for families with children. The original house, a typical cube-shaped structure, had old windows, poorly insulated exterior walls, and only the roof slab was insulated with an additional 20 cm of glass wool. In the first phase, the windows were upgraded, and a heat recovery ventilation system was installed. This phase cost HUF 6 million[10] (€ 15 000), with half (HUF 3 million) covered by the national refurbishment program subsidy.

The second phase involved adding 16 cm of Rockwool insulation to the exterior walls, which cost around HUF 5 million. This was partly financed through a HUF 10 million (€ 25 000) national prenatal loan, which could be used freely. Additional renovations, including retrofitting the roof and building the new extension, were funded through a combination of loans and personal savings.

Currently, a 5.6 kWp solar panel system with 10 kVA storage is being installed HUF 5.4 million (€ 13 500) with 66% of the cost covered by the government. The expected energy savings are around 65%, and detailed monitoring of actual energy consumption is planned.

[10] Exchange rate: HUF400/€ on 24 Dec. 2023

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Well organised staged renovation. ▪ Utilisation of EE/RES focused and general grants. ▪ Reasonable grant share (50%, 66%). ▪ Relatively easy process.	▪ Limited scale compared to the need. ▪ Low flexibility. ▪ Short time period for the tendering. ▪ High administration burden. ▪ Complex application process due to the need to coordinate different financing sources
Opportunities / Possibilities	**Threats / Barriers**
▪ Longer program periods (some years). ▪ Higher budget limit, more matching the real cost. ▪ Join to an energy community.	▪ Useless multiple processes caused by careless design of the processes and its interlink. ▪ Underestimated cost could results crisis in the financing. ▪ Market loan interest rate could rise.

No. 25: Renovation of single-family house in Tatabánya

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Detached family house
Owner	Homeowners
Type of building	Private
Total investment cost	€ 27 788[11]
Type of financing	Preferential loan
Financier	Hungarian Development Bank
Financing year	2025
Specific / Comment	Loan aimed at increasing energy efficiency and renewable energy use in residential buildings (Call identifier: GINOP-8.4.1/A-17- Loan programme)

DESCRIPTION

The preferential loan programme allowed complex renovation of private buildings, condominiums and housing cooperatives choosing from different eligible activities, such as: 1) Energy efficiency measures: outer wall insulation, replacement of doors and windows, installation of shading structures, modernization of heating and/or domestic hot water systems, Modernization of heat recovery equipment, Modernization of lighting system; 2) Renewables: installation of solar collector, briquette, pellet, wood chip and wood gasification boiler systems for domestic hot water, solar panel, heat-pumps.

Picture 25: House with insulation and new windows @ with the building owner's permission

The refurbishment was financed through the GINOP-8.4.1/A-17 preferential loan programme, which aimed to support residential energy efficiency investments and the increased use of renewable energy sources in residential buildings. The programme provided long-term loans to natural persons, condominiums and housing cooperatives, enabling them to implement energy renovation projects. It was financed by the European Regional Development Fund (ERDF) under the GINOP programme and implemented through the Hungarian Development Bank (MFB).

Within this framework, the project included comprehensive thermal insulation measures, including façade insulation with 5- 10 - 15 cm graphite expanded polystyrene and foundation insulation, roof insulation with 2 × 10 cm mineral wool, and window replacement. In addition, the building was equipped with LONGI LR5-5 HIH 415 W photovoltaic panels, contributing to on-site renewable electricity generation.

[11] Exchange rate: HUF 398.51/€ on 3 July 2025

The total cost amounted to € 5 400, of which 90% was covered by a preferential loan at a 0% interest rate, while the remaining 10% was financed through self-funding. The loan repayment term is a maximum of 20 years, providing favourable conditions and resulting in relatively low monthly instalments.

The call required energy performance certificate before and after the renovation. Energy efficiency improvements have resulted in a reduction of 4,570.284 GJ/year in primary energy consumption. Greenhouse gas emissions have decreased by 299.742 tons/year, and the annual primary energy consumption of the residential building has been reduced by 1,269,523 kWh/year.

INFO: https://archive.palyazat.gov.hu/ginop-841-a-17-lakpletek-energiahatkonysgnak-s-megjul-energia-felhasznlsnak-nvelst-clz-hitel#

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Other related costs, such as project preparation activities, project managements and cost of experts (notary, energy, etc.) are eligible costs. ▪ Low own contribution requirement. ▪ Interest-free loan. ▪ Extensive eligible technical content. ▪ Energy efficiency and renewable energy development investments can also be implemented within the program allowing comprehensive building energy renovations. ▪ Fast administrative processing. ▪ Clear communication. ▪ Personalized administration at Hungarian Development Bank Points. ▪ Free choice of contractors. ▪ Realistic implementation timeline.	▪ The support is refundable. ▪ As a loan product, additional supplementary costs may arise. ▪ Available only for homeowners (not for tenants).
Opportunities / Possibilities	**Threats / Barriers**
▪ Support for investment elements that do not directly increase energy efficiency or renewable energy use but are essential for the investment. ▪ Could always be available, not only for limited time. ▪ More stringent requirements for reaching deep renovation could be set. ▪ Although indicators must be provided higher energy saving targets could be set for projects.	▪ The program does not include provisions for long-term monitoring data, preventing assessment of actual energy savings or greenhouse gas emission reductions.

No. 26: Single family house refurbishment and PV installation in Tahitótfalu

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Building owners
Owner	Building owner family
Type of building	Private
Total investment cost	€ 28 000
Type of financing	Non-refundable grant (85%) and own resources
Financier	National Authority (85%), owners of the building
Financing year	2022 – 2025
Specific / Comment	6.2.1- 2021 call: Support for residential solar systems and electrification of heating systems combined with solar systems. Source: Recovery and Resilience Facility (~71%) + National fund (~14%) + own contribution, savings (~15%)

DESCRIPTION

This project involves the renovation and upgrade of a building originally constructed in the 1980s as a holiday home, which has since been reclassified as a residential property. The building features 30 square meters of living space spread over two levels.

The building renovation includes several major improvements aimed at increasing comfort and reducing energy consumption. The 40-year-old doors and windows were replaced with modern, triple-glazed units significantly improving the thermal performance of the building envelope. An air-to-air heating system was installed, complemented by four split air conditioning units alongside the original wood-burning stove to enhance climate control. In addition, a LONGI LR5-54 HIH 415W photovoltaic system is being installed on the roof to reduce electricity consumption and support the use of renewable energy.

Picture 26: Renovated house with PV
@ with the building owner's permission

At the time of reporting, precise energy savings data are not yet available, as the renovation works and system installations are still ongoing. Performance and consumption data will only be assessable once the building is fully operational.

From a financial perspective, the renovation was supported by a non-refundable grant within the Recovery and Resilience Facility (RRF) programme, which covered almost the entire investment cost. The total project cost amounted to HUF 11 073 million (~ € 28 000). Only a small portion of the expenses – mainly items not eligible under the programme rules – must be financed by the owner. The funding scheme primarily supports technical

system upgrades and energy-related improvements, but does not include external thermal insulation of walls or façade elements. The owners therefore plan to carry out additional insulation works in the future using their own financial resources in order to further improve the building's energy performance.

The favourable financial conditions of the call – particularly the high share of non-refundable support – resulted in a very high number of applications nationwide, reflecting the strong demand for residential energy renovation funding.

INFO:https://www.palyazat.gov.hu/programok/helyreallitasi-es-ellenallokepessegi-terv/rrf/rrf-621-21-2/alapadatok

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ 100% non-refundable grant for the eligible project cost. ▪ Frequent power outages in the area due to local conditions and aging electrical wiring, making this project advantageous for mitigating such issues. ▪ Supplementing the existing system with an alternative heating solution. ▪ Direct energy saving and improved thermal transmittance factor. ▪ Complex energy efficiency and renewable energy measures. ▪ Based on social needs, available for low-income households. ▪ Due to direct supplier financing and advanced payment, the owners are not required to pre-finance the renovation.	▪ Thermal insulation is not funded by the grant. ▪ Delays in the permitting and commissioning processes are attributable to the high workload of the Distribution System Operator (DSO) and contractors.
Opportunities / Possibilities	**Threats / Barriers**
▪ A more user-friendly and optimized application management system for individual applicants (homeowners). ▪ Building insulation could be also eligible as an optional activity, as most houses lack insulation, and this would significantly Improve energy efficiency. ▪ Eligible activities may include mechanical upgrades, replacement of piping networks, and enhancements to the heating system (e.g., installation of underfloor heating). ▪ The funding program could be available for condominiums, offering options for leasing or ESCO in addition to non-refundable grants. ▪ Repayable grant for unforeseen increased costs or non-eligible items could be also applied.	▪ Regional grids are insufficient to accommodate the increased energy production from solar panels. ▪ Changes in feed-in legal conditions: Introduction of a feed-in moratorium and the option for annual net metering for residential solar panels have been discontinued since January 2024. ▪ Limited availability of the funding scheme. ▪ Increase of building material and appliance cost (e.g. due to inflation) during project implementation, which cannot be covered by the grant.

No. 27: Single-family house refurbishment in Budaörs

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Private owner
Owner	Private individual
Type of building	Private
Total investment cost	€ 10 000
Type of financing	Private financing
Financier	Homeowners from own savings, HUF 4 million (€ 11 000)
Financing year	2021 February-July
Specific / Comment	6.5 kW, 2kW 96m^2

DESCRIPTION

Budaörs, Munkácsy utca 3 energy refurbishment project: HUF 3.6 million PV panels, HUF 200 000 boiler retrofit for electricity heating, HUF 200 000 refurbishment of the electrical wiring. The electricity bill has been reduced from HUF 436 000 to zero and the gas bill from HUF 703 000 to HUF 138 000. Hence the payback time is about 4 years.

Picture 27: Single-family house in Budaörs with rooftop solar PV installation
@ with the building owner's permission

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Well organised staged renovation. ▪ Full control of the project. ▪ Very considerable energy savings that can be seen in the electricity/gas bills. ▪ Strong commitment by the owners to finance the investment from own resources by understanding their own intertest.	▪ No concessional loans or subsidies available for energy efficiency enhancing renovations. ▪ Utilities companies' limited capacity of processing applications and approvals caused 1 month delay.
Opportunities / Possibilities	**Threats / Barriers**
▪ Having HUF 1 million more cash in hand a 40% larger PV unit could have been installed.	▪ Sceptical advice on payback times from professional and technical experts. ▪ Lack of support for bank loans.

No. 28: Municipality office building renovation VSZ Zrt., in Szentendre

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Non-profit city service company owned by the Municipality of Szentendre
Owner	EU grant, Municipality of Szentendre, Installer company
Type of building	Public
Total investment cost	€ 295 425
Type of financing	Municipal investment
Financier	EU Grant 50%, ESCO 50%
Financing year	2012-2014
Specific / Comment	EU grant (PIMES CONCERTO project), Municipality, ESCO by the installer

DESCRIPTION

Picture 28: After the refurbishment @PIME'S Concerto project

The building owned by the Municipality of Szentendre's City Service Company underwent a comprehensive renovation between 2012 and 2014, aimed at enhancing energy efficiency and modernizing its infrastructure. The project included the installation of a newly designed, simplified roof structure, featuring new roof windows to optimize natural light. Exterior upgrades were also made, with improved doors and windows to increase insulation and reduce energy loss. Furthermore, 16 cm of ROCKWOOL thermal insulation was added to the building's façade, significantly boosting its thermal performance.

In addition to structural improvements, advanced energy systems were incorporated. Hybrid PV/T (photovoltaic-thermal) panels and standard PV systems were installed on the south-facing roof and chimney to harness solar energy for both electricity and heating. A biomass Combined Heat and Power (CHP) unit was also introduced, complementing the existing gas burners to provide an eco-friendly heating solution. These upgrades not only improved the building's energy efficiency but also contributed to its sustainability by reducing reliance on conventional energy sources.

Picture 29: VSZ Zrt. building with PV/T system @PIME'S Concerto project

Within the framework of the CONCERTO PIMES project, the European Union provided funding for energy efficiency measures and renewable energy installations. A flat rate of 50 €/m² was allocated for energy efficiency improvements, 2 500

€/kWp for photovoltaic (PV) installations, and 500 €/kW for the installation of Combined Heat and Power (CHP) systems. This financial support significantly reduced the upfront costs of the project.

The remaining portion of the expenses was covered by the installer, who adopted an energy contracting model, specifically an Energy Service Company (ESCO) system. Under this arrangement, the installer recouped the investment through the annual savings generated by the building's enhanced energy efficiency. These savings were substantial, as the improved systems led to a reduction of more than 50% in the building's original energy consumption. This innovative financing model not only ensured the project's feasibility but also demonstrated the long-term cost-effectiveness of integrating energy-efficient technologies and renewable energy sources into building renovations.

INFO: https://smart-cities-marketplace.ec.europa.eu/sites/default/files/pimes_detailed_design_specifications_of_szentendre_energy_systems.pdf

http://www.emi.hu/webadatbazisok/Rendezvenyek.nsf/EventsPreviewHTMLByDate/1D02818581BAA932C1257DD50039AC04/$FILE/2014-05-06_06-12-PIMES-EMSZ-RSZN-Szfhvar.pdf

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Installer interest in working saving system is evitable. ▪ Value added renovation with simplifying the sophisticated and energy consumed old layout. ▪ Benefit from solar energy harvesting in hybrid way. ▪ Distributed and highly adjusted system results high energy saving potential, and low operational cost. ▪ Low investment cost from the Client side.	▪ Biomass CHP has high maintenance cost and treated wooden chips. ▪ The covered storing place has not been scheduled and occurs extra cost. ▪ Shading of the trees cause reduction on solar efficiency. ▪ Payback time proved longer than predicted due to the low and subsidized gas price.
Opportunities / Possibilities	**Threats / Barriers**
▪ Securing the biomass raw material quality and reasonable price. ▪ Improve the efficiency of the hybrid system by smart BEMS technology. ▪ Service contract for operation and maintenance with the installer.	▪ Lacking qualified personal for the Biomass CHP daily operation. ▪ Unbalanced systems could result reasonable decrease of efficiency of the hybrid systems. ▪ If Installer took loan for financing, the increase the interest rate this loan could turn be critical.

