Cost Efficient Options and Financing Mechanisms for nearly Zero Energy Renovation of existing Buildings Stock

DELIVERABLE 3.6

Report on suitable energy service options for the four municipalities

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ABBREVIATIONS AND ACRONYMS

Acronym	Definition
SEAP	Sustainable Energy Action Plan
EEAP	Energy Efficiency Action Plan
EPC	Energy Performance Contracting
nZEB	Near Zero Energy Buildings
ESCo	Energy Service Company
NES	National Energy Strategy
TPF	Third-party financing
EELL	Local authorities
TEE	Energy Efficiency Titles (White certificates)

CERTUS PROJECT IN BRIEF

Southern European countries undergo a severe economic crisis. This hinders the compliance to the latest Energy Efficiency Directive, demanding strict energy efficiency measures for the public sector. Investments required to renovate public buildings and achieve nearly zero energy consumption have long payback times. So the interest of financing entities and ESCOs is small, especially when banks have limited resources. Many of the municipal buildings in Southern Europe require deep renovations to become nZEB and this should not be regarded as a threat but rather as an opportunity for the energy service and the financing sector. The objective of the proposed action is to help stakeholders gain confidence in such investments and initiate the growth of this energy service sector. Municipalities, energy service companies and financing entities in Italy, Greece, Spain and Portugal are involved in this project. The plan is to produce representative deep renovation projects that will act as models for replication. Twelve buildings in four municipalities in each country have been selected. The partners will adapt existing energy service models and procedures and will work out financing schemes suitable for the 12 projects. Consequently, the partners will create materials, such as guides and maxi brochures, suitable to support an intensive communication plan. The plan includes four workshops with B2B sessions targeted to municipalities, ESCOs and financing entities. These actions shall be complemented by four training activities targeting municipal employees and the participation in international events targeting all 3 stakeholders. We expect that our action will have a significant impact by triggering investments in renovations to achieve nZEB and the uptake of the ESCO market in Southern European member states.

EXECUTIVE SUMMARY

The scope of this document is to identify the types of EPC contract more suitable for the realization of energy saving actions identified in each of the four municipalities of the project.

In particular, the report wants to indicate the appropriate tools to allow individual municipalities to choose the type of contract/s that will be most suitable to meet their needs.

Each municipality have performed energy audit to their buildings according to the applicable law in its country in order to estimate the energy saving and identify the financial viability for the renovation projects through the appropriate EPC contract.

So, in order to identify the type of EPC contract most suitable to apply to each project, a methodology has been developed.

The document in fact consists of three parts:

1. Definition of a "Risk Array" as a decision making tool to choose the most suitable type of contract, among EPC described in the Annex A, based on the needs of the Customer;

2. Analysis of the four municipalities' building projects and set up of possible scenarios to identify the possible types of contracts applicable among those identified in the deliverable D3.5. In this phase, called "DEFINITION OF POSSIBLE SCENARIOS", the data of each municipality, the local state laws and policies, the economic conditions, the possible sources of funding and the technical characteristics of the Energy audit according to the deliverable of the WP2 have been analysed. So the possible scenarios in which the municipality could operate have been identified.

3. Identification of type of contract for each renovation project. In this phase, called "DEFINITIONS OF TYPES OF CONTRACT", the results of the previous phase and the scenarios previously identified for each municipality have been shared and more information to better characterize the political, social, economic situation of the Municipality have been acquired. So, according to the shared baseline and the characteristics of each audit developed, the most suitable type of EPC contract has been identified for each project.

1. INTRODUCTION

The rate of building renovation needs to be increased, as the existing building stock represents the single biggest potential sector for energy savings. Moreover, buildings are crucial to achieving the Union objective of reducing greenhouse gas emissions by 80-95 % by 2050 compared to 1990[1]. Buildings owned by public bodies account for a considerable share of the building stock and have high visibility in public life. So the recently directive 2012/27/UE establishes an annual rate of renovation of buildings owned and occupied by central government on the territory of a Member State to upgrade their energy performance according to the obligations with regard to nearly-zero energy buildings set in Directive 2010/31/EU. Energy Performance Contracting is a smart, affordable and increasingly common way to make building improvements that save energy and money. Any large building or group of buildings is an ideal candidate for performance contracting, including council, state and federal sites, schools, hospitals, commercial office buildings and light industrial facilities. So, it is necessary to promote the market for energy services to ensure the availability of both the demand for and the supply of energy services. A list of energy services providers (ESCo), model contracts, exchange of best practice and guidelines, can contribute to this and also help stimulate demand. As in other forms of third-party financing arrangements, in an energy performance contract the beneficiary of the energy service avoids investment costs by using part of the financial value of energy savings to repay the investment fully or partially carried out by a third party. There is a need to identify and remove regulatory and non-regulatory barriers to the use of energy performance contracting and other third-party financing arrangements for energy savings. These barriers include accounting rules and practices that prevent capital investments and annual financial savings resulting from energy efficiency improvement measures from being adequately reflected in the accounts for the whole life of the investment. Obstacles to the renovating of the existing building stock based on a split of incentives between the different actors concerned should also be tackled at national level. It is necessary to promote the use of the Structural Funds and the Cohesion Fund to trigger investments

[1] Energy 2020: A strategy for competitive, secure, and sustainable energy [COM(2010)639]

in energy efficiency improvement measures. Investment in energy efficiency has the potential to contribute to economic growth, employment, innovation and a reduction in fuel poverty in households, and therefore makes a positive contribution to economic, social and territorial cohesion. Potential areas for funding include energy efficiency measures in public buildings and housing, and providing new skills to promote employment in the energy efficiency sector. The financing facilities could in particular use those contributions, resources and revenues to enable and encourage private capital investment, in particular drawing on institutional investors, while using criteria ensuring the achievement of both environmental and social objectives for the granting of funds; make use of innovative financing mechanisms (e.g. loan guarantees for private capital, loan guarantees to foster energy performance contracting, grants, subsidised loans and dedicated credit lines, third party financing systems) that reduce the risks of energy efficiency projects and allow for cost-effective renovations even among low and medium revenue households, promoting the energy services market and helping to generate consumer demand for energy services.

The report analyzes and compares the various models of EPC previously identified trying to identify those who have ascribed various contractual risks; then analyzes the situation of each municipality involved in the project in terms of political, regulatory, financial, in order to identify possible types of contracts applicable in respect of specific different needs.

2. OVERVIEW AND OBJECTIVES OF THE DELIVERABLE

The aim of this working document is to provide for Municipalities decision making tools to support more suitable EPC contract to achieving the restructuring measures designed to achieve buildings nZBE once analyzed the specific conditions of individual Municipality of Messina, Alimos , Errenteria and Coimbra.

The document is based on results gained in other Tasks, in particular:

- on the data (administrative, finance, regulatory, energy and experiences of each municipality) reported in the deliverable D3.1, D3.2, D3.3, D3.4;
- on deliverable D2.2, which explains, for each municipality, risks, constraints and difficulties in the implementation of restructuring measures in public buildings to make them nZEB;
- on deliverable D3.5, which explains the possible types of EPC contracts applicable.

In the first phase of the work we analyze each type of contract identified in the deliverables D3.5 and identify, through a "Risk Array", which subjects, ESCOs and Municipalities, the individual risk is attributable; In fact, each contract provides that one or both parties assume risk among those listed in the Array.

The second phase of the work involves the analysis of the situations of each municipality, the identification of their possible needs and the identification, according to these scenarios, of possible type of contract to be implemented, among those previously identified in Deliverable 3.5.

The qualifying elements for the construction of the various scenarios can be:

- own financial resources,
- technical experience in managing energy renovation,
- need to immediately obtain economic savings and payback time,
- time constraints, proper timing and allocation of measures,

- knowledge of tools such as the EPC contract and the TPF,
- amount of investment.

3. Risks Array

Each contract has a number of risks for each of the contracting parties, so at first it is necessary identify the risks that may normally be present in a complex contract as the EPC where there are technical, operational, economic and financial aspects.

According to literature and to consolidated practice, risk analysis usually concerns the following macro-categories of risk:

- Governance: lack of control, change of control, etc…
- Political/Social: risk of facing changes in regulations or complication of authorization procedures, loss of reputation/credibility
- Economic/Financial: risk of incurring changes in market prices of electricity, raw material, etc…
- Environmental: risk of incurring limited availability of natural resources, possible damages to the fauna, flora, Earth, water, air, etc…
- Technical/ Construction: construction defects, change of technology, etc..
- Commercial/Operations: demand, supply, etc…

These risks may arise during the different phases of the energy efficiency project managed through an EPC contract; then, for each phase, the following table describes all possible risks and their drivers.

