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D.3.8: Second Guide to Financial Services

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Abbreviations and Acronyms

EPLACE	Eco public PLAtform for smart green CityzEn's living labs	EE	Energy efficiency
ESD	Energy Services Directive	RES	Renewable Energy Sources
CDM	Clean Development Mechanism	GHG	Greenhouse Gases
EPBD	Energy Performance Building Directive	EU	European Union
EPC	Energy Performance Contracting	EC	European commission
ESCo	Energy Service Company	PPPs	Public Private Partnerships
ESD	Energy Service Directive	RETs	Renewable-energy and Energy-efficient Technologies
EC	European Council	TPF	Third Party Financing
ECO	Energy Conservation Opportunity	ROI	Return of investment
JI	Joint Implementation	NPV	Net Present Value
WEC	World Energy Council	IRR	Internal Rate of Return

1. Abstract

The second guide to financial services focuses on the prepared business plans for 7 pilot buildings in consortium partner's countries. These business planes are prepared for different type of pilot buildings in Bulgaria, Ireland and Spain.

The partners in the EPLACE project team REAP, ERATO, ENERGY SOLUTIONS and ATON ENERGY have made professional efforts, debt analyses and investigated the possibilities to conduct the best business plans (at least two per each country) for the further EE and RES project implementation of pilot buildings.

The second guide shall provide significant professional and useful information in connection to the necessity and understanding in the process of project financing and benefits to decision makers, building managers, end users, local and regional public authorities, businesses, financial institutions, ESCOs and other target groups.

The practical information presented in the current deliverable and detailed data analysis shows list of identified Energy Efficiency (EE) and Renewable Energy Sources (RES) measures per each pilot building with very big potential for further implementation and leading to the significant energy and cash savings and reduction of green house gas emissions.

This Guide also provides actual study and information on the existing and future financial schemes on regional level in the consortium countries.

Detailed information on the prepared pilot buildings business plans in Bulgaria, Ireland and Spain is given in Annex 1.

2. Goal of the prepared business plans

The main goal of the conducted business plans for pilot buildings in the consortium's member countries is presenting to the owners of buildings the available financial schemes for the projects implementation.

The second guide to financial services shall be printed in pfd format in national languages (Bulgarian, Irish and Spanish) in the EPLACE web page as well. This planned action is very good and useful opportunity to present to the other European

countries which are not involved in EPLACE project a quick overview of the financial possibilities for energy action plans and activities.

The prepared guide to financial services aims also to have multiply effect in the promotion and involving of local and regional authorities, government authorities, investors, financial institutions, energy agencies, building's owners, project developers, providers, ESCO's, and building managers.

The second guide also aims to give theoretical and practical information to readers that address the existing possibilities in the application of different financial tools to Energy Efficiency and RES projects implementation in the public sector.

The business plans analyses present the opportunity to invest in the projects which are combination between EE measures and RES measures. One of the main advantages to using of renewable energy is that it is renewable and therefore sustainable. Renewable energy installation in general requires less maintenance and operational cost than traditional facilities using energy sources. Renewable energy projects can also bring economic benefits to many regional areas, as most projects are located away from large urban centres and suburbs of the capital cities.

The main benefits of RES using in the environmental and economic aspects are following:

- Producing sustainable energy that not generated GHG emissions from fossil fuels and can decreased some types of air pollution;
- Establishing very good economic growth and jobs in many sectors of the economy;
- Diversifying energy supply and reducing dependence on imported fuels.

3. What this guide contains

The second guide to financial services contains the basic study on Energy Efficiency and RES project financing. Useful information regarding the different type of applicable financial schemes and their benefits is also proposed in this document. The guide also give information on the separate projects steps concerning the specific challenges in the process of financing which have to be solved during the project implementation.

On the other hand the project team considered during the business plans preparation the possibilities for grant funding, subsidizing, local and regional

support energy and renewable measures and utilization of resources under the EU Structural Funds. The current opportunity for starting of the proposed business plans for each pilot building under the procedure of the related funds was taken into account too.

Each business plan was evaluated based on the main project characteristics. The EPLACE team did detailed analysis of the technical design and proposed technology. The financial project indicators and the green houses gas emissions reduction after the projects implementation were taken into consideration too.

Each prepared business plan per each pilot building in the EPLACE consortium member countries includes the following information:

- Building description, main technical characteristics, installed energy consumers and energy consumption and costs base line;
- Detailed information on the proposed energy concervation measures;
- Project investment costs, energy and money cash savings by different energy savings measures;
- Description of sources for project financing;
- Project cash flow and project financial indicators;
- Reduction of CO_2 emissions after the project implementation.