No. 29: Püspökmajor Kindergarten, Szentendre

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Municipality of Szentendre
Owner	Municipality of Szentendre
Type of building	Public
Total investment cost	€ 830 000
Type of financing	EU Grant, own resources (Municipal investment),
Financier	EU FP7 grant (5.9 %), Structural Fund (EU + National Fund) (78.5%), Municipality of Szentendre (15.5%)
Financing year	2012-2013
Specific / Comment	EU flat rate (PIMES CONCERTO project), Structural Fund and own contribution

DESCRIPTION

The renovation of the kindergarten in Szentendre, originally built in the 1970s, was carried out in three distinct phases. The first phase focused on upgrading the windows and the parapet above them to improve energy efficiency and insulation. During this phase, a strong emphasis was placed on the use of recycled and natural materials, promoting sustainability in the renovation process.

Picture 30: Püspökmajor Kindergarten building after renovation
@PIME'S Concerto project

In the second phase, as part of the PIMES CONCERTO project, the foundation, parapet wall and roof were retrofitted for improved thermal performance. This phase also included the addition of a new sunspace at the entrance of the building, which helped regulate indoor temperatures by capturing sunlight in winter and providing shade in summer. A green roof was installed on part of the building to enhance insulation and contribute to environmental sustainability. Photovoltaic (PV) panels were mounted over the sunspace, designed to serve a dual purpose—providing shading in the summer while being adjustable to a different angle in winter to maximize solar energy generation.

The third phase involved the installation of additional PV panels over the terrace, providing further shading and energy generation.

The financing for the first phase was partially supported by a Structural Fund project, a joint effort between the European Union and the Hungarian Government. The second and third phases were financed by both the EU FP7 project grant and the Municipality of Szentendre.

The combined energy-saving measures implemented across the three phases resulted in a reduction of over 55% in the kindergarten's energy consumption, highlighting the success of the project in terms of both sustainability and cost-efficiency.

INFO: https://smart-cities-marketplace.ec.europa.eu/sites/default/files/pimes_detailed_design_specifications_of_szentendre_energy_systems.pdf

http://www.emi.hu/webadatbazisok/Rendezvenyek.nsf/EventsPreviewHTMLByDate/1D02818581BAA932C1257DD50039AC04/$FILE/2014-05-06_06-12-PIMES-EMSZ-RSZN-Szfhvar.pdf

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ High EE and RES performance. ▪ Value added renovation: Green roof, sun lighting space. ▪ With careful design optimal solutions for the cold bridges at the joints. ▪ Smart metering and the annual balance of consumption and production lead to high efficiency for the PV system. ▪ Low carbon footprint via recycled materials. ▪ Shared financing with Structural Fund, EU FP7 project grant and own contribution results high EE and RES.	▪ Shading on the PV because of trees, lowering expected energy generation and financial return. ▪ Long time waiting for approval to join the grid, delay commissioning and postpone the realization of energy cost savings. ▪ No practice in moving the PV between "summer" and "winter" position limits potential energy yield and reduces the system's financial performance.
Opportunities / Possibilities	**Threats / Barriers**
▪ Further developments: Create/join to the local energy community for PV production and electricity consumption. ▪ Involving the installer in the capital financing with energy contracting scheme. ▪ Heat recovery ventilation for better indoor air quality.	▪ Establishing energy communities is not promoted yet. ▪ Lack of adequate ventilation results low indoor air quality.

No. 30: Decarbonized Mórahalom, Hungary

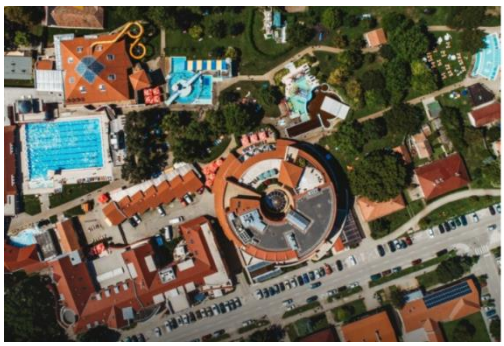
FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Municipality of Mórahalom
Owner	Municipality of Mórahalom
Type of building	Public
Total investment cost	€ 3.79 million
Type of financing	Subsidy, own resources (Municipal investment);
Financier	National Research, Development and Innovation Office of Hungary (Hungarian State) 99,7 %, Municipality of Mórahalom 0,3 %
Financing year	2020-2024
Specific / Comment	State supported project for ensuring the energy supply of settlements using alternative supply methods replacing natural gas, as well as using modern technologies and flexibility services (2020-3.1.3-ZFR-TEFH- Green Economy Financing System)

DESCRIPTION

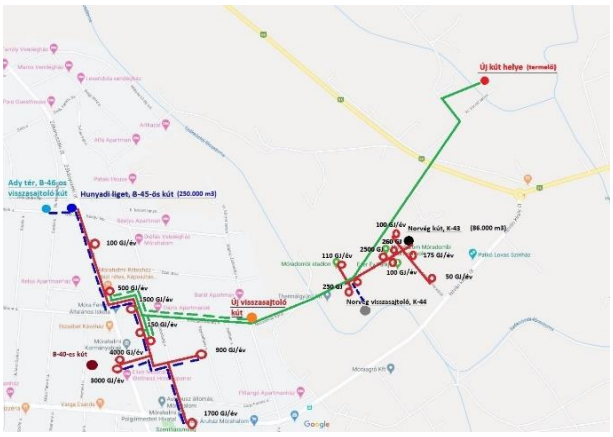
The Town of Mórahalom (population: 6,200) is located in the Southern Great Plain Region, along the Hungarian-Serbian border, near the regional centre, the City of Szeged. The main attraction of Mórahalom is the St. Elisabeth Spa of national significance. It is visited by nearly half a million guests every year. The spa has its own geothermal system.

Between 2008 and 2010, the Mórahalmi Geothermal Cascade System was established, providing geothermal energy for heating 16 municipal, state and church institutions located in the central parts of the town. Almost in parallel, a separate geothermal heating system (Norwegian Geothermal Utility System) was established in the eastern part of the town between 2009 and 2011, supplying nine additional institutional consumers with heat. All institutions connected to the system have been fully energy retrofitted in alignment with the "energy efficiency first" principle and include building-integrated renewable energy solutions.



Picture 31: St. Elisabeth Spa in Mórahalom @Thermal Panzio

The concept of connecting the two systems was developed in 2020, for which a consortium led by the Mórahalom Municipality successfully mobilised public funding of HUF1.5B (€ 3.78 million). The project, entitled "Decarbonized Mórahalom- a geothermal-based sustainable combined green energy pilot project for small communities", aims to integrate the two geothermal heating systems in Mórahalom with a newly established geothermal system and thereby connect the existing and additional consumers to an integrated geothermal utility system.



Picture 32: Geothermal district heating network @Innogeo Kft

By deploying intelligent control, the unified system is able to provide heat with the required flexibility at all points of the geothermal district heating network. The integrated system can meet a total annual heat demand of 55,000 GJ instead of the previous 22,500 GJ entirely offsetting natural gas use (i.e. 660,000 m3 at 34.11 MJ/m3 or HUF 493 million at HUF 747/m3). This results in annual savings of € 1.25 million, so the project payback time is about 3 years (without taking into consideration other supplementary costs).

The project completed in early 2024, also aimed to carry out technical development and innovation related to the design, construction and testing of the system as well as investigating the project replicability in same size communities. The project has laid the foundations for showcasing a local geothermal energy community, as well.

INFO: https://www.morahalom.hu/hu/reszletek/dekarbonizalt-morahalom-geotermikus-alapu-fenntarthato-kombinalt-zoldenergetikai-mintaprojekt-kistelepulesek-szamara

Further information about the spa: https://erzsebetfurdo.morahalom.hu/en/spa

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Avoidance of mandatory thermal water reinjection, because the existing spa can utilize effluent warm waters. ▪ Raising awareness of sustainability and opportunities of green energy use.	▪ This type of grant funding is not available for residential use of district heating. ▪ The project was funded by subsidy to almost 100 %, with minimum use of own resources of the municipality.
Opportunities / Possibilities	**Threats / Barriers**
▪ Formation of an energy community among public and private partners. ▪ Utilization of effluent lukewarm waters by using heat pumps. ▪ Projects with similar high returns could be financed with the inclusion of market participants (industrial partners, ESCOs, etc).	▪ Municipalities cannot obtain government guarantee for taking out bank loans, not even for short payback time project financing.

No. 31: Energy modernisation and smart energy management development of the "Autumn Light" Home for the Elderly in Alsómocsolád

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Municipality of Alsómocsolád
Owner	Municipality of Alsómocsolád
Type of building	Public
Total investment cost	HUF 82 508 825 = € 206 000[12]
Type of financing	75% EU Grant (KEOP) 2015 & 25% own resources (€ 51 000 Municipal investment)
Financier	European Regional Development Fund, Central Government, Municipality of Alsómocsolád
Financing year	2023
Specific / Comment	1. The development of the "Autumn Light" Home for the Elderly in Alsómocsolád (KEOP-4.10.0/F/14-2014-0155): the project was financed by the European Regional Development Fund and national central budget appropriations in the form of non-reimbursable grants. Amount of EU support: 80% (HUF 62 167 060) Municipal investment: 20% 2. Smart energy management improvements in the Autumn Light Home for the Elderly (self-financed investment. Municipal investment: 100% (HUF 4 800 000)

DESCRIPTION

Picture 33: Home for the elderly in Alsómocsolád @ Gabriella Zagyva

In August 2014, the Municipality of Alsómocsolád submitted an application for the call for proposals entitled "Development of the building energy efficiency of the "Autumn Light" Home for the Elderly in Alsómocsolád", announced by the Deputy State Secretary for Environmental and Energy Efficiency Operational Programmes of the Ministry of National Development in the convergence regions".

Prior to the renovation, the residential care home, built in 2006, had an energy rating of BB, which was upgraded to A+ with the renovation. The building currently accommodates 46 people in rooms with 2 and 3 beds. Two rooms (apartments) have 1-1 bathroom (shower + toilet). There is also a 300-capacity kitchen and a restaurant serving tourism.

[12] Exchange rate: HUF 400/€ on 24 Dec. 2023

The aim of the project was the energy modernisation of the "Autumn Light" Home for the Elderly. The investment included external thermal insulation, plasterboard suspended ceiling, attic insulation, plinth insulation, installation of 5 solar collectors with bivalent storage and a 16.5 kW solar panel system. The project resulted in an annual energy cost reduction of HUF 3 million.

The 2022 energy crisis strengthened the need to reduce energy consumption in the elderly home through smart solutions. Measurements in March 2023, at the end of the heating season, showed that windows in rooms and bathrooms were open on average 41% of the time, leading to higher gas consumption in winter and increased electricity use in summer, while also posing dehydration-related health risks during overheating. Based on these findings, window opening sensors were installed in rooms and bathrooms. If a window remains open for more than 10 minutes, the Loxone system automatically reduces heating. The system includes several automated functions to improve indoor comfort and energy management. It allows automatic day- and night-time temperature adjustment, as well as automated heating and cooling control. Overheating is prevented by setting maximum and minimum temperature limits in each room, while alerts are issued if temperatures exceed healthy thresholds. The system also supports automatic ventilation and air-quality warnings when airing is needed.

The system's installation and operation were self-financed, with the investment projected to achieve full payback within 3 to 4 years through energy savings. Beyond cost reductions, the implementation has also streamlined operations through automation, significantly lowering staff workload and contributing to a healthier living environment. Other development goals include the replacement of the existing 9-year-old solar panel system, the expansion of the smart energy management system, the deployment of a smart grid system - with the involvement of other public buildings in the municipality-, the purchase of an electric minibus for energy storage, the installation of an electric charging station, and the creation of an energy community involving the inhabitants and local businesses.

To finance these improvements, the municipality plan to use the ESCO model, the EKR (Energy Efficiency Obligation System) scheme, the involvement of businesses' own investments and the creation of an energy community fund for the inhabitants.

INFO: https://www.youtube.com/watch?v=O5eCnLdinUs&t=2sEnergymanagement in the Elderly Home of Alsómocsoád

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ The stable economic situation of the municipality as the maintainer. ▪ Availability of EU funding. ▪ Existing project management experience. ▪ Relatively new building with favourable but not perfect energy performance, reducing the scale and cost of required upgrades.	▪ Meeting grant/supporter requirements. ▪ Limited financial resources available. ▪ Lack of local expertise and skills.
Opportunities / Possibilities	**Threats / Barriers**
▪ The energy efficiency potential of smart energy management and automation. ▪ Scalability of projects. ▪ Attracting additional financial resources (ESCO, Energy Efficiency Obligation System). ▪ Opportunities in Smart Grid developments. ▪ The potential creation of an energy community with other municipal and residential buildings could improve cost efficiency through shared energy generation and reduced operating expenses.	▪ Changes to support options. ▪ Deterioration of the economic situation. ▪ Significant and continuous increase in prices of goods and services. ▪ Restructuring of the political and economic framework. ▪ Unpredictability of the regulatory environment. ▪ Lack of public resources and lack of motivation.