PHASES	TYPE OF RISK	DRIVER OF RISK
ENERGY AUDIT	Risk of audit	Wrong or not correct audit False detection/estimation of maintenance and repair costs False detection/estimation of potential regulatory changes
PLANNING	Risk of planning	Incorrect or unsuitable design Increase in design costs
AUTHORIZATION	Regulatory Risks	Lack of regulations / lack of information about regulations

	Political Risks	Delays / difficulties obtaining authorizations and permits Sociopolitical instability
FINDING FUNDING	Financial Risks	Obtaining funding Fluctuation in interest rates
START WORK AND CONSTRUCTION	Environmental Risks and conditions of the site	Environmental impact of the intervention (eg. Noise) Static and Geological conditions of the site Discovery finds historical/archaeological
	Construction Risks	Non conformity to the project Delayed delivery or impossibility of completion of the works Increase in construction costs Possible default of subcontractors
MANAGEMENT	Market Risk	Increased operating costs (maintenance, etc.) Change of use, occupation, mode of use of the building Increases in energy costs Regulatory changes Change of the incentive system Change in taxes (tax and VAT) Increase in insurance costs Changes in the dynamics of the indices of the royalties revisional Change in the rate of inflation
	Counterparty Risk	EELL Rating ESCo Rating Risk of default by ESCo Financial and technical reliability of suppliers of heat and electricity

		Provider of incentives
	Technological Risk	Lack of performance of technologies/facility plant shutdown/breaking plant Increase in maintenance Damages for accidents or erroneous management Risk resulting from innovative technologies
	Externa lRisks	Occurrence of acts of God
		Climate risk
		Damage to third parties

TABLE1- Types of risks during the energy efficiency process managed through a EPC contract

In order to indicate how each risk is distributed between the ESCO and the Municipality in each EPC contract, it is assumed to be assigned the following scores:

2,0	Maximum risk
1,5	Prevailing risk
1,0	Risk-sharing between the parties
0,5	Minimal risk
0,0	No risk

TABLE2 - Legend of the scores assigned in the risks array

So, considering the types of risk and assigning the above scores, it is possible to obtain the following table that shows, for each EPC contract, how each driver risk is, exclusively or overwhelmingly, in charge of the ESCo or Municipality.

RISK ARRAY			FIRST IN		FIRST OUT		GUARANTEED SAVINGS		SHARED SAVINGS		PAY FROM SAVINGS		FOUR STEPS		BOOT		CHAUFFAGE	
PHASES	**TYPE OF RISK**	**DRIVER OF RISK**	**ESCo**	**EELL**	**ESCo**	**EELL**	**ESCo**	**EELL**	**ESCo**	**EELL**	**ESCo**	**EELL**	**ESCo**	**EELL**	**ESCo**	**EELL**	**ESCo**	**EELL**
ENERGY AUDIT	**Risk of audit**	Wrong or not correct audit	2		2		2		2		2			2	2		2	
		False detection/estimation of maintenance and repair costs	2		2		2		2		2		2		2		2	
		False detection/estimation of potential regulatory changes	2		2		2		2		2			2	2		2	
		Evaluation %	**100%**	**0%**	**100%**	**0%**	**100%**	**0%**	**100%**	**0%**	**100%**	**0%**	**33%**	**67%**	**100%**	**0%**	**100%**	**0%**
PLANNING	**Risk of planning**	Incorrect or unsuitable design	2		2		2		2		2			2	2		2	
		Increase in design costs	2		2		2		2		2			2	2		2	
		Evaluation %	**100%**	**0%**	**100%**	**0%**	**100%**	**0%**	**100%**	**0%**	**100%**	**0%**	**0%**	**100%**	**100%**	**0%**	**100%**	**0%**
REGULATORY	**Regulatory Risks**	Lack of regulations / lack of information about regulations	1,5	0,5	1,5	0,5	1,5	0,5	1,5	0,5	1,5	0,5			2		1	1
		Delays / difficulties obtaining authorizations and permits	1,5	0,5	1,5	0,5		2	1,5	0,5		2			2		2	
		Sociopolitical instability	2		2		2		2		2				2		2	
		Evaluation %	**83%**	**17%**	**83%**	**17%**	**58%**	**42%**	**83%**	**17%**	**58%**	**42%**	**0%**	**0%**	**100%**	**0%**	**83%**	**17%**
PROCUREMENT OF FINANCE	**Financial Risks**	Obtaining funding	2		2			2	2			2			2		2	
		Fluctuation in interest rates	2		2			2	2			2			2		2	
		Evaluation %	**100%**	**0%**	**100%**	**0%**	**0%**	**100%**	**100%**	**0%**	**0%**	**100%**	**0%**	**0%**	**100%**	**0%**	**100%**	**0%**
STURT UP AND CONSTRUCTION	**Environmental Risks and conditions of the site**	Environmental impact of the intervention (eg. Noise)		2		2		2		2		2		2		2		2
		Static and Geological conditions of the site	2		2		2		2		2			2	2		2	
		Discovery finds historical/archaeological	1,5	0,5	1,5	0,5	1,5	0,5	1,5	0,5	1,5	0,5		2	2		2	
		Evaluation %	**58%**	**42%**	**58%**	**42%**	**58%**	**42%**	**58%**	**42%**	**58%**	**42%**	**0%**	**100%**	**67%**	**33%**	**67%**	**33%**
	Construction Risks	Non conformity to the project	2		2		2		2		2			2	2		2	
		Delayed delivery or impossibility of completion of the works	2		2		2		2		2			2	2		2	
		Increase in construction costs	2		2		2		2		2			2	2		2	
		Possible default of subcontractors	2		2		2		2		2		2		2		2	
		Evaluation %	**100%**	**0%**	**100%**	**0%**	**100%**	**0%**	**100%**	**0%**	**100%**	**0%**	**25%**	**75%**	**100%**	**0%**	**100%**	**0%**
MANAGEMENT	**Market Risk**	Increased operating costs (maintenance, etc.)	2		2		2		2		2		2		2		2	
		Change of use, occupation, mode of use of the building	2		2			2	2	1		2					2	
		Increases in energy costs	2		2			2		2		2		2	2		2	
		Regulatory changes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		Change of the incentive system	1,5	0,5	2		2		1,5	0,5	2				2		2	
		Change in taxes (tax and VAT)		2		2		2		2		2		2		2		2
		Increase in insurance costs	2		2		2		2		2			2	2		2	
		Changes in the dynamics of the indices of the royalties revisional	1	1													1	1
		Change in the rate of inflation	0,5	1,5	2		2				2			2	2		1,5	0,5
		Evaluation %	**67%**	**33%**	**81%**	**19%**	**56%**	**44%**	**57%**	**43%**	**56%**	**44%**	**25%**	**75%**	**79%**	**21%**	**75%**	**25%**
	Counterparty Risk	EELL Rating	2		2			2	2			2	2		2		2	
		ESCo Rating		2		2		2	1	1		2		2		2		2
		Risk of default by ESCo		2		2		2	1	1		2	2			2		2
		Financial and technical reliability of suppliers of heat and electricity	2		2		0,5	1,5	2		0,5	1,5		2	2		2	
		Provider of incentives	1,5	1	2		1	1	2		2	2		2	2		2	
		Evaluation %	**52%**	**48%**	**60%**	**40%**	**15%**	**85%**	**80%**	**20%**	**21%**	**79%**	**40%**	**60%**	**60%**	**40%**	**60%**	**40%**
	Technological Risk	Lack of performance of technologies/facility	2		2		2		2		2			2	2		2	
		plant shutdown/breaking plant	0,5	1,5		2		2	0,5	1,5		2		2	2		2	
		Increase in maintenance	2		2		2		2		2		2		2		2	
		Damages for accidents or erroneous management	2		2		2		2		2		2		2		2	
		Risk resulting from innovative technologies	2		2		2		2		2		2		2		2	
		Evaluation %	**85%**	**15%**	**80%**	**20%**	**80%**	**20%**	**85%**	**15%**	**80%**	**20%**	**60%**	**40%**	**100%**	**0%**	**100%**	**0%**
	External Risks	Occurrence of acts of God		2		2		2		2		2		2		2		2
		Climate risk	2		2		0,5	1,5	1	1	0,5	1,5		2	2		2	
		Damage to third parties		2		2		2		2		2		2	2			2
		Evaluation %	**33%**	**67%**	**33%**	**67%**	**8%**	**92%**	**17%**	**83%**	**8%**	**92%**	**0%**	**100%**	**67%**	**33%**	**33%**	**67%**
TOTAL RISKS			**75%**	**25%**	**78%**	**22%**	**58%**	**42%**	**75%**	**25%**	**58%**	**42%**	**27%**	**73%**	**85%**	**15%**	**80%**	**20%**

TABLE 3 -Risk array

The following figure shows the risk allocation between ESCo and Municipality in the different EPC contract.

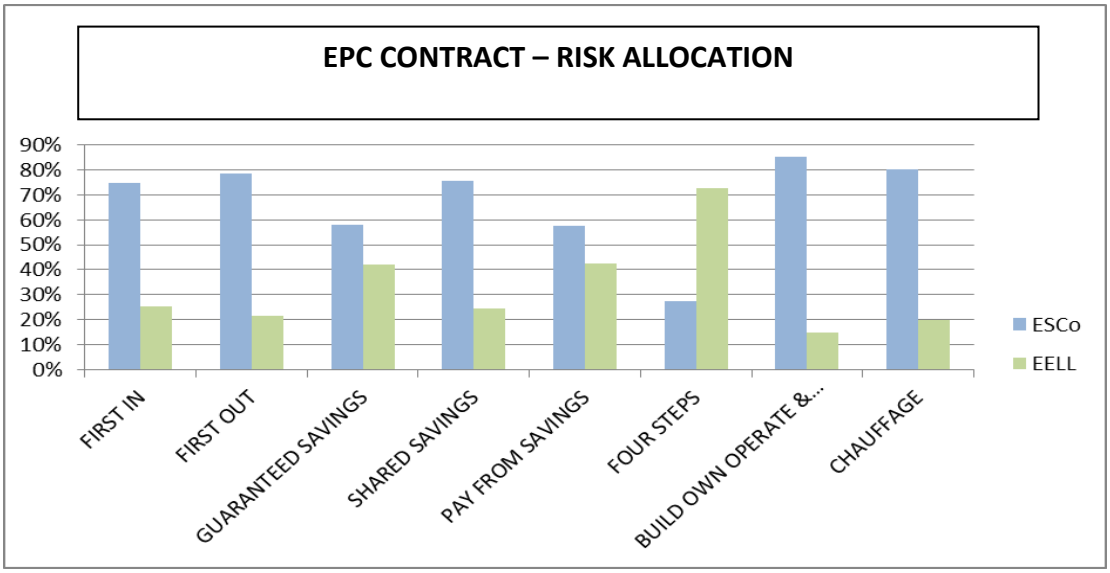


FIGURE 1 -Risk allocation in EPC contract

It is clear that in the definition of ESCO is intrinsically provided the need to take risks and the magnitude of these risks compared with the earnings identifies the attractiveness of a given initiative. The right balance of risk diversification and cost savings between the parties determines the success of an initiative to improve energy efficiency based on an EPC contract.