The deliverable shows detailed information for the main energy efficiency and RES benefits to the different type of energy users subject of the prepared business plans for 7 pilot buildings as follows:

- Reduction of energy cost to users;
- The significant control over energy costs to customers were given;
- Air pollutions reduction including decreasing of GHG;
- In a lot of cases the performance at a lower energy cost than new energy supply from new power sources including renewable.

The structured business plans per each pilot building in Bulgaria, Ireland and Spain are included in Annex 1.

4. Conclusions of the business plans for pilot buildings

The current financial market in the European Union presents an opportunity for sustainability development, environmental policy, and increasing of the standard of live through a wider range of policy and investment tools and mechanisms.

There are many financial institutions and bodies with funds for supporting many kinds of EPLACE Projects and pilot buildings projects as well. It is important that they are made aware of the financial needs of companies and administrations that are willing to take that step towards energy efficiency and renewable energy sources.

These financial bodies include banks, Ministries of energy, government agencies, and mezzanine funds, energy partnerships, community foundations, funding groups, institutions and Energy Service Companies (ESCO).

The next pages in this chapter include summary of the conducted business plans per 7 pilot buildings in Bulgaria, Ireland and Spain.

4.1. Bulgaria

The municipal **administrative building of Septemvri** municipality was built in 1978 and totally renovated in 2001. The building has four floors, and the first one is a ground floor. There are 105 employees working in it, engaged primarily in servicing the local citizens.

The propsed energy efficiency measures in the amdinistrative building of Municipality of Septemvri are given in Table 1.

Code	Measure	Description
EM1	BMS for control of the heat energy supplied to the building	Microprocessor controller, a standard PC, three digital temperature sensors, cable network to connect PC, sensors, and various boiler actuators.
E1	Replacement of 120 luminescent bulbs by LED lighting with 10W power.	The effect of this measure is estimated taking into account the working hours and as a difference between consumption before and after the replacement.
E2	Substitution of 20 obsolete computer configurations	The existing configurations have a 250 W power each, and a substitution by Net top configurations is proposed, with power less than 100 W each.
BE1	Heat insulation of outer envelope of the building	Installation of EPS heat insulation with thickness 80 mm at 1,741 m^2 outer walls; installation of heat insulation on 922 m^2 roof with thickness 100 mm; substitution of 937 m^2 outer wood windows by PVC double glazed windows and low emission glass. The effect is calculated on the basis of 42% reduction of heat losses through the envelope.
H1	Installation of pellet boiler	A pellet boiler with nominal thermal capacity 75 kW and accessories to it. The effect is calculate on the basis of reduced energy expenditures having substituted one energy carrier (electricity) by another one (pellets).
H2	Internal thermal system	Installation of 42 aluminum radiators and pipeline network. This measure alone does not have an energy saving effect, but this is the only way to change the decentralized heating into a centralized one.

Table 1: Proposed energy efficiency measures in the amdinistrative building of Septemvri Municipality

The total project costs is in the amount of € 44,620, and the expected annual energy money cash savings as a result of the implementation of proposed energy savings measures is in the amount of € 18,079.

The expected CO_2 savings after the energy efficiency measurements implementation in the administrative building are 103 tons/yr.

On the basis of estimates revenues and expenses we shall create a cash flow plan. In order to calculate the cash flow, we assume that the project will be realized the following way:

- 50% grant from the Bulgarian National Operative Programmes;
- 35% own contribution;
- 15 % loan from Fund FLAG with a 5.6% interest rate (this is the level of rate established at the beginning of 2015) for a period of 5 years.

The volume of savings is fixed for 10 years, for this reason the amount of inflow remains the same during that period.

The proposed project costs is acceptable because the internal rate of return is 12.3%, which is higher than the established minimum acceptable rate of return of capital for Bulgaria which is 5%. At the same time, the simple payback period is 4.7 years which is another positive indicator for this project and shows the period of time required to recoup the funds expended in this investment is relatively short. The ROI of 54.49% calculated on a 10-year period is another positive financial indicator which can be considered when evaluating the current investment.

The building of the **Medical centre of Municipality Septemvri** was built in 1958, and there was a full renovation in 1992. It is a two-floor building with unheated ground floor.

Table 2 presents the proposed energy concervation options (ECO) in the Medical centre in Municipality of Septemvri.