No. 32: Energy renovation of Tarján Bilingual Primary School

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Municipality of Szeged
Owner	Municipality of Szeged
Type of building	Public
Total investment cost	€ 1 770 215
Type of financing	Subsidy, own resources (Municipal investment)
Financier	Prime Minister's Office, Managing Authority of the Territorial Development Operational Programs (Hungarian State), European Regional Development Fund; Municipality of Szeged
Financing year	2016-2020
Specific / Comment	Territorial and Settlement Development Operational Program (TOP-6.5.1-15): non-refundable grant from European Regional Development Fund (75%) and National fund (15%) + own resources of the municipality (10%)

DESCRIPTION

The floor area of Tarján Bilingual Primary School is 4,114 m2. The results of the preliminary energy review showed that the school's energy consumption was higher than expected, which results in significant operating costs for the municipality.

The planned energy modernization focused on key efficiency improvements. External boundary structures were upgraded through the replacement of outdated façade doors and windows and the thermal insulation of the façade and roof slabs. The domestic hot water and heating systems were modernized by replacing old boilers, pipelines, and radiators and installing new insulated distribution systems. A household-sized photovoltaic system was installed on the flat roof to support renewable electricity generation. In addition, the internal electrical network and lighting were partially upgraded with energy-efficient fixtures, and barrier-free access was implemented.

The Tarján Bilingual Primary School, renovated as part of the project, is located in the Tarján district of Szeged. The school consists of a two-story main unit and single-story wings that house the gymnasium, kitchen, utility room, teachers' rooms, and additional classrooms, with a usable floor area of 4,098 square meters. The municipality aimed to make the school technically and energetically efficient, meeting current standards.

The facade was insulated with an average of 16 cm of expanded polystyrene, and fire sections were insulated with 16 cm of rock wool. The facade colour was chosen based on guidelines from the city’s chief architect. Existing windows and entrance doors were replaced with energy-efficient models. The outdated building engineering systems were modernized, including an updated electrical network, new lightning protection, and the replacement of old lighting fixtures with modern LED options. In addition to the energetic upgrades, the school underwent aesthetic renovations, with fresh paint applied to classrooms, corridors, and other interior spaces. Barrier-free access was ensured by constructing a new ramp at the main entrance, and new barrier-free toilet and washroom facilities were created as part of the renovation.

As part of the project, 54 solar panels with a total output of 39.9 kW were installed in the institution, which will partially cover the building's energy needs. Dél-Konstrukt Zrt. was the winning bidder during the open public procurement procedure announced for the construction, which accordingly carried out the full scope of the construction. Vázterv Engineering Office Construction, Planning, Execution and Service Kft. carried out the technical inspection tasks.

Picture 34.: Tarján Bilingual Primary School
Source: https://hu.polomap.com/szeged/14645

The contracted support for the TOP program amounts to HUF 409 583 424 [13] (€ 1 327 66), while the local government's own contribution stands at HUF 77 843 150(~€ 96 282 gross).

INFO: https://www.palyazat.gov.hu/eredmenyek/tamogatott-projektek/788040201

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ The annual primary energy demand decreases. ▪ Energy is produced from a renewable energy source. ▪ The condition of the property is improving. ▪ The value of the property increases.	▪ The principle of circularity does not appear among the criteria. ▪ The payback time will depend on the operation skills as well.
Opportunities / Possibilities	**Threats / Barriers**
▪ Depending on available funding sources, use of high-quality and long-lasting materials. ▪ Smart metering, smart solution, BEMS could be a good option for better overall performance and reducing operating costs. ▪ Monitoring indoor air quality and integrating a smart heat recovery ventilation system could further optimize energy performance and operational expenditures.	▪ Availability of grant. ▪ The energetical modernisation takes a long time. ▪ Without smart measurement and visualisation, the efforts will be non-visible.

[13] Exchange rate: HUF 308.50/€ on 30 Dec. 2016

No. 33: Retrofitting of Zahony Municipal Buildings for Renewable Energy Use

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Záhony City Municipality
Owner	Municipality of Záhony
Type of building	Public
Total investment cost	€ 1.43 million
Type of financing	Subsidy,
Financier	Prime Minister's Office, Managing Authority of the Territorial Development Operational Programs (Hungarian State), European Regional Development Fund
Financing year	2019
Specific / Comment	Territorial and Settlement Development Operational Program (TOP-3.2.2-15-SB1-2016-00018): 100% non-refundable grant of HUF 573.21M (€ 1.43 million) out of which 85% European Regional Development Fund and 15% State fund

DESCRIPTION

The municipality has set the goal of creating a "Green City" model by supplying its buildings with green energy. This initiative is supported by the residents of the settlement based on an informal public consultation.

The long-term direct goal and expected result of the planned development is to significantly reduce the operation and maintenance costs of the buildings. Within the framework of the planned investment, only 100% municipally-owned buildings will be supplied with renewable energy that perform public functions in the fields of public education, kindergarten care, basic health care, family and women's health care, public services provided by non-professional sports facilities.

The functions in the individual buildings do not generate income, they can only cover their operating costs from state subsidy and the support of the project owner. The energy classification of all buildings in their current state reached the relevant 176/2008. (VI. 30.) Classification category "FF" according to government decree.

As part of the planned investment, the energy needs of 7 buildings in Záhony serving public functions will be met by the heat pump and solar panel systems that will be installed in them. The heat pump and solar panel systems to be installed for each building provide 95% of the energy needs of the 7 buildings.

INFO: www.zahony.hu

Picture 35: Zahony Municipal Buildings

Picture 36: Zahony Municipal Buildings, PV panels

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Use of state subsidy made available for investment in renewables for municipalities. ▪ No own contribution was necessary.	▪ The use of subsidy was limited to renewable energy use; therefore, building renovation is yet to be completed, therefore energy consumption could not be reduced before installing the renewable system. ▪ The adoption of the old, outdated heating systems to the modern energy resources caused difficulties.
Opportunities / Possibilities	**Threats / Barriers**
▪ Switching to modern heating and cooling systems remains a future investment opportunity to improve energy efficiency and reduce operational costs.	▪ Absence of resources for further development can cause damages and keep energy consumption high. ▪ Lack of experienced operating and maintenance personnel.

5.4.2 Main findings for Hungarian cases

The Hungarian case studies (17–33) illustrate a variety of financing approaches for energy renovation projects and show how financing structures differ depending on ownership structure and building type. Most examples relate to residential buildings (Cases 17–27), while municipal projects (Cases 28–33) represent a smaller but important group of public-sector renovations. Overall, the cases demonstrate that renovation projects are typically financed through combinations of private contributions, grants and loans, while third-party financing mechanisms remain relatively limited. A common lesson across the cases is that careful project preparation, coordination between funding sources and well-structured financing arrangements are crucial for successful implementation.

Residential renovation cases highlight the importance of blended financing mechanisms, particularly in multi-apartment buildings where costs and financial responsibilities are shared among several owners. One of the most illustrative examples is Case 17 – the renovation of the multi-apartment building at Hamvas Béla Street in Szentendre, which applied a complex financing model. The project combined EU funding from the CONCERTO programme, national subsidies, municipal support, the condominium's own financial resources and ESCO-type financing for the renewable energy system. This case demonstrates how public funding can effectively leverage private investment, enable the integration of innovative technologies and distribute financial risks among several actors. Other condominium renovations, such as Cases 18, 21 and 22 in Budapest, follow similar financing patterns. In these projects, housing communities mobilised reserve funds, combined them with available subsidies and used bank loans to implement renovation measures. These examples show that multi-family buildings can provide favourable conditions for blended financing structures, as financial risks and costs are distributed among multiple owners, making larger renovation investments more feasible.

The renovation of single-family houses (Cases 24–27) reflects a somewhat different financing structure. These projects are typically financed through preferential loans combined with household savings, or entirely through private funds. For example, Case 27 in Budaörs was financed solely through private resources, with the investment motivated by expected energy savings, improved living comfort and increased property value. This highlights that in the absence of strong public support schemes, private investment can still drive renovation activity, particularly among households with sufficient financial capacity.

Municipal renovation cases show a different financing model. Renovations of schools, municipal offices, cultural buildings and other public facilities are generally financed through national or European grant programmes, which often cover between 70% and 100% of project costs. In some cases, municipalities provide the remaining share from their own budgets, resulting in grant-plus-co-financing structures. These examples demonstrate that grant funding plays a central role in enabling renovation projects in the public sector, as many municipalities have limited financial capacity to independently finance large investments. Although a few projects include elements of ESCO participation or other third-party financing solutions, these mechanisms appear only in a limited number of examples and remain secondary compared to traditional funding structures. Instead, the dominant financing model for public buildings continues to rely on public grants complemented by municipal contributions.

Nevertheless, the municipal cases still represent important best practices. Large-scale programmes linked to EU initiatives (e.g. CONCERTO, STACCATO) illustrate how well-coordinated funding structures, combined with careful technical preparation and administrative capacity, can enable substantial energy savings and the introduction of innovative technologies in public buildings. These experiences underline the importance of integrated financing approaches and effective cooperation between funding institutions, municipalities and technical experts when implementing complex renovation projects.

5.5 Slovenia

5.5.1 Presentation of Slovene cases

No. 34: Energy efficiency measures in MOK, Kranj	
FINANCIAL DATA OF RENOVATION	
Building / Beneficiary	Municipality of Kranj (MOK)
Owner	Municipality of Kranj (MOK)
Type of building	Public and private
Total investment cost	€ 6.18 million
Type of financing	Municipality resources, Energy Performance Contracting (EPC)
Financier	MOK, Petrol d.d. MOK, Petrol d.d., Domplan d.d. and Gorenjske elektrarne d.o.o., EU
Financing year	2001- 2015 (phase 1) 2018- (phase 2)
Specific / Comment	PPP between municipality and private company (phase 1); PPP between municipality and private companies (phase 2)
DESCRIPTION	

In 2001, the Municipality of Kranj (MOK) and company Petrol signed a 15-year contract based on the energy contracting model. This was the first project of contractual financing of measures for the efficient use of energy in Slovenia. The contract included 14 buildings with a total area of 73,000 square meters owned by the MOK. The business model included assurance of savings, assurance of energy supply and energy management. The buildings that were part of the contract were in poor energy condition with high energy costs.

With the contract, Petrol undertook to provide an average 18.7% saving in energy for heating by introducing energy measures in nine selected buildings. After the implementation of the first measures, the project was upgraded with some additional implemented measures. The project was mostly financed by Petrol, and the investment was repaid from the savings achieved. Additional upgrade measures also included funding from the MOK, grants from the tenders of the Republic of Slovenia and the Swiss Renewable Energy Across the Alpine Land (REAAL) mechanism, which supported projects in the field of renewable energy sources in the Alpine region to improve energy efficiency in public infrastructure. Investment risks, responsibility and possible consequences due to failure to achieve the predicted effects were assumed by Petrol.

The results of measures in 15 years, 14 contracted buildings saved 3 years of heat consumption as regard to reference year. With the implementation of measures in nine buildings, the use of heat in these buildings during the implementation of the contract was almost halved.

In the covered Olympic swimming pool and open swimming pool in Kranj, despite the increased use of the facilities, the use of primary energy for heat decreased by 62% compared to the reference use. All devices operated uninterrupted at all times. The project also included staff training on proper ventilation and energy management, technical details of system operation, thermostat settings, proper ventilation, etc.

Picture 37: Olympic pool in Kranj
Source: https://www.zsport-kranj.si/

This positive experience encouraged the MOK to continue the renovation of buildings according to the same 15-year contract model in the consortium of the companies Petrol, Domplan and Gorenjske elektrarne. The project (started in 2018) includes a comprehensive energy renovation of 10 public buildings and a partial energy renovation of 12 buildings (all together 68,450 m^2). The investment amounts to € 6.18 million, of which private partners invest € 3.1 million, 2.25 came from European cohesion funds, and € 0.83 million was the investment of MOK. The total guaranteed annual saving of energy is 2,473,000 kWh.

The project greatly improved energy efficiency and reliability of public buildings while ensuring uninterrupted operation of facilities. The success of the project also built institutional experience, enabling further large-scale public building renovations.

INFO: https://www.petrol.si/znanje-in-podpora/2019/clanki/mestna-obcina-kranj---trajnostno-zgodbo-skupaj-gradimo-ze-19-let.html

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Provision of enough funding for significant improvement of the energy efficiency of selected buildings and thus big energy savings. ▪ Demonstration case on which trust in contracting is built. ▪ The established trust and good experience encouraged the continuation of the process in a similar project.	▪ The criteria should include measures targeting more comprehensive approach for renovation, i.e. sustainable renovation. ▪ Commitment of client to a contracted supplier for 15 years. ▪ Inadequate methodology of evaluating the profitability of energy efficiency renovation: usual cost-benefit analysis is not useful in evaluating side benefits, such as improved health and well-being, better living and working conditions, general more favourable environmental effects, etc.
Opportunities / Possibilities	**Threats / Barriers**
▪ Opens possibility to obtain additional funds. ▪ Support also the supporting measures such as staff training and additional learning about technical details of system operation, ventilation, etc.	▪ Relatively long return of investment (due to low price of energy).