The following graphics show as the risks are shared between the ESCO and the Municipality in the different type of the EPC contract described in the Annex A:

FIRST IN: only the External risks are weighed more for public administration (PA), all other risks analyzed are completely borne by the ESCO or a percentage that is never less than 50%. Altogether the ESCO assumes 75% of the risks.

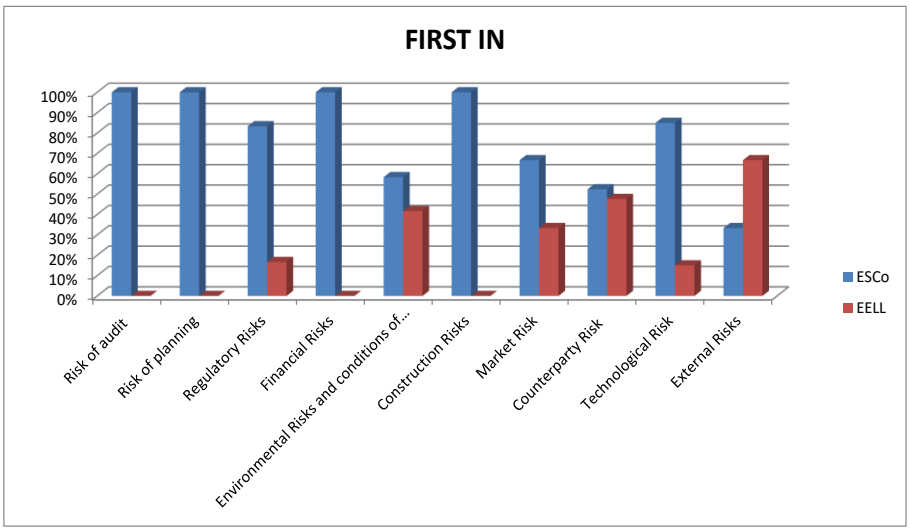


FIGURE 2 -Risks of the First In contract

FIRST OUT : only the External Risks are weighed more for public administration, all other risks are analyzed fully charge the ESCO or a percentage that is never less than 58%. Overall, the ESCO assumes 78% of the risks.

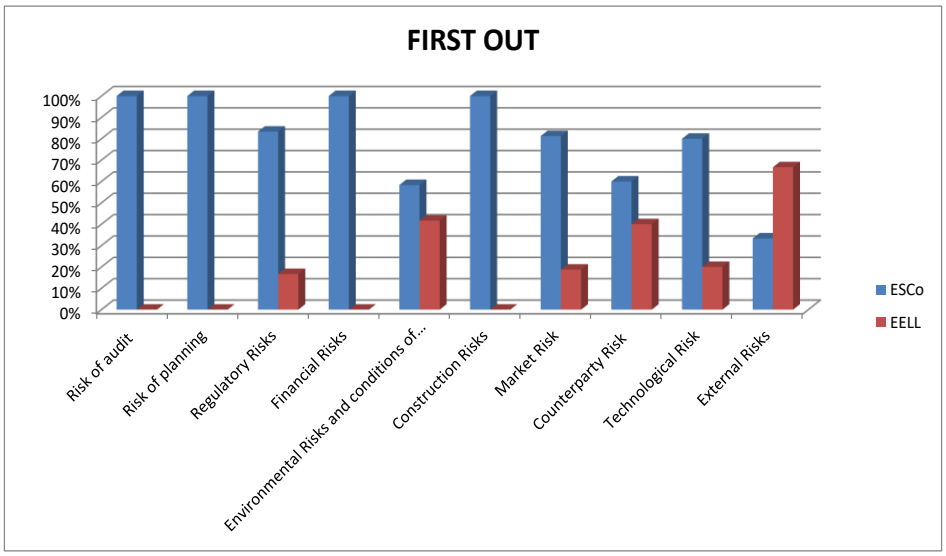


Figure 3 - Risks of the First Out contract

GUARANTEED SAVINGS : In this case, a high percentage of risk which mainly deals with Financial Risk, Counterparty and Exterior remains in charge of public administration; only the Risk Audit, Design and Construction remain totally in charge the ESCO while the remaining risks are balanced with a lead for the PA. Overall, the ESCO assumes 58% of the risks.

FIGURE 4 -Risks of the Guaranteed Savings contract

SHARED SAVINGS : Only the External Risks remain for a good percentage in the load to the PA, while all the others remain in load to ESCO for percentages that are never lower than 57%. Altogether the ESCO assumes 75% of the risks.

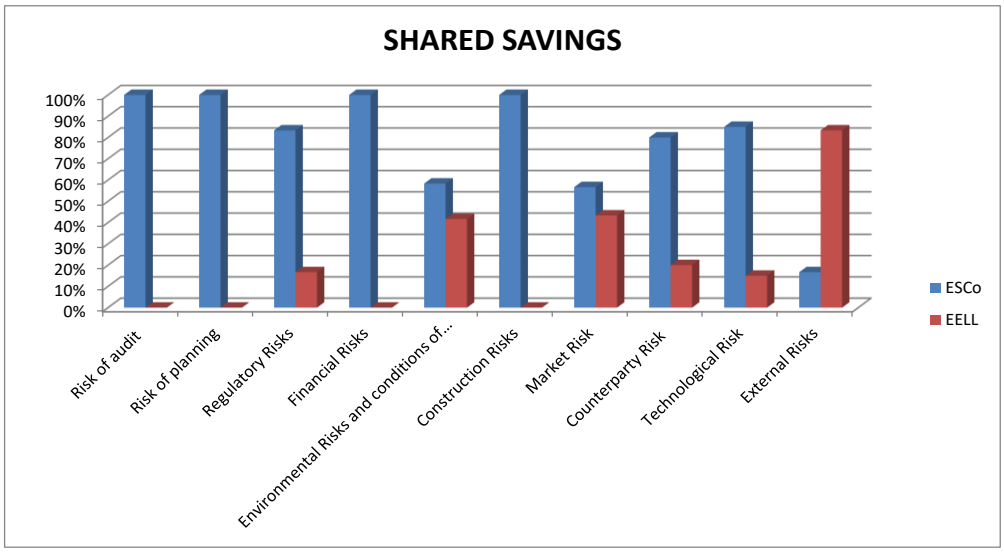


FIGURE 5 -Risks of the Shared Savings contract

PAY FROM SAVINGS: in that case remain in charge of the public administration a high percentage of risk with regard to the Financial Risk, Counterparty and External; Only the Risks of Audit, Design and Construction remain totally in charge of ESCO while the remaining risks are balanced with a lead for the PA that never exceeds 42%. Overall, the ESCO assumes the 58% risk.

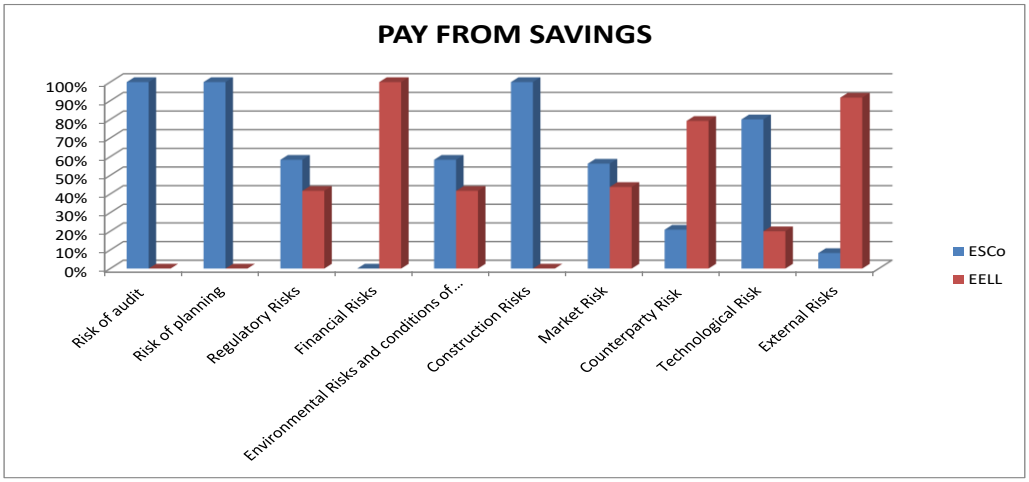


FIGURE 6 -Risks of the Pay from savings contract

FOUR STEPS: in general is a low risk contract where the totality of risks remains in load to the PA except as regards the technological risk that is reported to the ESCO to 60%. Overall, the ESCO assumes the 27% risk.