Code	Measure	Description
EM1	BMS for control of the heat energy supplied to the building	Microprocessor controller, a standard PC, three digital temperature sensors, cable network to connect PC, sensors, and various boiler actuators.
E1	Replacement of 130 luminescent bulbs by LED lighting with 10W power.	The effect of this measure is estimated taking into account the working hours and as a difference between consumption before and after the replacement.
BE1	Heat insulation of outer envelope of the building	Installation of EPS heat insulation with thickness 80 mm at 2,094 m^2 outer walls; installation of heat insulation on 868 m^2 roof with thickness 100 mm; installation of heat insulation on 868 m^2 floor with thickness 50 mm; substitution of 847 m^2 outer wood windows by PVC double glazed windows and low emission glass. The effect is calculated on the basis of 66% reduction of heat losses through the envelope.

H1	Installation of pellet boiler	A pellet boiler with nominal thermal capacity 50 kW and accessories to it. The effect is calc ulate on the basis of reduced energy expenditures having substituted one energy carrier (electricity) by another one (pellets).
H2	Internal thermal system	Installation of 31 aluminum radiators and pipeline network. This measure alone does not have an energy saving effect, but this is the only way to change the decentralized heating into a centralized one.

Table 2: Proposed energy efficiency measures in Medical centre in Septemvri Municipality

The total amount of investment is € 29,740 and the annual economical effect in the amount of € 3,854 is achieved through implementation of all energy savings measures.

The expected CO_2 savings after the energy efficiency measurements implementation in the Medical centre are 17.89 tons/yr.

On the basis of estimates revenues and expenses we shall create a cash flow plan. In order to calculate the cash flow, we assume that the project will be realized the following way:

- 85% grant from the Bulgarian National Operative Programmes;
- 15 % loan from Fund FLAG with a 5.6% interest rate (this is the level of rate established at the beginning of 2015) for a period of 5 years.

The volume of savings is fixed for 10 years, for this reason the amount of inflow remains the same during that period.

Proposed investment is acceptable because the internal rate of return is 9.1%, which is higher than the established minimum acceptable rate of return of capital for Bulgaria which is 5%. At the same time, the simple payback period is 3.5 years which is another positive indicator for this project and shows the period of time required to recoup the funds expended in this investment is relatively short. The ROI of 24.18% calculated on a 10-year period is another positive financial indicator which can be considered when evaluating the current investment.

4.2. Ireland

Finglas Leisure Centre was built in 2003 as a state of the art leisure centre with a total floor area of 2,600 m2. It incorporates many energy efficient features including a CHP plant, heat recovery ventilation a BMS and insulated building fabric.

The propsed energy efficiency measures in the Finglas Leisure Centre are given in Table 3.

Code	Measure	Description
E1	Optimise BMS for shutdowns	Difference between night baseload and total load over Christmas shutdown
E2	Replace 50W halogen lamps with 6W LEDs (74 lamps)	Based on 4,500 hours per annum
E3	Replace T8 fittings with T5 or LED equivalent (35 fittings)	Based on 4,500 hours per annum
E4	Replace CFL downlighters with LED fittings (135 fittings)	Based on 4,500 hours per annum
E5	Replace pool area 250W metal halides with LED fittings and daylight sensors (17 fittings)	Based on 4,500 hours per annum
E6	Replace 2-D fittings with LED equivalent (88 fittings)	Based on 4,500 hours per annum
E7	Improve Control on AHUs	30% saving on AHU fans. Cost based on controls upgrade and sensor installation. May require system upgrade/retrofit.
E8	Improve Control on Pool Pumps	75% reduction in out of hours use. Cost based on controls VSD installation and upgrade.
E9	Improve Control on other pumps (8 pumps, 30 kW)	30% reduction. Cost based on controls upgrade.

E10	Replace Pool Pumps with Energy Efficient Pumps	Based on SEAI's pump cost calculator
T1	Set CHP to prevent export of electricity	Based on measured exported electricity
T2	Optimise BMS for shutdown, temperature and humidity control	Estimated as 10% of thermal energy demand savings

Table 3: Proposed energy efficiency measures in Finglas Leisure Centre

The total amount of investment is € 87,000, and the annual economical effect of all measures is € 36,000.

The expected CO_2 savings after the energy efficiency measurements implementation in Finglas Leisure Centre are 156 tons/yr.

On the basis of estimates revenues and expenses we shall create a cash flow plan. In order to calculate the cash flow, we assume that the project will be realized with a 100 % loan from the National Energy Efficiency Fund (or other financing) with no grant and with a 7% interest rate (this is the level of rate established at the beginning of 2015) for a period of 5 years. The volume of savings is fixed for 10 years, for this reason the amount of inflow remains the same during that period.