No. 35: Energy renovation in MOK (EOL-1, EOL-2), Ljubljana

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Municipality of Ljubljana (MOL)
Owner	Municipality of Ljubljana (MOL), Republic of Slovenia
Type of building	Public
Total investment cost	€ 15 million
Type of financing	Municipality resources, Energy Performance Contracting (EPC)
Financier	MOL, Petrol d.d. MOL, Resalta d.o.o., Javna razsvetljava Ljubljana d.d.
Financing year	2017 – ongoing
Specific / Comment	PPP between municipality and private company (phase 1); PPP between municipality and private companies (phase 2)

DESCRIPTION

Picture 38: Sports park Kodeljevo,
Source: https://www.petrol.si/

In 2017 Municipality of Ljubljana (MOL), company Petrol and Resalta signed the largest PPP contract based on energy contracting model in Slovenia. The total costs of the EOL-1 project were 15 million euros, with the two private partners providing the majority of the investment funds, as much as 51%. In addition, all technical and economic risks of project implementation and management were on their side. The contract included 48 buildings.

As part of this large energy renovation of Ljubljana, a consortium of partners renovated kindergartens, primary schools, sports halls and other public buildings. The buildings were equipped with modern and environmentally friendly energy infrastructure for more efficient energy use and reduction of greenhouse gas emissions into the environment. These very important renovations also included the Central Swimming Pool in Tivoli, the Tivoli Sports Hall, the Kodeljevo Sports Park Hall, the Rudnik Shooting Range and the Bežigrad Unit of the Ljubljana City Library.

The result was an annual saving of 8 million kilowatt hours, which is more than one million euros, and a reduction of greenhouse gas emissions by approximately 3,000 tons annually.

Several technical measures were implemented in the Kodeljevo Sports Park Hall, for example, it was connected to a district heating system for heating, a new heating station was installed, and the existing energy-wasting lighting was replaced with energy-saving LED lights.

The Ljubljana project continued into the second part of the renovation of the buildings together with Resalta company and the company Javna razsvetljava Ljubljana. As part of this project, additional 11 buildings are planned to be renovated and equipped with heat pumps and PV panels (where possible). The additional 5 million euros from the second part enables implementation of measures that can assure annual savings of more than € 300 000 and reduction of greenhouse gas emissions by as much as 463 tons per year.

This large project modernized public buildings with efficient, environmentally friendly energy systems and consequently improved reliability and operational quality of buildings. As such it highly reduced greenhouse gas emissions and significantly improved thermal comfort, and transferred technical and operational risks to private partners.

The project won the prestigious European Energy Service Award in Brussels, which is awarded by the European Commission for outstanding results or efforts in the field of energy services in Europe.

INFO: https://www.petrol.si/znanje-in-podpora/2019/clanki/energetska-obnova-ljubljane-150.000-dreves-vec-in-tri-tisoc-ton-izpustov-manj.html

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Provision of enough funding for significant improvement of the energy efficiency of selected buildings and CO_2 savings. ▪ Consolidation of trust in this type of contracting. ▪ The established trust and good experience encouraged the continuation of new energy contracting for large renovation. ▪ Establishment of EPC guidelines at the national level and launch of the energy contracting market in the country. ▪ Reference case for companies involved. ▪ A new educational program on the efficient use of water, energy and renewable energy sources (MOL has committed to allocate 10% of savings for education of children).	▪ The criteria should include measures targeting more comprehensive approach for renovation, i.e. sustainable renovation. ▪ Commitment to a contracted supplier for 15 years. ▪ Inadequate methodology of evaluating the profitability of energy efficiency renovation: usual cost-benefit analysis is not useful in evaluating side benefits, such as improved health and well-being, better living and working conditions, general more favourable environmental effects, etc.
Opportunities / Possibilities	**Threats / Barriers**
▪ Further EPC phases and process continuity in MOL and other municipalities. ▪ Further implementation of such projects (EPC) by contracting companies. ▪ Opens possibility to transfer the knowledge of financial model.	▪ Relatively long return of investment (due to low price of energy).

No. 36: Energy renovation of Ministry of justice, Celje, Murska Sobota and Slovenj Gradec

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Ministry of justice
Owner	Ministry of justice, Republic of Slovenia
Type of building	Public
Total investment cost	€ 1.8 million
Type of financing	State resources, Cohesion fund, Energy Performance Contracting (EPC)
Financier	Resalta d.o.o., Ministry of justice, Republic of Slovenia, EU
Financing year	2018 (phase 1) 2023 (phase 2)
Specific / Comment	PPP between municipality and private company; public source: Operational Programme for Cohesion Policy Funding (OP-EKP 2014–2020)

DESCRIPTION

In line with the Longterm strategy for encouraging investment in energy efficiency renovations of buildings and the Operational Programme for the implementation of European Cohesion Policy 2014-2020 the Ministry of Justice began the pilot project of energy efficiency renovation on buildings on Prešernova ulica 22, 3000 Celje, Slomškova ulica 19, 21, 23; 9000 Murska Sobota and Kidričeva 1; 2380 Slovenj Gradec in 2018.

Picture 39.: Judicial building in Celje
Source: https://www.celje.info/

They chose Resalta as the private partner in renovation. The total investment in the energy renovation of the buildings amounted to € 1.8 million, 49.9% of which was financed by the public partner, € 560 482 from European Union and € 98 909 from Republic of Slovenia.

Integrated energy renovation of judicial buildings of the building sector was to include reduction of annual primary energy consumption in public buildings, reducing greenhouse gas emissions, increase the total floor area of energy renovated buildings owned and used by central or sub-central government, increase in the number of demonstration projects implemented energy renovation projects of different types, increase in the total floor area of energy renovated buildings public sector.

Among measures that were to be implemented were: renovation of heating systems, installation of additional thermal insulation on roofs and facades and replacement of lighting. Yearly saving amounted up to € 112 000, with 164 MWh saved yearly in heating energy and 53 MWh in energy.

The renovation was implemented in 2018, and the energy efficiency contract is currently running in phase 2, until 2032, when Resalta gave the management back to the Ministry of justice. Through all renovation measures such as modernization of heating, implementation of thermal insulation, and integration of new energy efficient

lighting systems the buildings improved general energy efficiency and environmental performance. It is serving as a pilot and demonstration project in the local area, strengthening public-sector experience in long-term energy performance contracting and sustainable building management.

INFO: https://www.resalta.si/reference/ministrstvo-za-pravosodje

https://www.energetika-portal.si/nc/novica/n/vlada-rs-odobrila-pilotni-projekt-energetske-prenove-sklopa-treh-sodnih-stavb-v-upravljanj-3563/

https://www.gov.si/assets/ministrstva/MP/SIKP/Predstavitev-4-prednostne-osi-na-MP.pdf

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Reference for the financial model and public-private partnership in renovation. ▪ Short time of Resalta management (3 years) before the system was handed over to the client. ▪ Provision of enough funding for significant improvement of the energy efficiency and CO_2 savings. ▪ Consolidation of trust in this type of financial model. ▪ Reference case for company.	▪ Lack of public information about the financial model and the whole process. ▪ Practically no promotion actions.
Opportunities / Possibilities	**Threats / Barriers**
▪ Further implementation of such financial models. ▪ Development of criteria for determining eligible costs for sustainable energy renovation of public buildings.	▪ Rapid changes in the energy market can hinder to achieve the contractual results of this financial model. ▪ Complicated public procurement procedure.

No. 37: Renovation of boiler house in Deteljica housing estate, Tržič

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Apartment owners, premises owners
Owner	Apartment owners of Deteljica housing estate
Type of building	Private
Total investment cost	Approximately € 46 000 per year
Type of financing	Building's reserve fund, Energy Performance Contracting (EPC)
Financier	Interenergo d.o.o.
Financing year	2017
Specific / Comment	No public source

DESCRIPTION

The Deteljica housing estate in Tržič comprises 12 apartment buildings. The inhabitants own the boiler house, which heats 278 apartments and 15 commercial premises. The boiler house and the heat substations were outdated, so the residents decided to renovate and replace the heating system.

Picture 40.: The renovated boiler room in Deteljica
Source: https://www.finance.si/

The goals of the contractor were: the overall organisation, investment and implementation of the renovation of the heating system, the refurbishment of the boiler house with state-of-the-art natural gas boilers, the implementation of the system in control centre and the continuous monitoring of its operation, remote access to the system and on-call service, the refurbishment of the heating stations and the reduction of heat transfer losses, the switch to the more environmentally friendly energy source natural gas, the reduction of carbon dioxide emissions and cleaner air, the maintenance, the insurance and the care of the proper functioning of the system with regular and emergency servicing services.

After signing the contract, the project was completed within two months. The complete renovation of the boiler house included a new 1 000 kW gas boiler, mechanical installations with equipment for pumps, exchangers and a new chimney, new electrical installations, a modern central control system with monitoring, settings, alarming via email and SMS, and more.

The energy contracting project between Interenergo and the apartments owners of the Deteljica neighbourhood was divided into three parts. The first phase was the renovation, followed by the second phase, which covers seven years of management, maintenance and insurance of the equipment, as well as a reliable supply of heat energy.

In the third phase, Interenergo will hand over ownership of all the newly installed equipment and system to the users.

The investment was completed before the start of the 2018/19 heating season, so the new system is already delivering savings. The energy savings of the boiler are 730.69 megawatt hours per year or per 1,500 operating hours, and the environmental savings are 306.18 tonnes of carbon dioxide per 1,500 operating hours. Both savings are calculated according to the Regulation on methods for determining savings.

The renovation will result in total annual savings of approximately € 46 000 in Deteljica. Before the renovation, the total heating costs with maintenance and management amounted to just over € 137 000 per year, while after the renovation they amount to less than € 91 000 per year.

The figure is valid for the first seven years after the renovation. During this period the equipment will be paid off through savings, so the heating, maintenance and management costs after this period will be less than € 77 000 per year, with annual savings of almost € 61 000. In total, the energy renovation will save Deteljica more than half a million euros over ten years.

The modernization of an outdated heating system, improved reliability, safety, and comfort for residents through automated control, continuous monitoring, and assured maintenance. It also reduced heat losses and significantly lowered carbon dioxide emissions, contributing to cleaner air and a more environmentally friendly energy supply in the wider Tržič area.

INFO: https://www.finance.si/okolje-%26-energija/%28video%29-z-energetsko-prenovo-do-pol-milijona-prihrankov/a/8947028

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Model enables good cooperation of the floor owners, building managers and the private contractor. ▪ A nice demonstration of financial model in case of renovation of boiler house in multi-owner apartment building.	▪ The predicted savings can be lower due to rapid changes in the energy market.
Opportunities / Possibilities	**Threats / Barriers**
▪ To learn about organisational steps for a large number of units / apartments and commercial premises. ▪ Opportunity for promotion of this successful financial model used for multi-owner apartment building with a large number of units.	▪ Rapid changes in the energy market threat the further investments. ▪ Financially vulnerable people can be an obstacle as usually they cannot invest.

No. 38: Energy renovation of buildings in MOM, Maribor

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Municipality of Maribor (MOM)
Owner	Municipality of Maribor (MOM), Republic of Slovenia
Type of building	Public
Total investment cost	€ 10 539 293
Type of financing	Municipality resources, Cohesion fund, Energy Performance Contracting (EPC)
Financier	Municipality of Maribor (MOM), Petrol d.d, EU
Financing year	2018
Specific / Comment	PPP between municipality and private company; public source: Energy Renovation of Public Buildings Programme of the Ministry of Infrastructure and includes cohesion funds from the 2014-2020 financial perspective

DESCRIPTION

Picture 41.: Elementary school Rada Robiča - during the renovation
Source: https://maribor.si/

In 2018 the Municipality of Maribor and its partner PETROL, Slovenska energetska družba, d.d., Ljubljana, concluded a public-private partnership for the implementation of energy renovation of public buildings in the Municipality of Maribor, which at that period represents one of the largest public-private partnership projects in the field of energy contracting in Slovenian municipalities. The project was prepared and implemented in accordance with the provisions of the Energy Renovation of Public Buildings Programme of the Ministry of Infrastructure and includes cohesion funds from the 2014-2020 financial perspective.

The energy renovation project of the public buildings of the Municipality of Maribor was implemented according to the principle of public private partnership (PPP) and EPC over a 15-year concession period. The private partner invests in the energy renovation of the building and provides certain savings with the same or higher comfort in the premises, and the public partner repays the private partner with these savings over the contractual period. At the end of the contract period, all savings in energy costs remain with the public partner. The private partner will also ensure the management and maintenance of the newly installed or rehabilitated energy installations and systems during the 15-year concession. 24 buildings were renovated as part of the energy renovation of the MOM: kindergartens, primary schools, sports halls and public buildings.

Due to the wide range of facilities, the project was divided into two lots. Strand 1, which covers the comprehensive energy renovation of 14 buildings, dealt with technological as well as construction measures for which it was possible to obtain cohesion grants amounting to 40% of the investment. The comprehensive energy renovation measures included thermal insulation of façades, replacement of windows, thermal insulation of unheated attic ceilings, installation of thermostatic valves, renovation of gas and ELKO boiler rooms, renovation of heating

sources with installation of heat pumps and renovation of DO heat stations, renovation of interior lighting systems, installation of an energy management system.

Strand 2, which covers the renovation of 10 buildings, focuses mainly on the rehabilitation of the building's technological systems: heating, ventilation, refrigeration, ice-making and efficient lighting systems.

The total investment value of the project amounted to EUR 10 539 293. The majority of the investment (88%) is in the overall energy renovation of the buildings, while the technological renovation of the buildings represents 12% of the total investment. The private partner (PETROL d.d.) invested € 5 280 186.14 (50.1%), € 3 706 601.83 (35.17%) came from the European Cohesion Fund and the municipality's share was € 1 552 505.72 (14.73%).