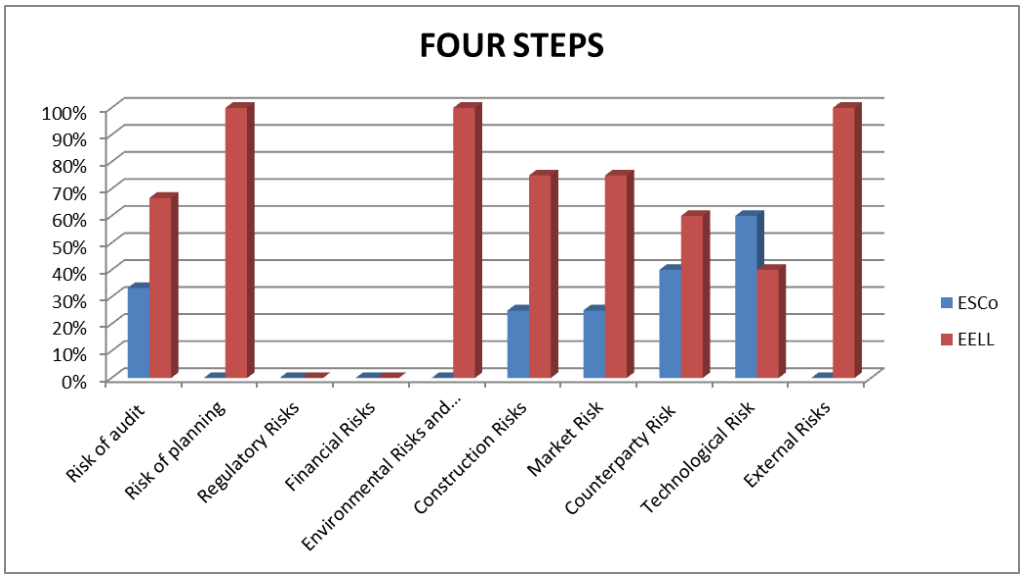


FIGURE 7 -Risks of the Four Steps contract

BOOT: the ESCO assumes total of 85% of the risks, many specific risks do not fall on the PA and in any case does not act never more than 40% specific risk.

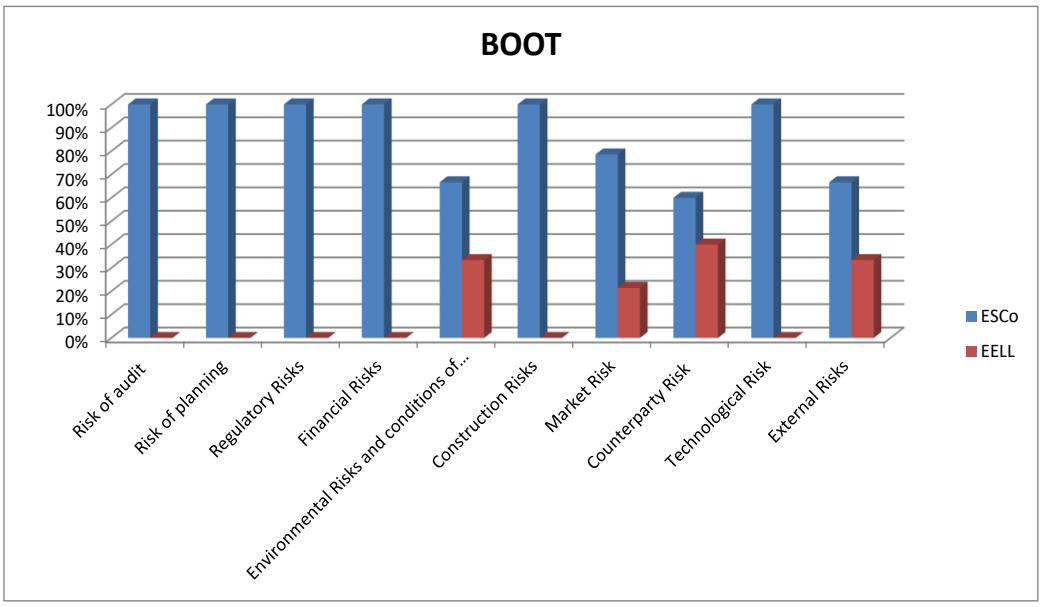


FIGURE 8 -Risks of the Boot contract

CHAUFFAGE: Only The External Risks remain for 67% in charge of the PA, other specific risks or are invalid or do not take more than 40% value. Overall, the ESCO assumes the 80% risk.

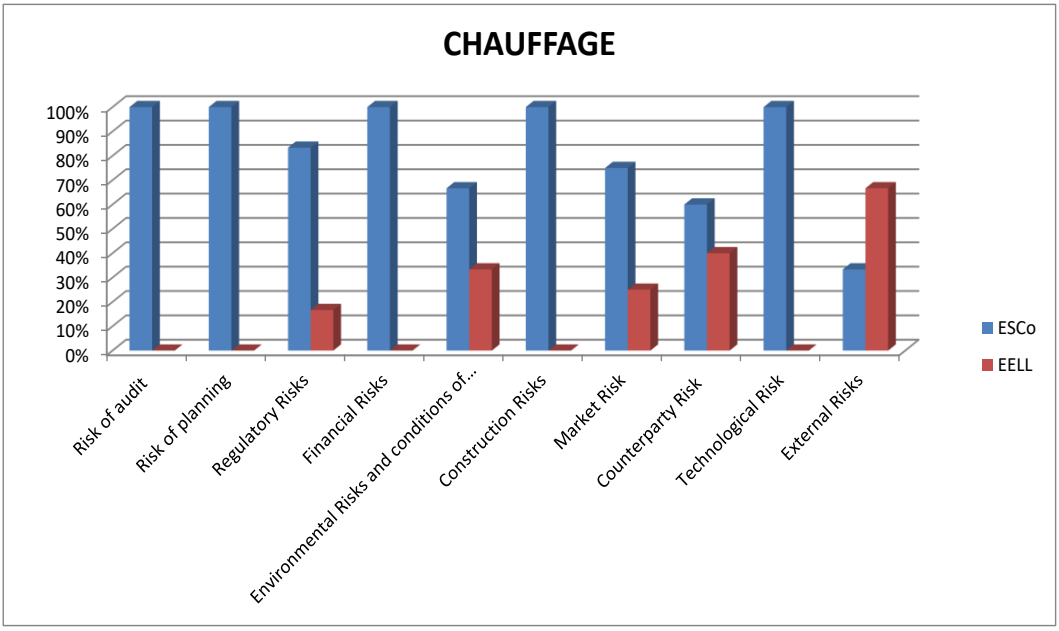


FIGURE 9 -Risks of the Chauffage contract

4. METHODOLOGY

For each of the four Municipalities involved in the project, they were identified three buildings to be redeveloped to make them nZEB. The twelve renovations projects resulting from energy analysis must be made through EPC contracts and by mobilizing the instrument of Third Party Financing (TPF).

In order to identify the most suitable type of EPC to be used for each energy renovation project, ASSISTAL has developed a working methodology divided into the following two phases.

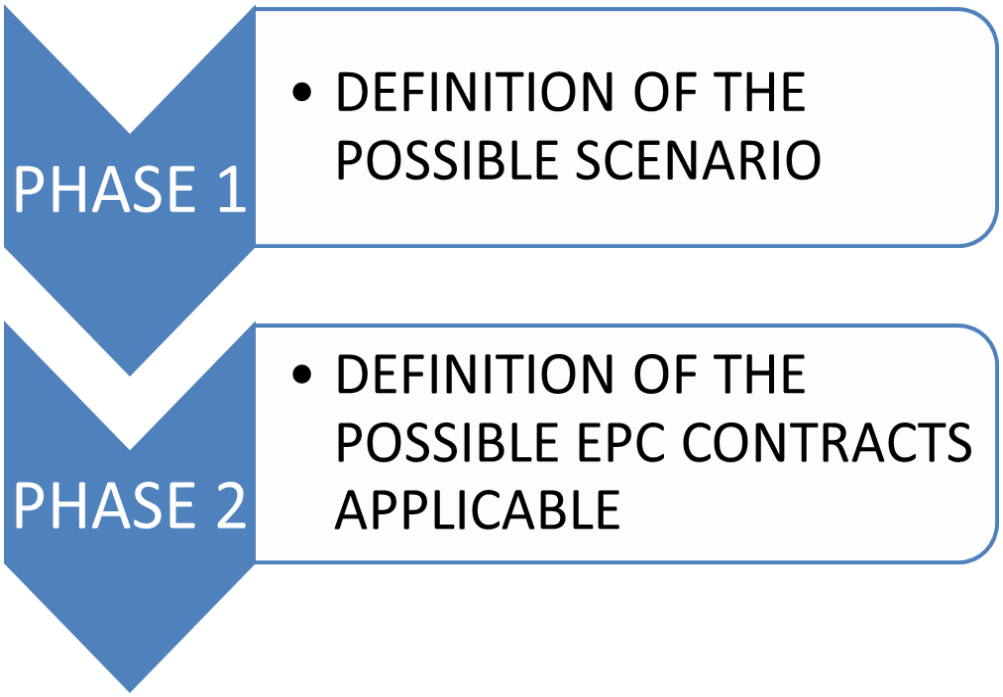


FIGURE 10 - THE PHASES OF THE METODOLOGY

This methodology, applied as an example to all 12 CERtuS projects, can be a useful analytical procedure for future similar projects.