Proposed investment is attractive with a rate of return of 40%. At the same time, the simple payback period is only 2.4 years which is a positive indicator for this project and shows the period of time required to recoup the funds expended in this investment is relatively short. The ROI of 291% calculated on a 10-year period is another positive financial indicator which can be considered when evaluating the current investment.

The County Library, Tallaght which reopened in April 2008 following a major refurbishment program, is in the heart of the cultural quarter of the Tallaght Town Centre, which includes the Civic Theatre, the Big Picture and Rua Red Art Centre. The library extends to over 2,500 m2 over three floors with public areas on the ground and upper floors and an open plan office area for staff in the basement. The total area of the library is 2,550 m^2 spread over three levels.

Table 4 presents the list of propsed energy concercation options in County Library, Tallaght.

Code	Measure	Description
E1	Optimise BMS	10% of 'General services' use.
E2	Reduce out of hours use for upper floor lighting.	Based on reducing out of hours use to out of hours use for Mon-Thu.
E3	Reduce out of hours use for ground floor services.	Based on reducing out of hours use to out of hours use for Mon-Thu.
E4	Replace 70W halogen lamps with 10W LEDs (10 lamps)	Based on 2,700 hours per annum
E5	Replace twin T8 fittings with T5 or LED equivalent (282 fittings)	Based on 2,700 hours per annum
E6	Replace single T8 fittings with T5 or LED equivalent (44 fittings)	Based on 2,700 hours per annum
E7	Replace twin CFL fittings with LED equivalent (77 fittings)	Based on 2,700 hours per annum
E8	Install/upgrade lighting controls	30% of residual lighting load after retrofit

Table 4: Proposed energy efficiency measures in County Library, Tallaght

The total amount of project investment is € 55,800, and the achieved annual economical effect after all measures implementation is in the amount of € 13,700.

The expected CO_2 savings after the energy efficiency measurements implementation in County Library, Tallaght are 40 tons/yr.

On the basis of estimates revenues and expenses we shall create a cash flow plan. In order to calculate the cash flow, we assume that the project will be realized with a 100 % loan from the National Energy Efficiency Fund (or other financing) with no grant and with a 7% interest rate (this is the level of rate established at the beginning of 2015) for a period of 5 years. The volume of savings is fixed for 10 years, for this reason the amount of inflow remains the same during that period.

Proposed investment is attractive with a rate of return of 21%. At the same time, the simple payback period is only 4 years which is a positive indicator for this project and shows the period of time required to recoup the funds expended in this investment is relatively short. The ROI of 128% calculated on a 10-year period is another positive financial indicator which can be considered when evaluating the current investment.

4.3. Spain

The **City Council of Cartaya** was built in the sixteenth century although carried out a comprehensive reform in 2000, leaving the interior with modern architecture and exterior with the facade without changing. Due to the last refurbishment, now, the building counts with a complex layout with four floors.

The propsed energy efficiency measures in the City Council of Cartaya are given in Table 5.

Code	Measure	Description
M1	Replacement of traditional lights by LED lighting	LED lighting consumption is notably lower than traditional lighting, however this technology is more expensive. Therefore, it is important to study which lights are important to change and which ones are not worth because they are not used enough. In table 5 there is a description of the final proposal.
M2	Renovation of HVAC system	The existing heat pumps air water do not work. It is an efficient system and produces more comfort for users, it is necessary to replace it.
M3	Elimination of unnecessary printers	In the office, there are more printers than workers need. It would be more efficient to have one for several employees working in the same office.

Table 5: Proposed energy efficiency measures in City Council of Cartaya

The total amount of investment is € 92,475, and the annual economical effect of all measures is € 7,220.4.

The expected CO_2 savings after the energy efficiency measurements implementation in City Council of Cartaya are 24 tons/yr.

Since, for each measure it can be obtained a type of financing, the estimation of cash flow is going to be analysed separately.

- M1: Replacement of traditional lights by LED lighting

Regarding energy efficiency in lighting, it might be got a subvention of the Andalusian Government for efficient lighting. It could achieve, if the project is accepted, a fund of 22% of the initial investment of the project.

The rest of the project is going to be funded through an EPC by Aton Energy. Therefore, there is not any type of initial investment by the City Council.