The total guaranteed annual savings of heat and electricity amount to 3,367,419 kWh or € 555 804 (excluding VAT) per year, which also means a reduction of 1,325 tonnes of CO_2 per year, equivalent to the equivalent of 147 hectares of forest in a greenhouse gas accumulation.

This renovation project not only significantly improved energy efficiency, but also comfort of public buildings, schools, kindergartens, and sports facilities through comprehensive building and system renovations. It also reduced greenhouse gas emissions, ensured long-term professional maintenance and energy management, and strengthened the municipality's capacity to manage large-scale sustainable infrastructure projects through a PPP model.

INFO: https://www.petrol.eu/sl/aktualno/2018/podpis-koncesijske-pogodbe-za-izvedbo-projekta-energetskega-pogodbenistva-na-objektih-mestne.html

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ Provision of enough funding for significant improvement of the energy efficiency of selected buildings with guaranteed annual energy savings up to 3,367,419 kWh ▪ Private partner of this financial model ensures the management and maintenance of the newly installed systems during the 15-year concession.	▪ The criteria should include measures targeting more comprehensive approach for renovation, i.e. sustainable renovation. ▪ Commitment of the client to a contracted supplier for 15 years. ▪ Lack of public promotion.
Opportunities / Possibilities	**Threats / Barriers**
▪ Obtaining users' assessment of additional benefits in cases of comprehensive renovation. ▪ To include simple findings and results into the learning process.	▪ In this financial model outcome of energy savings, emissions savings and cost savings is based on calculations for the future. Due to long and non-predictable economic situation, the outcome is quite uncertain.

No. 39: Renovation of energy system for heating in Šorlijevo naselje, Kranj

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Apartment owners of Šorlijevo naselje
Owner	Apartment owners of Šorlijevo naselje
Type of building	Private
Total investment cost	€ 800 000
Type of financing	Building's reserve fund, deferred payment of investment
Financier	Apartment owners of Šorlijevo naselje, Domplan d.d.
Financing year	2017 – 2018, 2017- 2026
Specific / Comment	The possibility and burden of delayed payment was taken over by the private company Domplan d.d.

DESCRIPTION

In 2017 and 2018 a community of housing settlement Šorlijevo naselje in Kranj decided to renovate their boiler house. The investment was covered from their own savings (in their housing fund). The conditions for the start of the investment were made possible by the management of Domplan, which, together with the heating committee, prepared the starting points for the preparation of the technical documentation and the terms of the deferred financing.

Picture 42.: Boiler room in Šorlijevo naselje
Source: https://www.domplan.si/

The total investment was around € 800 000. Around € 250 000 has been saved by users over the past two years in the form of payments into a maintenance fund, and Domplan has allowed the remainder of the investment to be repaid over nine years, in the same form and amount as before. Thus, the amount of heating bills would not increase, but a reduction in variable heating costs of around 12 % was expected as a result of the modernisation of the system.

The renovation of the boiler house included construction, mechanical and electrical works. The construction work on the boiler house included the renovation of the roof, replacement of windows and doors, rehabilitation of concrete surfaces, and painting of external and internal surfaces. The mechanical work included the installation of two hot water boilers with an attached gas burner of 1,400 kW each, the construction of two new flue gas stacks, the installation of a heat exchanger, the replacement of distribution pumps, valves, piping, etc. The renovation switched the entire heating system to a closed static pressure maintenance system, with attached dictation pumps and a degassing plant. In the boiler room, the entire electrical installation was replaced, a controller was installed to control the operation of the plant and auxiliary devices were installed for remote control of the boiler room.

With the replacement of the heating pipelines in the estate, a total of approx. 3,300 m of pipelines were replaced. The existing steel were replaced by pre-insulated pipelines with leakage indication fitted. The route of the new pipelines mostly follows the existing AB kinettes. At the same time as the heat pipes were replaced, electrical cabling was installed to allow the connection, remote monitoring and control of the heat stations. After the renovation, the boiler house and all the heat substations to which the heat pipeline was being renovated were remotely controlled and operated from the headquarters of Energetika.

After the renovation of the boiler house and the heat pipeline, no additional financial burden was imposed on the apartment owners, who would repay the remaining difference through their established earmarked savings. However, the savings due to lower heat losses in the heat pipe, better boiler efficiency and more optimal control were passed on to the apartment owners in January 2018, with a reduced variable heating cost of approx. 12%.

The project modernized the heating infrastructure, improving reliability, safety, and comfort through energy efficient boilers, upgraded pipelines, and remote monitoring and control. It also reduced heat losses and environmental impact while strengthening local management capacity and long-term sustainability of the housing community.

INFO: https://www.domplan.si/energetika/toplotna-oskrba/prenova-ogrevalnega-sistema-sorlijevo-naselje

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ A new model for paying off a large private investment, while also having lower electricity cost immediately.	▪ The residents covered 100% of the investment with their savings fund, with deferred payment for the next 9 years. ▪ The criteria should include measures targeting more comprehensive approach for renovation, i.e. sustainable renovation.
Opportunities / Possibilities	**Threats / Barriers**
▪ Provides opportunity for combining this financial model with EU models or national financial models (Ecofund subsidies or loans) ▪ Using the case of this financial model as a promotion for other similar renovations.	▪ 100% consent and cooperation from all owners is still required for a financial model like this. ▪ No public promotion of the financial model.

No. 40: Energy renovation of public buildings, Novo mesto

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Municipality of Novo Mesto
Owner	Municipality of Novo Mesto
Type of building	Public
Total investment cost	€ 3 157 893
Type of financing	Municipality resources, Cohesion fund, Energy Performance Contracting (EPC)
Financier	Municipality of Novo Mesto, Petrol d.d. , EU
Financing year	2017
Specific / Comment	PPP between municipality and private company; public source: Operational Programme for Cohesion Policy Funding (OP-EKP 2014–2020)

DESCRIPTION

In cooperation with Petrol, the Municipality of Novo mesto improved the energy efficiency of 24 public buildings in the project of energy renovation of municipal buildings. This part was largely implemented according to the public-private partnership model. The partner also ensured the management and maintenance of the newly installed energy installations and systems during the concession period.

Picture 43: General hospital Novo Mesto
Source: https://www.radio-odeon.com/

The project was divided into two parts. The first part consists of 16 buildings, for which it was planned to undergo a partial energy renovation. The measures mainly included the establishment of a high-tech energy management system for the buildings with the implementation or upgrade of central control systems, optimisation of the operation of heating and cooling systems, renovation of boiler rooms and renovation of interior lighting. The implementation was fully funded by the private party and the total guaranteed savings in heat and electricity amount to 1,037,114 kWh or € 147 437.28 excluding VAT per year.

The second set of renovation measures comprises eight buildings where comprehensive energy renovation was planned. The comprehensive renovation mainly involved thermal insulation of façades, replacement of windows and doors, thermal insulation of unheated attic, installation of thermostatic valves or heat pumps, replacement of lighting, renovation of boiler rooms, etc. For these buildings, the private sector provided a minimum of 51 % of the funds, up to 40 % from cohesion funds, the rest is provided by the municipality. The total guaranteed savings in heat and electricity amount to 831,038 kWh or € 97 394.76 excluding VAT per year.

The total investment for the renovation of the 24 buildings amounts to € 3 157 893 excluding VAT, with Petrol investing € 1 610 526 excluding VAT, European cohesion funds € 993 626 excluding VAT and the Municipality of Novo mesto € 553 741. VAT on the entire investment is covered by Petrol.

The Municipality of Novo mesto was additionally planning comprehensive energy renovations of three more buildings, where the expected savings did not meet the criteria of the public-private partnership and were therefore renovated within the framework of a public procurement procedure and with the help of financial resources from the European Cohesion Policy.

The energy renovation was financed by a cohesion grant of up to 40%, the rest being provided by the municipality. The energy measures on three primary schools did mainly involve installation of thermal insulation on the facades, ceilings and replacement of windows. The investment is worth € 457 942 excluding VAT, of which € 183 177 excluding VAT are European Cohesion funds and € 307 797 was the share of the Municipality of Novo mesto. VAT on the entire investment was covered by the Municipality of Novo mesto.

The benefits of the measures have been demonstrated in improving the energy efficiency, comfort, and operational reliability of public buildings through modern energy management systems, upgraded heating and lighting, and comprehensive building renovations. Long-term professional management and maintenance, reduced environmental impact, and strengthened the municipal capacity to deliver sustainable public infrastructure through both PPP and public procurement models are also ensured.

INFO: https://www.petrol.eu/sl/objave/2017/02/mestna-obcina-novo-mesto-in-druzba-petrol-podpisali-pogodbi-za-energetsko-sanacijo-javnih.html

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ A large share in this financial model needs to be covered by private partner. ▪ Comprehensive energy renovation of second part.	▪ The criteria for use of financial model should include measures targeting more comprehensive approach for renovation, i.e. sustainable renovation: here for 6 buildings only partial energy renovation was implemented.
Opportunities / Possibilities	**Threats / Barriers**
▪ Opportunity to prepare simple analysis of the process needed for implementation of financial model to be included into educational process. ▪ Visualisation of the results for the promotion of the whole process, including the financial model, and technical results, improvements, other benefits etc.	▪ 3 buildings that did not meet the criteria for public-private partnership had to be renovated through separate process.

No. 41: Renovation of University for lifelong learning, Velenje

FINANCIAL DATA OF RENOVATION	
Building / Beneficiary	University for lifelong learning Velenje (Ljudska univerza Velenje)
Owner	Municipality of Velenje (MOV)
Type of building	Public
Total investment cost	€ 112 946 (€ 154.64/m2)
Type of financing	Municipality resources, crowdfunding (via natural persons)
Financier	MOV and general public
Financing year	2020
Specific / Comment	This is an example of the first testing of a crowdfunding financial model for building renovation in Slovenia. It was not successful.

DESCRIPTION

The Lifelong Learning University in Velenje with its programmes and content that started as a link between the immigrant miners and their families in their new hometown is an adult education organization. It is settled in public building built in 1980 and is now under protection as cultural heritage. The building needs the renovation, which must comply the nearly Zero Energy Building (nZEB) standard. So, the target was set to reach primary energy consumption of 65 kWh/m2 or below. This means yearly savings of electric energy of 19,847 kWh (86,3%) and yearly energy savings of heating energy of 27,214 kWh (26,6%). The overall reduction of CO2 emissions is expected to reach 41,1% and overall energy costs per year would be reduced for around € 3 245 or 42,6%.

Picture 44: University for lifelong learning Velenje
Source: https://programme2014-20.interreg-central.eu/

The renovation was planned to take place in two phases. Here the first phase investment with predicted costs € 112 946.12 is described. It includes replacement of light bulbs with low-energy ones, installation of thermostatic valves on radiators, thermal insulation of the roof, general improvements of building envelope energy losses, and installation of solar power plant on the roof of building.

The selected co-financing model was crowdfunding. For this new model an Action Plan was prepared with the goals of the campaign, the way they are achieved, the cost and time of the campaign, the choice of the crowdfunding model and the crowdfunding platform, the campaign team, the communication channels, etc. Despite a very well-prepared campaign, the campaign failed to reach the amount of money to be raised, € 10 000. Reasons for not reaching the goal were: the goal was set too high, legislative barriers, a whole new way to raise

funds, the first example of this type of fundraising- people do not know it enough, general public opinion that the municipality, because it already collects taxes, has to pay for the renovation itself.

The project upgraded a protected cultural heritage building to nearly Zero Energy Building standards, significantly reducing energy use and CO_2 emissions. It also fostered community engagement and built valuable experience in new innovative, sustainable financing and energy-efficient renovation of public buildings

INFO: https://programme2014-20.interreg-central.eu/Content.Node/Municipality-of-Velenje-crowdfunding.html

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Strengths of public and private funding combination allows one party to take on a greater financial burden (public from MOV) if the other fails (private by crowdfunding). ▪ Crowdfunding is based on gathering small contributions to raise a lot of money. ▪ With crowdfunding a very high diversification of investment (in society) can be achieved	▪ Crowdfunding is a whole new way to raise funds in Slovenia and mechanism is not well known among people. ▪ General public opinion about crowdfunding is that the municipality, because it already collects taxes, has to pay for the renovation of public buildings itself.
Opportunities / Possibilities	**Threats / Barriers**
▪ Crowdfunding may strengthen community affiliation. ▪ With crowdfunding awareness among the public about the benefits of sustainable renovations of public buildings is spread.	▪ The goal of crowdfunding amount (if not set realistically) may not be reached. ▪ The crowdfunding financial model may not be fully compliant with the law or there may be regulatory ambiguities.

No. 42: Energy renovation of School centre, Nova Gorica

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	School centre Nova Gorica
Owner	School centre Nova Gorica, Municipality of Nova Gorica, Republic of Slovenia
Type of building	Public
Total investment cost	€ 5 415 804
Type of financing	Municipality resources, Cohesion fund, Energy Performance Contracting (EPC)
Financier	Synco d.o.o., Municipality of Nova Gorica, EU
Financing year	2023
Specific / Comment	PPP between municipality and private company; public source: Operational Programme for Cohesion Policy Funding (OP-EKP 2014–2020)

DESCRIPTION

Picture 45: School centre Nova Gorica
Source: https://www.scng.si/

The main purpose of this investment project was to carry out the necessary technical measures for the comprehensive renovation and establishment of energy efficient management in public buildings in Nova Gorica. The aim was to functionally improve and increase energy efficiency, reduce energy costs and maintenance/management costs of buildings, and reduce greenhouse gas emissions and dust particles. The private partner selected in the public tender to carry out the energy renovation was Synco d.o.o. The implementation of energy renovation measures improved living and working conditions for the users of these buildings.