The methodology requires a continuous exchange of information between the City, the designers of the interventions and ESCOs in order to build an EPC contract that can meet the needs of the Municipality and create the conditions for the intervention of an ESCO.

The methodology assumes that the City has already chosen the buildings on which to carry out the redevelopment to make them nZEB and performed their energy audits. This hypothesis is applicable to cases where the Municipality announces a tender for

the award of the redevelopment works. In other cases, instead both the energy audit and the design are carried out by the ESCO itself.

As aforesaid the working method is based on two stages: the first setting out the conditions and the feasibility of the initiative while the second specifies the type of contract to be applied.

The following list defines the steps to the definition of the types of contracts EPC applicable to each of the 12 nZEB projects.

4.1. Phase 1 - "Definition of the possible scenario"

In the first phase in order to define the possible scenario is necessary to acquire, for each municipality, the data of Municipality and, in particular, the data concerning the legislative and political situation in force, the economic conditions, the possible sources of funding, and finally the technical and financial characteristics of the energy efficiency measures designed .

The goal of this first phase is to verify the existence of minimum conditions for which the proposed projects can be the subject of a partnership public- private through the instruments of the EPC contract and the Third-party financing (TPF), according to the standard market conditions; where this does not occur the ways and the tools to create such conditions are identified.

In fact, when you want to engage an external partner, ESCo or Sponsor, we must ensure that the project can provide returns to these two new subjects and so you can ensure that the project margins and indexes that vary company to company and market by market but which they are normally represented by IRR value and cash flow. These indices are clearly influenced by the cost of money that needs to support the company to perform the work is that it accesses external funding or finance with equity capital. If such indexes cannot be met it is necessary to bring the project to the minimum lease payments.

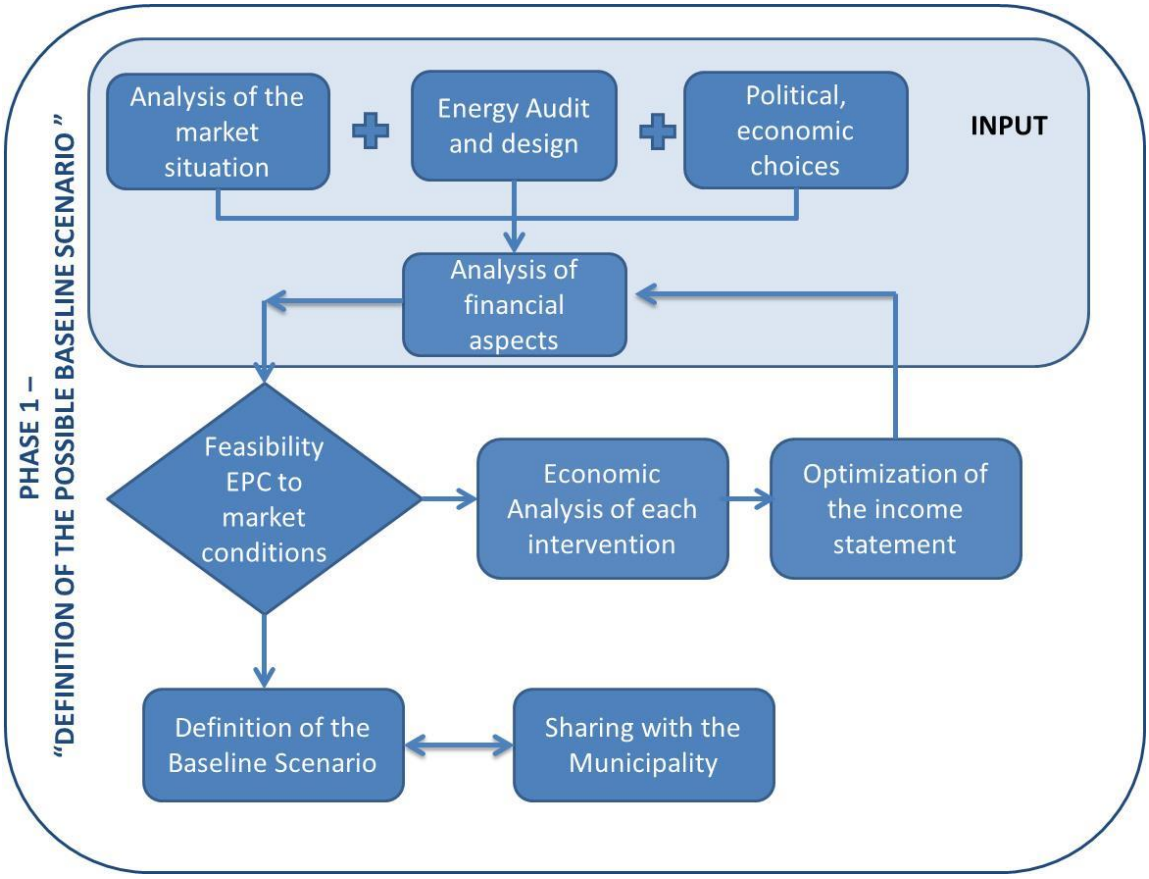


FIGURE 11 -Flow chart of the phase 1 of the methodology

The Input data to build an EPC contract:

- The economic situation of the municipality and the national context
- The legislative constraints
- The political and economic choices as well as the Municipality strategies on energy efficiency actions
- The energy efficiency projects realized in previous deliverables
- The economic analysis of the projects (D2.5 "Twelve economic evaluation reports").

At this point, whether there are the economic feasibility conditions to standard conditions, it is possible define the Reference Scenario. Otherwise it is necessary to take into account the interventions of a purely economic nature which can reduce investment such as the possible direct funding of the municipality, the availability of incentives, recourse to concessional funds, etc. in order to identify a economic feasible solution.

In this phase there was a continuous exchange of information with the municipalities and with the designers to share their choices and to acquire additional information in order to better characterize the political, social, economic framework as well as define the "Reference Scenario".

Once defined the actions necessary to improve the economic aspects, a check of maximum has been carried out and in some cases possible alternatives and / or additional solutions have been indicated.

So it's been defined the Reference Scenario in which the municipality should choosing the form of contract to be used to realize the project and the type of contract EPC most suitable among those normally used.

4.2. Phase 2 - "Definition of the possible EPC contract applicable"

In the second phase, according to the Reference scenario shared and based on the characteristics of each project developed, it is identified the type of Contract EPC most suitable to be applied.

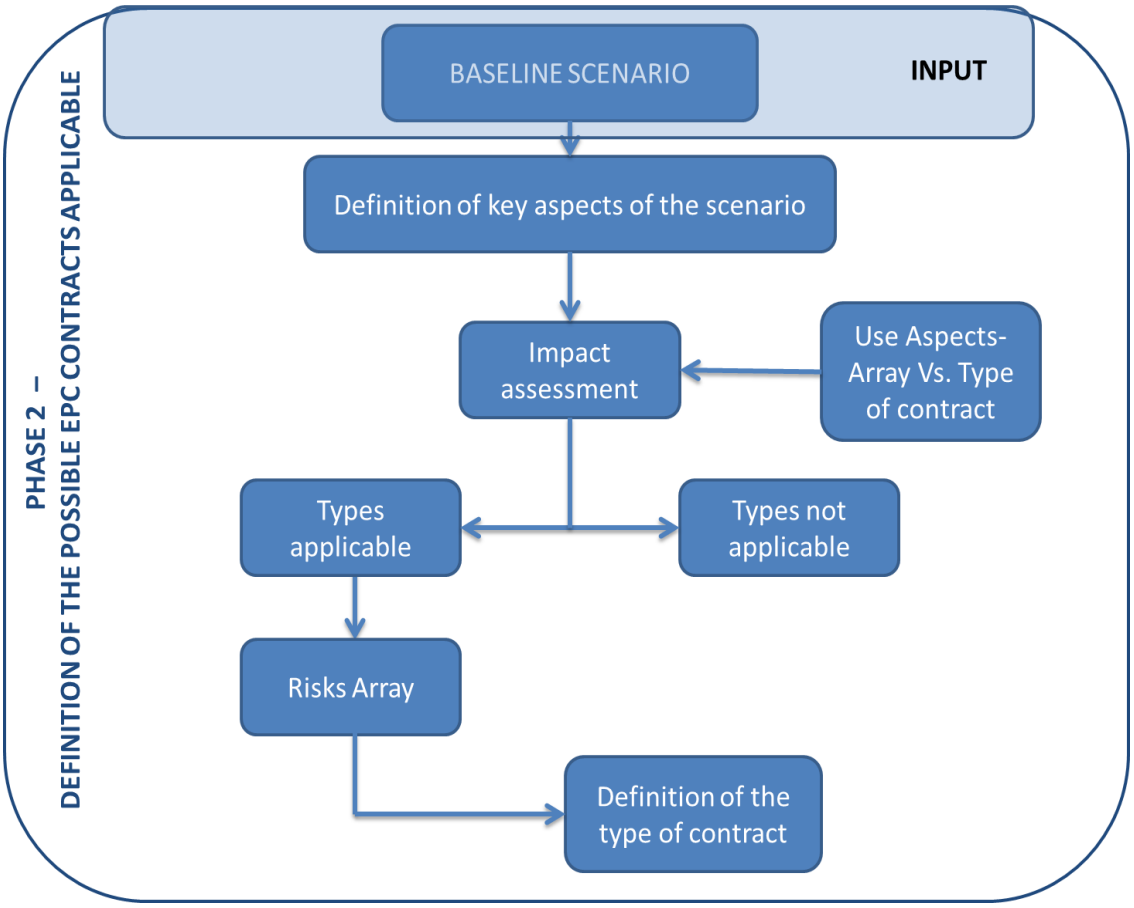


FIGURE 12 -Flow-chart of the phase 2 of methodology

The choice of the type of contract provides for a first identification of the most significant aspects and binding of each scenario and thus a timely assessment of the impact that each of these aspects would have on the single type of contract (for example the impossibility of a municipality to finance directly the energy upgrading automatically exclude all those types of contracts which provide for direct investments of the Municipality with the help of the TPF instrument).