- M2: Renovation of HVAC system

In order to finance the project, it is going to make use of the fond JESSICA - F.I.D.A.E. Specific financial conditions applicable to each project are determined by the managers, according to the provisions of the regulations and the investment strategy of the Fund. The maximum conditions would be a financing 70% of the investment, for 15 years and a interest depending on the Euribor plus a extra percentage.

According to the characteristics of this project and the autonomous community, we are going suppose a financing of 65% in 12 years with an interest of 6%.

Moreover, even though It is difficult to assure a subvention for this project with the current situation, it is going to be considered that it achieves a fund of 25% of the project. In other way it would not be rentable.

The financial analysis of the project has been divided in the three measures because of the differences of scope and financing of each one.

M1 has positive financial and technical results, the City Council does not have to do any investment and it starts to notice savings during the third year.

Regarding M2, there are two problems concerning this measure. On the one hand, the investment is very high and subventions now are difficult to achieve, maybe when political structure is more settled it is possible to get a better way of financing or funding. On the other hand, the benefits of the installation are not very high, but this is because both technologies are not "comparable". Using electrical heaters, it just satisfied the necessity of a user, while electrical pumps are installed to develop much more power in order to conditioning the whole building both, in winter and summer.

The Cultural Centre of Cartaya started to work in 2004. In this building there are developed different activities, it has two libraries, offices, academies, a theatre, etc. The Cultural centre has an area of 930m^2 and five floors.

Table 6 ilustrate the list of propsed energy efficiency measures in Cultural Centre of Cartaya.

Code	Measure	Description
M1	Replacement of traditional lights by LED lighting	LED lighting consumption is notably lower than traditional lighting, however this technology is more expensive. Therefore, it is important to study which lights are important to change and which ones are not worth because they are not used enough. In table 5 there is a description of the final proposal.
M2	Installing thermal solar panels	The emplacement of this town is suitable to get notable benefit of thermal solar energy. It can supply hot water, replacing electric water heater.
M3	BMS (Building Management System)	Installation of BMS in order to control electrical devices and HVAC system of the building

Table 6: Proposed energy efficiency measures in Cultural Centre of Cartaya

The expected project costs for the energy efficiency project implementation are in the amount of € 22,058, and in will lead to the annual money cash savings in the amount of € 6,609.96.

The expected CO_2 savings after the energy efficiency measurements implementation in Cultural Centre of Cartaya are 32.36 tons/yr.

This project could have a subvention by Andalusian Government of 18% if it is conceded. In this case, to get the subvention, it is presented as a project of energy efficiency rehabilitation in public buildings, by using renewable energies and improving energy efficiency. (In this case, by replacing lighting is not possible to get the Andalusian subvention because it exceeds the investment of € 10,000).

In order to finance part of the project, it would be suitable to make use of the fond JESSICA - F.I.D.A.E. Specific financial conditions applicable to each project are determined by the managers, according to the provisions of the regulations and the investment strategy of the Fund. The maximum conditions would be a financing 70% of the investment, for 15 years and a interest depending on the Euribor plus a extra percentage.

According to the characteristics of this project and the autonomous community, we are going suppose a financing of 60% in 5 years with an interest of 5%.

The conclusion of the economic analysis is that the project is a recommendable investment to do by the Cultural Center of Cartaya. Both, TIR and ROI have a positive result.

Community facility Guadalinfo is a room of 25m^2 with tables and computers where social activities are developed. It is placed in a new building, built in 2012, where is located the market of the town.

The propsed energy efficiency measures in the Community facility Guadalinfo are given in Table 7.

Code	Measure	Description
M1	Replacement of traditional lights by LED lighting	6 Panel LED lights of 40W might replace 24 Fluorescent tube lights of 18W.

Table 7: Proposed energy efficiency measures in Community facility Guadalinfo

The total amount of measure investment is € 406.32, and the expected annual energy savings of the implementation of the proposed measure is in the amount of € 119.39.

The expected CO_2 savings after the energy efficiency measurements implementation in Community facility Guadalinfo are 0.26 tons/yr.

For this project, it might be got a subvention of the Andalusian Government for efficient lighting. It could achieve, if the project is accepted, a fund of 22% of the initial investment of the project, which means a quantity of € 89.39.

The rest of the project is going to be funded through an EPC by Aton Energy. Therefore, there is not any type of investment by Guadalinfo.

Due to the simple energy consumption of Guadalinfo, there is no many proposals to do in order to save energy.

Based on the economic and technical analysis, the installation of LED lighting would carry out saving in electricity, costs and CO_2 emissions, involving no cost of investment by Guadalinfo.