The objects intended for energy renovation were: The School of Mechanical Engineering, Transport and Woodworking, The School of Electrical Engineering and Computer Science, The Secondary School of Economics and Commerce building in Nova Gorica.

The operation was implemented under the Operational Programme for the implementation of the European Cohesion Policy for the 2014-2020 programming period. The general objectives of the investment planning were to include costs for comprehensive energy renovation and refurbishment of three public buildings of the Nova Gorica School Centre. This means partially covering the costs of the energy renovation from the savings to be achieved after the project implementation. The renovation should improve the energy efficiency of the buildings, reduce electricity and heating costs, as well as running and investment maintenance costs, reduce of CO_2 emissions, thereby reduce negative impacts on the environment, optimize the management and maintenance of the energy system of the buildings in a way that improves energy efficiency at the cost of the invested resources, ensure smooth operation of heating and other energy systems in the building in order to increase thermal comfort, improve working and living conditions for

building users (employees, school children, other building users), and to improve the quality of the educational process and the operation of the buildings.

The specific objectives of the energy renovation investment project are: total final energy savings in the buildings after the renovation: 978,098 kWh annually, 3 energy renovated public buildings owned by the SJU, total net heated area of the energy rehabilitated public buildings owned by the SBS: 14,137 m^2, CO_2 emissions reduction per year: 297,474kg.

The value of the operation at current prices including value added tax was estimated at € 5 415 804.14. The operation was financed by the founder's own resources (€ 158 990.24), the private partner's resources (€ 2 656 269.72) and the EU Cohesion Fund (€ 2 600 544.18), of which the national contribution amounts to € 390 081.63.

Comprehensive renovation measures and optimized energy management in three public school buildings in Nova Gorica the resulted in energy efficiency improvement, as well as in higher thermal comfort, and operational reliability. Students and staff are very satisfied with sustainable building management practice.

INFO: https://www.scng.si/energetska-sanacija-stavb-sc-nova-gorica-v-novi-gorici/

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ New case study of energy efficiency renovation using private-public partnership (PPP) for energy contracting. ▪ Private partner was a different corporation (Synco d.o.o.) than in majority of Slovenia (Petrol d.d.).	▪ There was no promotion about the successfully implemented financing model.
Opportunities / Possibilities	**Threats / Barriers**
▪ To promote and publish the financial model among the users and among general public. ▪ To use the financial model concept and its technical results of the renovation (measurements) for visualisation and for the educational process.	▪ Building seismic and fire safety is inadequate, consequently endangering safety of the residents; the first measure (before energy renovation) must be to improve seismic and fire resistance, but usually there is no funding for these measures.

No. 43: PV panels installation on multi-apartment building, Jesenice

FINANCIAL DATA OF RENVATION

Building / Beneficiary	Floor owners of the multi-apartment building in Jesenice
Owner	Floor owners of the multi-apartment building in Jesenice
Type of building	Private
Total investment cost	€ 36 400
Type of financing	Building's reserve fund, Energy Performance Contracting (EPC)
Financier	GEN-I d.o.o., apartment owners of the multi-apartment building in Jesenice
Financing year	2019
Specific / Comment	Private investment, no public source

DESCRIPTION

The first Slovene multi-apartment building to meet its own electricity demand with a PV self-supply system from inexhaustible and clean energy, the sun, was set up in Jesenice. The PV system was installed on the roof of the building block. The whole operation was planned by private partner GEN-i, floor owners of the 23-apartment building block and the building manager.

Picture 46: PV panels on the multi-apartment building in Jesenice
Source: https://www.dnevnik.si/

The investment in the solar power plant cost € 36 400, but because they agreed with Gen-I to finance the investment, individual owners did not need to acquire debt and won't be paying higher electricity bills than before. The bills remained the same, at an average of around € 20 per apartment, but the cost of electricity would only be half, and the other half being used to pay off the investment over seven years. In the eighth year of management, electricity bills per home will be € 10 or € 11 lower per household.

The solar power plant on a 23-apartment apartment building a capacity of 36.7 kW and will generate 37,000 kilowatt hours of green electricity per year. It will reduce carbon dioxide emissions by 17 tonnes per year and will generate annual savings of over € 4 500 in electricity consumption. The owners of the € 36 400 investment, which will pay for itself in full in seven years, will be able to cover most of the building's energy needs from their own production. 15.1 kW of the modules were intended for use in the common areas and the heating station, while the remaining 21.6 kW are for consumption in each of the 23 apartments.

The implementation was based on an innovative business model: the residents paid nothing for the investment in the solar power plant, but the € 36 400 investment was covered by GEN-I Sonce. For seven years, the residents

will pay for electricity similarly to before the investment, and after seven years (2027), when the plant is paid off, their electricity costs will be roughly halved, as the electricity generated by the solar plant will be free for them.

In 2019, the law currently allowed for only 50% self-supply of energy, but an amendment was being prepared to allow 100% self-supply. Then, they had 129 solar panels on the roof but left the space for 110 more. The goal in planning was to be 100% self-sufficient.

This measure enabled a multi-apartment building in Jesenice to meet most of its electricity needs with clean solar energy, reducing carbon dioxide emissions and energy costs. It also introduced an innovative financing model, allowing residents to benefit from renewable energy without upfront investment, while gathering experience in self-sufficient, sustainable building energy management.

INFO: https://www.dnevnik.si/1042873136

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ First implementation of this kind of financial model, a combination of private-private partnership, with initiative that came from the building manager and floor owners themselves. ▪ The financial model of the project was promoted as an investment for the future generations (“their kids will have free electricity”).	▪ Long lasting process to finalize all formalities (more than 6 months). ▪ Lack of appropriate legislation for faster implementation.
Opportunities / Possibilities	**Threats / Barriers**
▪ Simplifying decision making processes among floor owners and private partners to shorten the implementation time. ▪ Promoting trust and awareness before decision making processes so that the building occupants feel confident in their own decision. ▪ To improve formal procedures to fasten and ease the process for intensifying this kind of financial models on multi-apartment buildings.	▪ 100% approval from floor owners is needed for decision regarding the measures. ▪ A good relationship and preestablished trust between building manager and floor owner is necessary.

No. 44: Energy renovation of Secondary school for economic, service and construction, School centre Kranj - Building B, Kranj

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	School centre Kranj
Owner	School centre Kranj, Municipality of Kranj (MOK), Republic of Slovenia
Type of building	Public
Total investment cost	€ 828 000
Type of financing	Municipality resources, Cohesion fund, Energy Performance Contracting (EPC)
Financier	Municipality of Kranj, Interenergo d.o.o., EU
Financing year	2022
Specific / Comment	PPP between municipality and private company; public source: Operational Programme for Cohesion Policy Funding (OP-EKP 2014–2020)

DESCRIPTION

In order to become more energy efficient, the Secondary School of Economics, Services and Construction of the Kranj School Centre decided to cooperate with Interenergo. One of the main reasons for the comprehensive energy renovation was the excessive energy consumption for heating. Using the public-private partnership (PPP) model of energy contracting, the school centre was able to access the missing funding.

Picture 47: Secondary school Kran
Source: https://www.mestomladih.si/

The investment of € 828 000 was supported with € 294 020 by European and Slovenian grants, Interenergo covered 56.5% of the investment, while School centre Kranj contributed 7.99% of its own funds, with the concession period of 20 years. The project had a short implementation time of three months. The overall energy renovation comprised: refurbishment of the boiler house, replacement of lighting, replacement of windows, replacement of the glass façade, thermal insulation of the attic.

In addition to the financial savings of € 55 218 per year, the renovation also reduced emissions by 140 tonnes per year, which would otherwise have required more than 4,200 trees to absorb.

The energy efficiency, comfort level, and indoor conditions at the Kranj School Centre was significantly improved tough a comprehensive renovation of the building envelope, lighting, and heating systems. It also reduced carbon emissions, contributing to a cleaner environment and demonstrating the benefits of sustainable public-private partnership energy projects.

INFO: https://www.sckr.si/documents/20222023/sanacija/Odgovor.pdf; https://interenergo.kelag.at/slo/kranj.htm

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Possible combination with missing financial sources makes the predicted measures for renovation possible.	▪ A very long concession period of 20 years makes calculations even more uncertain. ▪ A lot of paperwork to combine all funding and to prepare for the renovation works.
Opportunities / Possibilities	**Threats / Barriers**
▪ To promote and publish the financial model among **the students and visitors and among general public.** ▪ To use the financial model concept and its technical results of the renovation (measurements) for visualisation and for the educational process.	▪ The building is from the era of modern architecture (1930s), so interventions in the façade were very limited. ▪ No own funds for covering the necessary financial share.

No. 45: The first cooperative community solar power plant, Hrastnik

FINANCIAL DATA OF RENOVATION	
Building / Beneficiary	Users of the solar power plant (public and private)
Owner	Energy community Zeleni Hrastnik
Type of building	Public
Total investment cost	€ 235 000
Type of financing	Members' resources, state nonrefundable grant and Ecofund loan
Financier	Energy community Zeleni Hrastnik (public and private users/owners of the power plant), Ministry for Infrastructure, Eco Fund
Financing year	2024
Specific / Comment	PPP between ministry and owners: Zadruga Zeleni Hrastnik 20 %, Ministry for Infrastructure 20%, loan by Eco Fund 60 %

DESCRIPTION

The Hrastnik Solar School is Slovenia's first community-owned, self-sustaining solar power plant set up by a cooperative group (*zadruga*) on the roof of a public building. It differs from other community power plants in an important way- all customers own the power plant at the same time, so major energy intermediaries are removed from the calculation.

The solar power plant is made up of 662 PV panels and is therefore much bigger than the ones you usually see on domestic roofs. With a capacity of around 300 kW, the Hrastnik Solar School is one of the largest solar power plants for community self-sufficiency in the country. It supplies 16 homes in nearby blocks of flats, three public buildings- a municipal building, a school and a swimming pool, a small commercial space and the premises of two companies with electricity generated by the sun, according to the Zeleni Hrastnik Cooperative.

Picture 48: School in Hrastnik
Source: https://www.caszazemljo.si/

The electricity generated by the Hrastnik School solar power plant is net metered and deducted from the energy consumed by the customers of the solar power plant. Over the first 13 years, the total cost of their electricity consumption will be reduced by around 30%, and after the loan is paid, by around 65%, they will only have to cover the maintenance and management costs. Independence from market fluctuations was also a key factor in their decision.

The investment was worth approximately € 235 000. The financing method involved an initial contribution of € 150 per kW of capacity from the customers involved, which covered 20% of the investment. A further 20% was co-financed by the Ministry of Infrastructure, under a call for tenders

for grants for solar power plants, and the remaining 60% was covered by a loan to Zadruga Zeleni Hrastnik (cooperative group) by Eco Fund.

The customer is connected according to their own electricity needs, so that by leasing a share of the solar power plant it covers their annual electricity consumption. As an example, a household that consumes 170 kWh of electricity per month: Since the annual electricity production of a solar power plant is about 1000 kWh per 1 kW of capacity, this means that this household would need to lease 2 kW of solar power plant capacity to cover its annual needs. Their initial investment was therefore € 300 (€150 x 2 kW). The lifetime of such a plant is expected to be 25-30 years.

The project, which combines solidarity-based community resource management and environmental sustainability, was led by the Zeleni Hrastnik Energy Cooperative, established in 2022, with the support of the Municipality of Hrastnik and the environmental organisation Focus. Technical know-how was contributed by Kisik, which also carried out the installation of photovoltaic panels on the roof of the Hrastnik primary school. The financial structure of the project is as follows: one fifth was contributed by the cooperators with initial inputs, one fifth was covered by a grant from the Ministry for the Promotion of Solarisation and the remainder by a loan from the Eco Fund.

The Hrastnik Solar School project created as Slovenia's first community-owned, self-sufficient solar power plant they managed to reduce electricity costs and increase energy independence for homes and public buildings. It also fostered local cooperation, promoted sustainable energy use, and demonstrated a scalable model for community-led renewable energy initiatives.

INFO: https://www.caszazemljo.si/zelena-energija/soncna-sola-hrastnik.html

SWOT ANALYSIS of the financial model

Strengths	Weaknesses
▪ A good financial option for people to join. ▪ Cooperative model means all users are also co-owners of the power station. ▪ Independence from market price fluctuations.	▪ Currently, only houses that are connected to the school's transmitter station can be included in the solar plant. ▪ The solar plant is facing a possibility of overwhelming due to big interest to join the system.
Opportunities / Possibilities	**Threats / Barriers**
▪ Subsidy funds by Eco Fund or Borzen to supplement the loan to Zadruga Zeleni Hrastnik. ▪ Expanding the capacity of the solar plant beyond school's transmitter station with additional financial concept ▪ To promote the financial model of how to finance the community-owned, self-sustaining solar power plant.	▪ Lack of qualified leaders and financial managers for financial models like these. ▪ Issues with communication with the local community.