For the identification of significant matters a table was created that lists the main aspects that characterize a reference scenario; of course, these aspects are not exhaustive and are not always applicable.

This table was made consistent and personalized for each of the twelve identified scenarios.

These significant aspects are correlated with the type of EPC Contract defined in the deliverable 3.5 for an accurate assessment of the impact that each significant aspect would have on the individual type of contract.

BASELINE SCENARIO		
KEY ASPECTS	**VALUATION**	**NOTE**
Total value of the investments	*"High/Medium/Low"*	*"Value"*
Payback time of the investments	*"High/Medium/Low"*	9-10 years
Constraints on contract duration	*YES/NO*	max 9 years
Knoledge of the tools (EPC contract, FTT)	*"High/Medium/Low"*	
Municipality capacity to finance all the interventions	*"High/Medium/Low"*	*"Value"*
Municipality capacity to finance part of the interventions	*"High/Medium/Low"*	*"Value"*
Possibility of the Municipality to borrow	*YES/NO*	
Need to obtain an immediate cost savings	*YES/NO*	*"%"*
Presence of the supply of energy carriers in EPC contract	*YES/NO*	
Use of the incentives for the repayment of the investment by third funders	*YES/NO*	
Definition of possible savings	*YES/NO*	

Type of EPC
FIRST IN
FIRST OUT
GUARANTEED SAVINGS
SHARED SAVINGS
PAY FROM SAVINGS
FOUR STEPS
BUILD OWN OPERATE & TRANSFER
CHAUFFAGE

Table4 –Key aspects of the baseline scenario vs EPC contract

KEY ASPECTS OF BASELINE SCENARIO	TYPE OF CONTRACT					
	A	B	C	D	E	F
Aspetct 1^	0,00	0,00	0,00	0,00	0,00	0,00
Aspect 2^	[illegible]	[illegible]	-2,00	0,00	0,00	0,00
Aspect 3^	0,00	0,00	0,00	0,00	0,00	0,00
Aspect 4^	0,00	0,00	0,00	0,00	0,00	0,00
Aspect 5^	0,00	0,00	0,00	0,00	0,00	0,00
Aspect 6^	0,00	0,00	0,00	0,00	0,00	0,00

Table 5 – Example of numerical assessment of each significant aspect of the referent scenario on the types of contract EPC

To assess the impact that the conditions have on the applicability of the various types of contract is designed a methodology that seeks to transform objective assessments into numbers.

The application of this method provides for to assign, for each significant aspect of the Reference Scenario and for

each type of contract, a value according to the weights shown in the table below. This weight expresses the impact that the key aspect has on the type of contract.

IMPACT ON THE TYPE CONTRACT	VALUE
Applicable	1
Indifferent	0
Shortly applicable	-1
Not applicable	-2

Table6 – Legend of the values corresponding to each key aspect of the baseline scenario

Once executed the analysis of all key aspects, we have performed the sum of the values obtained for each type of contract, and then discard all the types of contracts that have been awarded a total negative value because they are not very effective or are not applicable to the baseline scenario examined.

This will reduce the types of contracts to be taken into account; each type will be compared with the other on based of the Risks Array previously defined in paragraph 3.

This will make it possible to identify the risks of each type of contract for the Municipality and to evaluate with special attention to the most critical aspects.

The latter assessment, own of the Municipality, will define the type of contract to be used or, as often happens, a mix of contract types selected in order to better adapt the contract to the needs of the Municipality and the ESCo.

In the document they have been indicated some choices that must be understood as mere suggestions that before being put into practice need further verification as regards both the Input data and the considerations made.

This methodology, which has been applied to each of the four municipalities that are part of the CERtuS project, and then for each of the twelve projects, follows the logical decision path that each municipality should implement within itself to be able to give life to the EPC contracts.

5. Suitable energy service options for Coimbra, Alimos, Messina and Errenteria

5.1. Messina

The city of Messina is the third largest city in Sicily with a population of over 242,000 inhabitants and a total area of 211.2 km^2 and a density of 1,142.99 inhabitants / km^2

Municipality	Messina
Province	Messina
Region	Sicilia
Coordinates	38°11'00'' N 15°33'00'' E
Altitude	3 m s.l.m.
Surface	211.23 km^2
Population	241'434[2]
Density	1142.99 ab./km^2
Postal code	98121-98168
Prefix	090
Time zone	UTC+1
Code ISTAT	083048
Codastral code	F158
Class seismic	Zona 1 (High)

TABLE7 - Data of Messina

[2] Resident population to 31/05/2013. Source: ISTAT.

Messina is characterized by 32.405 residential buildings and table below shows that the 1-2 storey buildings are the most popular in the municipality, as they represent about 75% of the buildings in total, but 56% in terms of housing.

It also appears that about 78% of the building of Messina was built before the 80s, mainly before 1946 (36%).

NUMERO DI ABITAZIONI								
Tipologia di edificio	Epoca di costruzione						TOTALE	Totale [%]
	Fino 1945	Dal 1946 al 1961	Dal 1962 al 1981	Dal 1982 al 1991	Dal 1992 al 2001	Dal 2002 al 2011 *		
Numero di piani ≤ 2	16'961	9'955	23'054	8'604	4'349	2'993	**65'916**	**56%**
Numero di piani > 2	13'422	7'877	18'244	6'808	3'442	2'368	**52'161**	**44%**
TOTALE	**30'383**	**17'832**	**41'298**	**15'412**	**7'791**	**5'361**	**118'077**	**100%**
Totale [%]	**26%**	**15%**	**35%**	**13%**	**7%**	**5%**	**100%**	

EDIFICI	
TOTALE	Totale [%]
25'293	75%
8'653	25%
33'946	**100%**

EDIFICI								
	TOTALE	12'279	5'088	9'333	3'817	1'888	1'541	**33'946**
	Totale [%]	36%	15%	27%	11%	6%	5%	**100%**

*: i dati relativi al periodo 2002-2011 sono stati stimati sulla base dei dati al 2011 divulgati da ISTAT e dell'andamento demografico

TABLE8 - Number of buildings and homes by type and time of construction in the city of Messina to 2011 (Source Istat)

The number of housing units in 2001 is equal to 112.716 and projected on the basis of demographic and the number of dwellings occupied by residents (93.409 and 97.852 in 2001 and in 2011) it is estimated that in 2011 was amounted to 118.077 units.

It is possible to observe that as many as 44% of housing is within buildings characterized by number of floors greater than 2 and 1-2 storey buildings are the most popular in the municipality"; also shows that about 76% of the homes are located in buildings built before the '80s, especially between 1962 and 1981 (35%).

It is also interesting to note that the houses occupied by residents represent 83% of total units inhabited: this result may indicate the presence of a significant number of unoccupied dwellings permanently and / or second homes, in line with the tourist and the geographical location of the territory.

5.1.1. Regulatory and policy framework

The initiatives of redevelopment of the City of Messina comply with the provisions of Legislative Decree 102/2014 "Implementation of Directive 2012/27/EU on energy efficiency" about the redevelopment of 3% of the properties of the Public Administration in this framework, Italy set their own goals in the reduction of 20 Mtoe of primary energy by 2020 and 15 Mtoe of final energy savings.

The same initiatives must be seen as part of good implementation in Italy of EC/2010/31 even if you have not published the action plan in which the government had to be defined the technical parameters around the definition of building nZEB.

The National policy framework seems particularly favorable to try to implement energy saving initiatives:

• Italy in the document of the National Energy Strategy prepared in March 2013 stated that "Energy efficiency is the first priority of the new energy strategy. In fact, at the same time it contributes to the attainment of all the objectives of Italy's National Energy Strategy (NES): reducing energy costs, reducing emissions and environmental impact, improving the security and independence of supply and the development of economic growth. "

• In June 2014, the Council of Ministers approved the Energy Efficiency Action Plan 2014 (EEAP 2014) in which special attention is devoted to the description of the new measures introduced by Legislative Decree 102/2014, which transposed Directive 2012/27/EU.

At regional level the Sicily region signed on 9 November 2009 the Partnership Agreement with the General Directorate for Energy and Transport of the European Commission, for the Community initiative called "Covenant of Mayors" which was officially recognized as "support structure" of the local government of Sicily.

In order to promote and support the Union of Municipalities of the Covenant of Mayors, the Sicily Region assigns the sum of € 7,641,453.00 to finance the completion of the SEAP of all municipalities in the Sicily.

The city of Messina, with the Resolution of the City Council No. 45 of May 2011, resolved to adopt the Covenant of Mayors in order to draft the SEAP to achieve the objectives 20-20-20.

Messina Municipality has prepared its SEAP whose actions planned for 2020 will reduce the CO_2 emissions by 22%.

5.1.2. Analysis of current economic conditions

For some years Italy has to undergo a significant economic crisis which forced the central government to implement measures in order to reduce the public expense.

Such measures have effectively reduced considerably the resources of the municipalities for investments by introducing rules for public spending contained in the Stability Pact[3].

5.1.3. Main sources of financing

As part of the SEAP, the Municipality of Messina has provided for the implementation of the same 11 million euro for the next six years to cover about 70% of the cost of retrofit.

In the current budget it is expected to fund € 180,000 for audit, preliminary design of municipal buildings and the next will be allocated EUR 3.6 million for the redevelopment of the town hall which is one of the buildings covered by the initiative.

This availability of planned resources mean that the City can directly fund at least in part the actions that will be identified in reducing the value of the third party financing need and therefore the timing of payback.

This availability of planned resources will allow the City to fund directly, or at least in part, the energy saving measures identified by reducing the value of the financing necessary and the payback time.

[3] The Stability and Growth Pact (SGP) is an agreement, among the 28 Member states of the European Union, to facilitate and maintain the stability of the Economic and Monetary Union (EMU). Based primarily on Articles 121 and 126[1] of the Treaty on the Functioning of the European Union, it consists of fiscal monitoring of members by the European Commission and the Council of Ministers, and the issuing of a yearly recommendation for policy actions to ensure a full compliance with the SGP also in the medium-term.

In addition the program NOP Metropolitan Cities[4] could be an interesting opportunity for the city of Messina. Energy efficiency is a key part of this fund dedicated to metropolitan cities. The city of Messina proposes, therefore, to take full advantage of this tool with the financial support of ESCO (following the line of financing public - private) for the energy renovation of buildings of "Zanca Building", "Palacultura" and "Satellite Building". This type of action could be proposed as a "strategic model" to be replicated in other municipal buildings.

In particular, the public funding, from national funds (NOP Metropolitan Cities), expected to be dedicated to energy efficiency initiatives amounts to approximately EUR 3,600,000.00.

In support of the initiatives remain forms incentive in Italy to support energy efficiency and use of renewable sources such as:

• The “ContoTermico” is a tool particularly suitable for public administrations for the financing of small interventions for increased energy efficiency, and for the production of thermal energy from renewable sources.

• White certificates, also known as "energy efficiency certificates" (TEE), are securities that certify the achievement of energy savings in end-use energy through actions and projects to increase energy efficiency.

It is important to specify that these incentives are not cumulative.

5.1.4. Advantages and disadvantages of each energy service models

The municipality of Messina has little relationship and knowledge of both the market for ESCO (unique experience entrusting the preparation of the SEAP to an ESCO) that of the instruments of the EPC contract and of the third party financing. Furthermore by the

[4] National Operational Programme on Metropolitan Cities 2014-2020, approved by the European Commission on 14 July 2015, is dedicated to urban development plans and actions in the Digital Agenda sectors, energy efficiency, sustainable mobility, the housing economy and social unrest . The areas affected by the NOP Metropolitan Cities 2014-2020 are 14: the 10 metropolitan cities (Bari, Bologna, Genoa, Florence, Milan, Naples, Rome, Turin, Venice and Reggio Calabria) and 4 metropolitan cities identified by the regions with special status (Cagliari, Catania, Messina and Palermo)

questionnaire of INNOVA BIC has also emerged the need of the Municipality to have a "transparent" contract.

These aspects must be considered when choosing the most suitable type of contract beside of the goals and the need of the Municipality.

5.1.5. Technical and financial characteristics of energy efficiency renovation schemes

The following table contains the technical characteristics of the three buildings of Messina:

Building	Surface area m^2	Annual consumption kWhe	Energy costs
Zanca building	13.500	2.920.798	€ 523.606,00
PalAntonello – Palace of Culture	10.300	875.445	€ 159.165,00
Palazzo Satellite	6.870	1.885.156	€ 337.053,00
TOTAL	**30.670**	**5.681.399**	**€ 1.019.824,00**

TABLE9 – Technical characteristics of the audited building of Messina

The following tables contain the investment for each renovation options identified for each building of Messina:

a) ZANCA BUILDING

FIGURE 13 - Zanza building (Messina)

Zanca Palace is located on the seafront, in the same place of the old town hall, which was destroyed twice by earthquakes in 1783 and 1908. The reconstruction work began in December 1914 and were completed in 1924, the building is neoclassical and it consists of two floors with a surface of about 13,500 square meters. The provided interventions are varied and cover both the building envelope that the engineering part with the use of renewable energy.

HVAC

The proposed HVAC systems are VRV (Ceiling-Mounted Cassette) with EER and COP = 3.91 and EER = 3.46

Lighting system (internal + Esternal)

All of the palace lamps will be replaced with new LED lamps. Also daylight sensors and occupancy sensors will be installed so that the lights can be turned on or off according to light levels and occupancy detection.

RES

A photovoltaic plant of 61 kWp will be installed on the roof. This value provides 40% of the annual electricity consumption.

Building envelope

It involves the insertion of a plaster with high performance.

Windows

Existing fixtures will be replaced by selective glazing and thermal break frame of Corten steel.

Control system

A system Building Automation Control (BACS) will be installed to optimize mechanical and electrical equipment of the building.

INVESTMENTS	€
HVAC	1.200.000
Lighting system (internal+external)	321.000
Renewable energy	122.000
Casing Building skin	319.985
Windows - Low e Thermo Break	1.519.150
Control system	25.000
Investment for renovation	**3.507.135**

TABLE10 - Investment for renovation options of the 1st building of Messina (Source D2.5)

b) PALANTONELLO – PALACE OF CULTURE

FIGURE 14 - Palantonello building (Messina)

Palacultura consists of three areas for cultural activities and hosts: a public library, a museum, a theater of 850 seats, an outdoor amphitheater and even an exhibition space located on the terrace. The building was completed in late 2000 and comprises six floors. The dimensions in the height and shape are very different for each floor. The cultural activities are housed in the first three levels, while the other three are occupied by offices. The interventions are varied and cover both the building envelope that the engineering part with the use of renewable energy.

Lighting system (internal)

It is expected to replace the existing lighting with the introduction of LED lamps and, where possible, to insert intelligent system on / off, which is activated by daylight sensors.

RES

A photovoltaic system of 28 kWp will be installed on the roof and provides 40% of electricity consumption. The structure has four areas available for the positioning of the photovoltaic system.

Building envelope

It includes internal insulation on three floors. The inclusion of an internal insulation reduces the building area but it is the only possible solution in the case of a prospectus with the difficult external geometry as that of the Palace of Culture.

Night ventilation system

It is provided for the mechanical ventilation during the course of the day and night to recover the heat. The circulation system is integrated to the heating / cooling and is inserted into the ceiling.

Passive solar gains / insulation

The inclusion of a green roof will give two major advantages: at first will reduce the loss of heat during the winter season as a thermal insulator, and at second will hinder heat input during the summer season as reflective system for sunlight.

Windows

The glass and existing fixtures will be replaced by selective glass and thermal break frame PVC.

INVESTMENTS	€
Lighting system (internal)	336.200
Renewable energy	56.000
Casing Building skin	354.210
Windows - Low e Thermo Break	208.000
Investment for renovation	**954.410**

TABLE11 -Investment for renovation options of the 2nd building of Messina (Source D2.5)

c) PALAZZO SATELLITE

FIGURE 15 - Satellite building (Messina)

Satellite Palace is located in the historic city center, near the central station. The building includes many municipal government functions. It is a building in modern style built in 1970 and consists of 5 floors above ground, of equal size for each floor, for an

area of 6,870 square meters. The interventions are varied and cover both the building envelope that the engineering part with the use of renewable energy.

HVAC

For the air conditioning system is planned the construction of a suspended ceiling through the common areas for the passage of ducts.

Lighting system (internal)

It is expected to replace the existing lighting with the introduction of LED lamps and, where possible, of an intelligent system on / off, which is activated by daylight sensors.

RES

It is planned the installation of three photovoltaic systems of 60 kWp, 50 kWp and 45 kWp with a total capacity of 155 kWp on the roof and walls of the building. This ensures little over 30% of the electricity consumption.

Night ventilation system

It is planned the mechanical ventilation during the course of the day and night to recover the heat. The circulation system is integrated to the heating / cooling and is inserted into the ceiling.

Passive solar gains / insulation

It is assumed the inclusion of a green roof that will give two major advantages: at first will reduce the loss of heat during the winter season as thermal insulator, at second will hinder heat input during the summer season as reflective system for sunlight.

Control system

A system Building Automation Control (BACS) will be installed to optimize mechanical and electrical equipment of the building.

INVESTMENTS	€
HVAC	500.000
Lighting system (internal)	101.200
Renewable energy	310.000
Casing Building skin	1.691.237
Control system	20.000
Investment for renovation	**2.622.437**

TABLE12 -Investment for renovation options of the 3rd building of Messina (Source D2.5)

The total value for the realization of all three projects is particularly high and amounts to € 7,082,982.00.The three projects produce an annual savings of 3.054.600 kWh.