No. 46: Energy renovation of the Home for seniors, Jesenice

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Home for Seniors Jesenice
Owner	Home for Seniors Jesenice, Municipality of Jesenice, Republic of Slovenia
Type of building	Public
Total investment cost	€ 1.4 million
Type of financing	Energy Performance Contracting (EPC), Cohesion fund grant, municipality resources
Financier	Municipality of Kranj, Petrol d.d.
Financing year	2022
Specific / Comment	PPP between municipality and private company; public source: Operational Programme for Cohesion Policy Funding (OP-EKP 2014–2020)

DESCRIPTION

The project includes renovation of buildings B, C and D of the Dr. Franck Bergelj Jesenice Retirement Home, which cover an area of 6612.50 square metres. The financing model used here was EPC provided by Petrol. Within the scope of the concessioned activity, Petrol ensured the implementation of energy measures to improve energy efficiency in facilities and contractually guaranteed energy savings. With EPC, he also took over the investment risk and the availability risk. The energy renovation comprised the construction of a façade, replacement of windows and doors, thermal insulation of the roof, installation of balcony railings, replacement of roofing, installation of thermal insulation of the external walls inside (Building B), modification of the control equipment in the district heating substation, earthing of the lightning conductor, renovation of the lighting and several other energy upgrades.

Picture 49: Retirement home in Jesenice
Source: https://www.facebook.com/

The energy renovation of the Dr Franck Bergel Jesenice Retirement Home increased the efficiency of energy use and consequently reduce operating costs. The project was worth € 1.4 million, and the Cohesion Fund has contributed € 550 000. The renovation was completed in 2023.

The project upgraded multiple buildings with improved thermal insulation, new windows, roofing, energy efficient lighting, and heating controls. The result is significant increase of energy efficiency. Through implementation all these measures it reduced energy consumption and operating costs while ensuring reliable, long-term management of the renovated systems.

INFO: https://www.gov.si/novice/2022-02-04-evropska-sredstva-za-energetsko-prenovo-doma-upokojencev-dr-franceta-bergelja-jesenice/

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Financial model offers a wide range of renovation measures and additional functional improvements. ▪ Recent example of the use of this financial model.	▪ 15-year long concession contract with the same energy provider (Petrol).
Opportunities / Possibilities	**Threats / Barriers**
▪ Promotion of investment concept. ▪ Obtaining information (positive and negative), learning from experiences, introducing this financial model to new companies.	▪ Installation of thermal insulation on inner side of the external walls could cause more intense thermal bridges and thus affect the predicted financial calculations. ▪ Lack of ESCOs with proper competences for such a large project.

No. 47: Renovation of Museum, Semič

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Municipality of Semič
Owner	Municipality of Semič
Type of building	Public
Total investment cost	€ 1 151 201
Type of financing	Interreg funding, municipality resources
Financier	European Commission (European Regional Development Fund – ERDF), Municipality of Semič
Financing year	2017 – 2019
Specific / Comment	Renovation was carried out as part of the Interreg V-A Slovenia–Croatia 2014–2020 Cooperation Programme and co-financed by the European Regional Development Fund; Public source funding

DESCRIPTION

The renovation of the 180-year-old building located in the very centre of the Municipality of Semič was carried out as part of the MISTERION – Experience of Water project, implemented under the Interreg V-A Slovenia–Croatia 2014–2020 Cooperation Programme (INTERREG and co-financed by the European Regional Development Fund.

Picture 50: Museum of Semič
Source: https://www.striplab.si/

The renovation included a complete structural and energy refurbishment of the existing building, which had been in very poor condition, requiring extensive construction works. A new extension made of durable materials was added to the original structure. The extension is prefabricated, built from solid cross-laminated timber panels and clad with a fibre-cement façade. This design ensures greater durability and allows for easier future recycling of construction materials. The annex accommodates all service and technical facilities.

The total value of the renovation, including the exhibition installations, amounted to € 1 151 201. Of this, approximately € 425 000 was contributed by the European Regional Development Fund (ERDF) under the Interreg Slovenia–Croatia Cooperation Programme, while the remaining funds were invested by the Municipality of Semič.

The project completely renovated a 180-year-old building, improving structural integrity and energy efficiency while adding a durable, prefabricated extension for technical and service facilities. It enhanced the building's functionality, longevity, and sustainability, using materials that support easier future recycling.

INFO: www.semic.si/objava/223776

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ The strength of this financial model is in combination of funding: help from EU public funding is always welcomed to lower the municipality own renovation costs.	▪ The majority of the investment in this financial model, which is the combination of project financial resources and municipality own resources, was covered by the municipality/owner. ▪ Funding from the project is subject to the project rules.
Opportunities / Possibilities	**Threats / Barriers**
▪ Higher funding by Slovenian government and European Regional Development fund. ▪ To combine another funding option.	▪ Funding from the projects Interreg is limited to particular period (e.g. 2014-2020) and can be used only in specific cases.

No. 48: Renovation of Cultural Centre, Črnomelj

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Municipality of Črnomelj
Owner	Municipality of Črnomelj, Republic of Slovenia
Type of building	Public
Total investment cost	€ 5 768 583
Type of financing	Municipality resources, Slovenian Climate Change Fund and state funds
Financier	Office of the Republic of Slovenia for Recovery and Resilience (The Recovery and Resilience Plan – the RRP), The Climate Change Fund, Municipality of Črnomelj
Financing year	2024 – 2025
Specific / Comment	Public source funding

DESCRIPTION

Picture 51: Cultural Centre Črnomelj
Source: https://www.gov.si/

The renovation of the Cultural Centre Črnomelj began in the first half of 2024. The building is of great importance to both the local environment and the country, therefore the renovation also involved restoration experts.

At the beginning of 2025, the Ministry of Culture obtained additional funding from the Climate Change Fund to finance measures aimed at improving the building's energy efficiency. These measures include thermal insulation of the façade, roof, and ground floor slab, replacement of windows and lighting, installation of an energy-efficient heating system, and a central ventilation system.

The project is being implemented under the Recovery and Resilience Plan of the Republic of Slovenia, the Climate Change Fund, and the European Union – NextGenerationEU.

The total project value amounts to € 5 768 582.65 (including VAT). Of this, the Office of the Republic of Slovenia for Recovery and Resilience contributed € 3 396 059.68, the Climate Change Fund provided € 1 294 801.48, and the remaining amount was covered by the Municipality of Črnomelj.

The project renovates a culturally and nationally important building, improving energy efficiency through adding thermal insulation layer, energy efficient windows and lighting, and modern heating and ventilation systems. It preserves the building's heritage while enhancing comfort, functionality, and long-term sustainability

INFO: https://www.gov.si/zbirke/projekti-in-programi/nacrt-za-odpornost-in-okrevanje/trajnostna-obnova-in-ozivljanje-kutlurne-dediscine-in-javne-kulturne-infrastrukture/crnomelj-kulturni-dom-esd-89/#content

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ Two types of public fundings, one specifically for buildings with significant cultural status, which contributed to more options to select proper renovation measure. ▪ Specific funding for buildings with significant cultural status enables the implementation of usually more expensive renovations.	▪ Necessity for the municipality to contribute its share, as some municipalities do not have enough financial resources. ▪ Special requirements for the combination of financial mechanisms, e.g. that it is necessary to specify exactly what will be renovated from which financial source.
Opportunities / Possibilities	**Threats / Barriers**
▪ To use the combination of similar funding's to other protected and culturally significant buildings.	▪ Two (or more) public source fundings are not available at the same period of time (the combination is not possible).

No. 49: Energy renovation of single-family house, Kranj

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Single family house / family
Owner	Owner of the house
Type of building	Private
Total investment cost	€ 31 300
Type of financing	Public subsidy ZER 2024, private financing, Public subsidy 114SUB-OB24
Financier	Eco Fund (100%, max € 18 000 including VAT) ZER2024, € 3 100-114SUB-OB24), owner
Financing year	2025
Specific / Comment	The ZER 2024 public call and 114SUB-OB24 are Eco Fund calls for non-refundable financial incentives for reducing energy poverty

DESCRIPTION

The building dates from 1963 and was in its original condition until 2025, except for the replacement of windows with energy-efficient ones and roof. The object is a single-storey house with simple and compact volume and a pitched roof over unused attic. Heating and domestic hot water was provided by very old stove from 1978. The heating source was fossil fuel, the extra-light heating oil (ELKO). The consumption of ELKO was 2500-3000 l of oil per heating year which resulted in very high heating costs. Additionally, the thermal comfort in the building was extremely poor. The size of heating area (used area) of the building is 140 m2.

In 2025, the owner who by all criteria belonged to the energy-threatened households in Slovenia, decided to carry out the energy renovation. The renovation included installation of façade with thermal insulation layer, thermal insulation of unheated attic, replacement of old heating system with heat pump and installation of ventilation system with local recuperation in bathroom and sleeping room.

Picture 52.: Singe family house @owner's archive

The owner applied for Eco Fund non-refundable financial incentive ZER 2024 that is aiming to reduce energy poverty in Slovenia. The amount of this non-refundable financial incentive is therefore 100% of the eligible costs of the applicant's project, but not more than € 18 000 including VAT. The step-by-step renovation started with façade works. after all non-repayable funds with ZER 2024 have been used up, owner replaced t of old oil stove with heat pump. Then the local recuperation services were installed and all the non-repayable funds with 114SUB-OB24 have been used up. The attic was thermally insulated without any non-repayable funds. The total investment costs. The project significantly improved thermal comfort, indoor air quality, and overall living conditions, enhancing the household's quality of life. It also eliminated the dependency on fossil fuels, lowered

environmental impact, and increased energy independence and sustainability were € 31 300 of which € 21 100 were subsidized. Most of the works were finished in 2025, however part of them were extended into year 2026.

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ The financial model includes subsidy that is aimed at improving energy poverty of households in Slovenia. ▪ List of approved materials and contractors is available online. ▪ The assistance of an energy consultant or coordinator is included to support the applicant in applying for subsidy and implementing measures.	▪ Highly demanding, complex, technically and formally very demanding application and reporting process. ▪ Most contractors are unwilling to take on a project with so many specific technical demands. ▪ The applicant carries all the financial risk for contractors' compliance with ZER's 2024 requirements. ▪ Mandatory order of energy measures according to the instructions of the energy consultant.
Opportunities / Possibilities	**Threats / Barriers**
▪ Simplify and speed up formal procedures. ▪ Prepare practical examples that applicants can follow. ▪ Strengthen the information campaign for this financial model	▪ Energy consultant who is required to be involved in the process, is not available. ▪ No energy performance certificate for building, no calculation of the energy performance, negative statement from an energy consultant. ▪ Shortage of contractors to implement measures.

No. 50: Energy renovation of five public apartment buildings of MOL, Ljubljana

FINANCIAL DATA OF RENOVATION

Building / Beneficiary	Residents of five multi-apartments buildings in Municipality of Ljubljana (MOL)
Owner	Municipality of Ljubljana
Type of building	Public
Total investment cost	€ 1.8 million
Type of financing	Municipality resources, Cohesion fund
Financier	Cohesion Fund of the European Union, Republic of Slovenia and Municipality of Ljubljana (MOL)
Financing year	2018 – 2019
Specific / Comment	Public source funding

DESCRIPTION

Municipality of Ljubljana (MOL), within the Operational Programme for the Implementation of European Cohesion Policy for 2014–2020, in cooperation with the Government Office of the Republic of Slovenia and European cohesion policy, launched the energy renovation of five multi-apartment buildings 100% owned by MOL.

Picture 53.: Apartment bloks at Zvezna ulica, Photo: Gužič Trplan architects
Source: https://www.gtarhitekti.si/en/

The buildings included in the energy renovation are located at Hladilniška pot 34, Knobleharjeva 24, Cesta dolomitskega odreda 17, Gerbičeva 37, and Topniška 58.

The energy renovation involved the installation of thermal insulation on the building envelope, thermal insulation of the attic, replacement of windows, installation of ventilation, and renovation of the heating system. The main effects of the energy renovation are visible in the reduction of operating costs and energy expenses. The renovation has increased the reliability of building operations and the quality of living. Following the renovation, the buildings are classified into a lower energy class.

The total cost of the energy renovation of all five multi-apartment buildings amounts to € 1.8 million excluding VAT, of which € 331 601.69 will be obtained from EU funds and the state budget, with the remaining funds provided by MOL.

The energy renovation improved thermal comfort, indoor air quality, and overall living conditions for residents. It also enhanced building reliability, reduced energy use, and increased the sustainability aspects of the buildings.

INFO: https://www.jssmol.si/o-nas/evropska-sredstva

SWOT ANALYSIS of the financial model	
Strengths	**Weaknesses**
▪ The strength of this financial model is in combination of funding: help from EU public funding is always welcomed to lower the municipality own renovation costs.	▪ The majority of the investment in this financial model, which is the combination of EU financial resources and municipality own resources, was covered by the owner, the municipality ▪ Necessity for the municipality to contribute its share, as some municipalities do not have enough financial resources.
Opportunities / Possibilities	**Threats / Barriers**
▪ Strengthen the information campaign for this financial model. ▪ Higher funding by EU funds. ▪ To combine another funding option.	▪ EU sources for fundings are not always available (the combination is not possible).

5.5.2 Main findings for Slovenian cases

Slovenian financial models for sustainable renovations mostly consists of public building projects, in majority through a combination of own resources and funding through the EPCs. Out of ten EPC projects investigated in this deliverable, Petrol d.o.o. is acting as ESCO in six cases, following by Resalta d.o.o. with two cases. EPCs funding mechanisms are in all cases involved in larger scale projects, managed or owned by municipalities. Public cases are relatively broader, financially and technically more interesting and their data is publicly available, so they dominate the study. Of course, there are also many building renovations by private investors. However, to acquire the necessary data for their analysis is almost impossible. For example, the Eco Fund reported for 2025 that more than 15.000 households and private entities received subsidies for energy efficiency measures, and around 2.000 received financially subsidized loans. The details of this data, however, can only be obtained directly from the owners.

The deliverable does present one best practice of a single-family home, which participated in ZER 2024, a specific public call and 114SUB-OB24 (Eco Fund) for non-refundable financial incentives for reducing energy poverty. Two successful cases of energy-efficiency renovation of boiler rooms in multiapartment buildings have also been analysed, as well as two special cases dealing with heritage-protected buildings of cultural significance. Among highlights is also the first cooperative community solar power plant in Slovenia, located in Hrastnik and one case of testing the crowdfunding financial model for building renovation. Lastly, an interesting PV self-supply system on the roof of the building block should be given some attention.

The analysed projects present examples of innovative combinations of diverse funding sources to successfully execute energy efficiency renovation measures of buildings. They serve as a reference and demonstration for future projects and contribute to building trust and awareness particularly around financial models such as EPC and public-private partnership. Additionally, they promote stakeholder cooperation, solutions for successful long-term system management, education and importance of energy efficiency, as well as socially beneficial goals such as reducing energy poverty and supporting future generations.

A deeper look into them, however, reveals their weaknesses such as often too narrow approach to renovation, insufficient general promotion of the project itself, long commitment periods in case of EPCs, complex and drawn-out bureaucratic processes for which there is no guidance or support available, especially for private stakeholders. The threats and barriers for similar future projects derived from the analysed cases depend on relatively long expected return on investments (ROI), with the price of energy itself currently being relatively low but likely to rise rapidly. Rapid changes on the market can significantly hinder the achievement of contractual results in the EPC model. A major obstacle to the implementation of sustainable renovation in multi-apartment buildings is the complexity of the procedures for taking out a loan and legislation, which requires 100% consent of all owners. Future endeavours are also threatened by the lack of qualified workers and financial managers for new financial models and renovation approaches.

To conclude in optimistic outlook, the report shows that such projects offer valuable opportunity in many areas. Larger renovations are marked by relative continuity and stability of funding and open the possibility of obtaining additional funds. They also offer transfer of knowledge about the specific financial models. Successful building renovations proved to be crucial learning and collaborative moments between stakeholders involved. And finally, there is plenty of opportunity for promotional campaigns to raise awareness.

5.6 List of financial model cases for sustainable building renovation

In this chapter, fifty examples of good practices - buildings or other built structures that were renovated using different financial models and sources of finance - are listed in a table (Table 1). The table indicates whether the case is from the public or private sector and which type of funding was used. It can be observed that only 20% of here presented cases are from private sector, the rest come from the public sector. In addition, more than 40% of the collected examples of used financial mechanisms are EPCs.

Table 1: Best practices of sustainable renovations from Austria, Hungary and Slovenia.

No	Best practice name	Country	Public/ Private	Type of funding
1	**Apartment block Markartstraße Linz**	Austria	**Private**	Reserves, funding & subsidised housing loan, 2006
2	**Residential complex "Friedrich-Inhauser-Straße", Salzburg – Zero Carbon Refurbishment "Wir InHAUSer"**	Austria	**Private**	Housing Subsidy Salzburg, 2021
3	**Liebenauer Hauptstraße – Graz**	Austria	**Private**	Reserves, funding & subsidised housing loan, 2014
4	**Smart Block Geblergasse – refurbishment & district heating and cooling pilot project – Vienna**	Austria	**Private**	Subsidy & ESCO, 2019
5	**KA 7 Kaiserstrasse - Innovative refurbishment of a listed Gründerzeit building with interior insulation - Vienna**	Austria	**Private**	Subsidies, 2013
6	**"Gründerzeithaus" Kauergasse 2, Vienna**	Austria	**Private**	Subsidies, contracting, 2020, 2024
7	**Out of gas' showcase project Zwölfergasse 2- Vienna**	Austria	**Private**	Subsidies, Erste Green Housing Loan, 2023
8	**Smarter Together - Hauffgasse 37 – 47, Vienna**	Austria	**Private**	Reserves, Subsidies, 2017,2022
9	**Landespflegezentrum Bad Radkersburg - Carinthia**	Austria	Public	ESCO, 2009-2010
10	**Schoolcenter Vorchdorf – Upper Austria**	Austria	Public	ESCO, 2014-2021
11	**School Campus Hittisau**	Austria	Public	Municipal Loan, 2020-2035
12	**Kindergarten Bad Eisenkappel - Vellach - Carinthia**	Austria	Public	Subsidies and transfers, 2020
13	**Elementary school Semirach - Model Renovation (Styria)**	Austria	Public	Subsidies and transfers, 2019-2044
14	**Town hall Mondsee - Model Renovation, Upper Austria**	Austria	Public	Model Renovation, Transfers, 2022
15	**Künstlergasse 14-16 – Puba Foundation (Vienna)**	Austria	**Private**	Private capital & Subsidies, 2015
16	**Bludenz- Model Renovation (Vorarlberg)**	Austria	**Private**	Subsidy FFG (Research) & Federal State, 2022-2026

No	Best practice name	Country	Public/ Private	Type of funding
17	**Multi-apartment building at Hamvas Béla street 2-10, Szentendre**	Hungary	Public/ Private	EU Grant (CONCERTO III. call), National Grant (ZBR14), ESCO, Municipality, private financing, 2014
18	**Multi-apartment building at Kassai u. 8-16., Budapest**	Hungary	**Private**	Subsidized loan, 2024
19	**"Faluhaz project" (Village Block)**	Hungary	**Private**	Grant, preferential loan, private financing, 2006-2009
20	**Multi-apartment building at Pázsitos sétány 1-3, Budapest**	Hungary	**Private**	Private financing, 2018, 2021
21	**Implementation of smart cost-sharing systems and radiator replacement in a condominium located in the 3rd district of Budapest**	Hungary	**Private**	Subsidy and private financing, 2020
22	**Multi-apartment building at Budapest, 1068 Benczúr street 43.**	Hungary	**Private**	Private financing, 2018, 2023
23	**Municipal multi-apartment building in Szeged**	Hungary	Public	savings and commercial bank loan (free-to-use) Private financing, 2024
24	**Single-family house in Gödöllő**	Hungary	**Private**	Grant, preferential loan, private financing, 2023-ongoing
25	**Renovation of single-family house in Tatabánya**	Hungary	**Private**	Preferential loan, 2025
26	**Single family house refurbishment and PV installation in Tahitótfalu**	Hungary	**Private**	Non-refundable grant (53%) and own resources, 2022-2025
27	**Single-family house refurbishment in Budaörs**	Hungary	**Private**	Private financing, 2021
28	**Municipality office building renovation VSZ Zrt., in Szentendre**	Hungary	Public	Grant, ESCO, Municipal investment, 2012-2014
29	**Püspökmajor Kindergarten, Szentendre**	Hungary	Public	EU Grant, own resources (Municipal investment), 2012-2013
30	**Decarbonized Mórahalom, Hungary**	Hungary	Public	Subsidy, own resources (Municipal investment), 2020-2024
31	**"Autumn Light" Home for the Elderly in Alsómocsolád**	Hungary	Public	EU Grant (KEOP), Municipal investment, 2023
32	**Energetic modernization of Tarján Bilingual Primary School**	Hungary	Public	Subsidy, own resources (Municipal investment), 2016-2020
33	**Retrofitting of Zahony Municipal Buildings for Renewable Energy Use**	Hungary	Public	Subsidy, 2019

[14] ZBR: Green investment Scheme

No	Best practice name	Country	Public/ Private	Type of funding
34	**Energy efficiency measures in MOK, Kranj**	Slovenia	Public	Energy Performance Contracting (EPC), 2001 - 2015 (phase 1), 2018 - (phase 2)
35	**Energy renovation in MOL (EOL-1, EOL-2), Ljubljana**	Slovenia	Public	Energy Performance Contracting (EPC), 2017 and ongoing
36	**Energy renovation of Ministry of justice, Celje, Murska Sobota and Slovenj Gradec**	Slovenia	Public	Energy Performance Contracting (EPC), 2018. 2023
37	**Renovation of boiler house in Deteljica housing estate, Tržič**	Slovenia	**Private**	Energy Performance Contracting (EPC), 2017
38	**Energy renovation of buildings in MOM, Maribor**	Slovenia	Public	Energy Performance Contracting (EPC), 2018
39	**Renovation of energy system for heating in Šorlijevo naselje, Kranj**	Slovenia	**Private**	Housing savings fund, deferred payment of investment, 2017 – 2018, 2017 - 2026
40	**Energy renovation of public buildings, Novo mesto**	Slovenia	Public	Energy Performance Contracting (EPC), 2017
41	**Renovation of University for lifelong learning, Velenje**	Slovenia	Public	Crowdfunding (attempt), 2020
42	**Energy renovation of School centre, Nova Gorica**	Slovenia	Public	Energy Performance Contracting (EPC), 2023
43	**PV panels installation on multi-apartment building, Jesenice**	Slovenia	**Private**	Energy Performance Contracting (EPC), 2019
44	**Energy renovation of Secondary school for economic, service and construction, School centre Kranj - Building B, Kranj**	Slovenia	Public	Energy Performance Contracting (EPC), 2022
45	**The first cooperative community solar power plant, Hrastnik**	Slovenia	**Private**	Initial investment by owners, Ministry for Infrastructure and loan by Eco Fund, 2024
46	**Energy renovation of the Home for seniors, Jesenice**	Slovenia	Public	Energy Performance Contracting (EPC) European cohesion fund financing and state funding, 2022
47	**Renovation of Museum, Semič**	Slovenia	Public	European Regional Development Fund – ERDF), - Municipality of Semič, 2017-2019
48	**Renovation of Cultural Centre, Črnomelj**	Slovenia	Public	Office of the Republic of Slovenia for Recovery and Resilience (The Recovery and Resilience Plan – the RRP), The Climate Change Fund, Municipality of Črnomelj, 2024-2025
49	**Energy renovation of single-family house, Kranj**	Slovenia	**Private**	Subsidies, 2025
50	**Energy renovation of five public multi-apartment buildings of MOL, Ljubljana**	Slovenia	Public	Cohesion Fund of the European Union, Republic of Slovenia and Municipality of Ljubljana (MOL), 2018-2019

6 CONCLUDING REMARKS

The present study is a collection of best practices in the use of various financial mechanisms for sustainable building renovations from three partner countries, Austria, Hungary, and Slovenia. It contributes to the understanding of the past and current uses of models, procedures and processes of financing the renovation of buildings or building complexes, both in the private and the public sectors. The study was prepared as part of the EU-funded project **LIFE22-CET-RENOINVEST-Roundtables enhancing smart investments in sustainable renovation of buildings**.

The research showed that renovation cases demonstrating comprehensive and well-documented sustainable renovation approaches remain relatively rare. It also revealed that investment in renovations is easier and more widespread in public buildings, since private renovations most often investors' own savings and/or additional financing through loans or subsidies. Also, public investments in renovation are usually carried out on larger buildings or in a combination of a larger number of buildings. The fact that these projects are public and often larger in scale may also explain why they are more visible and better documented, making more information available about them. In the private sector, shared ownership - particularly in multi-apartment buildings - can also be an issue, as it is more difficult to agree on a joint investment.

The results of the study show that in **Austria** there is diversity in subsidies and ESCO collaborations, partially due to many different and fragmented funding schemes and options available. This presents advantages and disadvantages. Different schemes and funding options were shown to be combined in best practices, with cases of good social support in non-profit and public buildings. However, through SWOT analyses it was highlighted that most large-scale (public) renovations faced a lack of funding or dependency on future projects or schemes. Like in other two countries, high costs of renovation also discouraged the users and investors from starting or continuing the energy efficiency measures. Private renovation cases are the minority, as renovations of public buildings with different forms of municipal, national or European funding predominate. Like Slovenia, Austrian best practices also show limited dissemination and promotion across the country.

In **Hungary,** most of the energy efficiency public renovation cases were financed by non-refundable grants, i.e. subsidies (70-100 %), or by a combination of grants and the municipality's own contribution (50-50 %). The study revealed that for municipalities grants are often the only opportunity to implement investments in renovations or renewable energy solutions. However, the availability of grants also requires administrative capacity and the ability to prepare successful project applications. Based on experiences with the special very large example of PIMES CONCERTO and Staccato project financing, and financing from government´s grant programmes and own contributions of the municipality/homeowners, and to some extent ESCO it should be emphasized that careful planning, preparation and coordination is a must. The renovations of Hungarian single-family homes are financed by the combination of grants and own contributions, by preferential loans and own contributions or by own resources only. There are more possibilities for financing renovations in the case of multi-family buildings. However, it has to be emphasized, that none of the grant programmes and facilities are long-standing, and there is a lot of administrative burden connected to them.

In **Slovenia,** the two main paths to fund an energy / sustainable renovation from combined sources were distinguished: energy performance contracting (EPCs) and funding schemes of the European Union. The analysis of the cases in general showed that in Slovenia there is insufficient emphasis on the promotion of successful financial renovation solutions. It was found that knowledge and findings are not transferred enough to the educational process (or at all) and that confidence in financial models

does not increase over the years of use. Additionally, based on the presented examples, it can be pointed out that in Slovenia there are certain specific legal, formal and procedural obstacles that should be eliminated in order to make the implementation of financial solutions for renovation easier and, above all, faster, especially in the private building sector.

To conclude, the examples of good practices collected in this report have been useful for discussions at the national thematic working group events and on national and international platforms within the RENOINVEST project. The collection can also be basis for further networking of the three countries, Austria, Hungary and Slovenia, and an opportunity to learn from each other. At the same time, the collected cases provide a useful basis for further improving financing models, strengthening replication potential and supporting future policy and market recommendations for sustainable building renovation.

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sustainable renovation of buildings

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