The following table of the Deliverable D2.5 "Twelve economic evaluation reports" contains the economic data for each renovation schemes:

Building	Square meter (m^2)	Energy consumption	Energy expenditure	Cost of the Investiment	Energy Saving		Savings (Energy + Maintenance)	Payback period
		kWh/year	€/year	€	kWh/year	%	€/year	year
Palazzo Zanca	13.500	2.912.933	€ 523.606,00	€ 3.507.135,00	1.518.815	52%	€ 332.311,00	11,50
Palacultura "Palantonello"	10.300	885.469	€ 159.165,00	€ 954.410,00	253.879	29%	€ 42.263,00	22,58
Palazzo Satellite	6.870	1.872.943	€ 337.053,00	€ 2.622.437,00	1.281.906	68%	€ 184.899,00	14,00
TOTAL	**30.670**	**5.671.345**	**€ 1.019.824,00**	**€ 7.083.982,00**	**3.054.600**	**54%**	**€ 559.473,00**	**12,66**

TABLE13 -Economic evaluation for renovation schemes of Messina

The economic analysis of the D2.5 shows payback time within 15 years.

Through the economic contribution of the municipality and/or the recourse to funds, all three projects are economically attractive to the ESCO market.

In practice, interventions were analyzed according to economic convenience and, in particular, according to the cost of each project and its contribution to energy saving. This analysis shows that some high-cost interventions carry a marginal contribution to overall savings.

Site	Intervention	Investment (€)	Savings (€)	Investment / Savings ratio	Invstiment /Totale Investiment ratio
Palazzo Zanca	Compression heat pumps - VRV system - NEW CIRCULATION AREAS	553.846	0	n.a.	16%
	Horizontal structures on roofs - False Ceiling CIRCULATION AREAS	75.633	0	n.a.	2%
	BACS	25.000	0	n.a.	1%
		654.479	0		19%
Palazzo Satellite	Horizontal structures on floors - WATERPROOFING FOUNDATIONS and FOUNDATIONS STRUCTURAL RENOVATION	360.000	3.205	112	16%
		360.000	3.205	112	16%
Palacultura	New facades --INTERNAL INSULATION OF WALLS and COVER BLOCK	354.210	9.871	36	39%
		354.210	9.871	36	39%

TABLE14 – Analysis of Investments and Savings for the interventions of Messina

According to the economic analysis of the deliverable 2.5 "Twelve economic evaluation reports", it is necessary to optimize the financial structure of the investment in order to make the market attractive for the ESCo through the use of other sources of funding.

The result of this analysis leads to the following conclusions:

a) A non-repayable contribution of the Municipality to € 2,150,000.00 is needed

b) Gather a low-interest loan facility of 1.5%, 12-year, to € 3,320,000.00 with indebtedness of the City is needed

c) It is necessary to reduce the total value of the ESCO to € 2,026,200.00

d) It is necessary to accept payback time over 15 years.

FINANCIAL STRUCTURE OPTIMIZATION BY DELIVERABLE 2.5				
	Palazzo Zanca	Palazzo Satellite	Palacultura	TOTALE
Equity investment by the ESCo	€ 513.459,00	€ 267.612,00	€ 105.400,00	€ 886.471,00
Senior debt	€ 770.189,00	€ 369.560,00		€ 1.139.749,00
Subsided Funds (duration 12 years);	€ 1.420.000,00	€ 1.600.000,00	€ 300.000,00	€ 3.320.000,00
Grant (Incl. VAT);	€ 1.000.000,00	€ 480.000,00	€ 670.000,00	€ 2.150.000,00
	€ 3.703.648,00	€ 2.717.172,00	€ 1.075.400,00	€ 7.496.220,00
Duration of the contract:	20 years	15 years	25 years;	

TABLE15– Proposal of optimization of the financial structure

5.1.6. Phase 1 - "Definition of possible scenario"

The municipality wants to carry out a transformation intervention of some buildings in nZEB and proceed through the use of a contractual instrument such as the Energy Performance Contracting - EPC.

In order to identify the possible scenario and the possible solutions to the realization of energy renovation projects, the documents used in this phase are:

- D3.1 "Report on current conduction of the City of Messina",
- D2.1 "Report presenting the 3 nZEB renovation schemes in Italy, fully documented with technical and economic evaluation"
- D2.5 "Twelve economic evaluation reports".

In addition to the study of these documents we have proceeded to a direct confrontation with the Municipality in order to clarify some aspects of the economic and political situation.

The reference scenario consists in the summary of those fundamental aspects that constitute the decision-making framework for the verification of the feasibility for the adoption of an EPC contract.

1. The situation in Italy shows two contrasting situations from the point of view of development of initiatives aimed at saving energy involving ESCO and the others funders:

a. The cost of energy in Italy is particularly high compared with the European average, due to the high incidence of taxes, so the energy efficiency market is particularly attractive for energy-saving investments;

b. In the list drawn up by the World Bank that measures the difficulties met by the companies in business, Italy is at 45th place and results an unattractive country to carry on the business and financial initiatives;

2. The financial analysis showed that for all three projects there is a need for a direct financial contribution by the municipality; indeed:

a. The total value of investments to implement projects for all three buildings is very high (over € 7,000.00 k);

b. The average payback period of the investment for all three projects is over 12 years (for two buildings the payback time is 15 years);

c. It is necessary to use Third Party Financing and incentives.

3. The analysis of the constraints and of economic and political situation of Municipality identifies various situations:

a. The City cannot predict long-term contracts over 9 years both for legislative constraints and for political will;

b. The Municipality has no specific experience in the management of energy saving projects and EPC contract management;

c. There is the possibility that the Municipality finance directly the totality of interventions;

d. There is the distinct possibility that the Municipality can directly finance part of the interventions through the National Operational Programme on Metropolitan Cities for an amount of approximately EUR 2,000,000.00;

e. The Municipality declares to need to lead to the budget each year at least 2% of the savings achieved by the action of energy efficiency in order to reduce the annual current expenditure;

f. The Municipality declares to need to include within the EPC contract also the supply of energy carriers to contribute to the reduction of operating costs;

g. The Municipality is available to make useful any incentives arising from Conto Termico or TEE to reduce Investment return times.

The scenario as presented puts the need to make attractive the projects; in particular, the City will have to first create the conditions for which it is feasible the use of a

public/private partnerships through an EPC contract and then locate the most suitable contract type.

So, the favourable conditions for the intervention of an ESCO are:

A. For each building it is necessary to revise the interventions to be carried out eliminating those with high cost and low yield, which in fact are necessary only for a Property retraining, in order to reduce the overall cost of investment;

B. it is necessary to use their own funds and / or find other sources of funding in order to reduce the investment share held by the ESCO;

C. Evaluate the opportunity to carry out projects with different EPC contracts or under a single contract. This choice implies, in the case of a single contract, a greater complexity in the definition of procurement procedures, (given the high value of total investments), a smaller number of possible ESCO participants (the economic / financial and technical qualifications are more high), greater synergies for ESCO, less flexibility for the Municipality and more counterparty risk.

D. Insert the incentives that may arise from Conto Termico in the income statements

The solution below can respond to all points and could make each project attractive for the market of the ESCo:

A. Reduction of the investment costs through the elimination of the following interventions:

- Palazzo Zanca: interventions that do not produce savings
- Satellite Palace: removal of the foundation to waterproofing (see D 2.5 ch. 3.4.5.2)
- Palacultura: removal of the "Internal insulation of walls and cover block".

This reduction of interventions leads to a reduction in the value of investment of around 19% of capital to be invested with an overall reduction of the energy savings of approximately 4%.

	Investment	Savings	Investment/Savings ratio	Cumulated saving	Max Incentive "Conto Termico"
	(€)	(€)			
Palazzo Zanca	2.852.656	273.307	10	93%	1.500.000
Palacultura	600.200	35.826	17	13%	390.130
Palazzo Satellite	2.262.437	227.538	10	58%	1.470.584
TOTAL	5.715.293	536.671	11		3.360.714
Reducing investment/savings	-19%	-4%			

TABLE16- Proposal of the energy service model for the three projects of Messina

B. The Municipality directly finances a part of the interventions using funds arising from METRO PON project for a value of approximately EUR 2,000,000.00 and the resulting savings contribute to total savings in order to reduce the payback time.
C. Preparation of a single EPC contract for buildings subject to energy renovation in order to reduce return times.
D. Use the Conto Termico 2 (DM 02/16/2016) that, as a first approximation could cover up to 65% of eligible costs for the transformation of buildings in nZEB (Article 4 paragraph 1e) for an amount of about € 1.7 million in five years. This will reduce the payback of the investment by the ESCo and the contract would respect the Italian legislative time constraints.

5.1.7. PHASE 2 - "DEFINITION OF POSSIBLE EPC CONTRACT APPLICABLE"

The following table summarizes the aspects that can be discriminating in choosing a contract type.

These aspects are associated with various types of EPC contracts, previously described, to assess the impact that each of them has on the single type of contract:

ASPECTS	VALUATION	NOTE	Type of EPC
Total value of the investments	High	>5.700,00 k€	FIRST IN
Payback time of the investments	High	9-10 years	FIRST OUT
Constraints on contract duration	Yes	max 9 years	GUARANTEED SAVINGS
Knoledge of the tools (EPC contract, FTT)	Low		SHARED SAVINGS
Municipality capacity to finance all the interventions	None		PAY FROM SAVINGS
Municipality capacity to finance part of the interventions	High	2.000,00 k€	FOUR STEPS
Need to obtain an immediate cost savings	Yes	2%/year	BUILD OWN OPERATE & TRANSFER
Presence of the supply of energy carriers in EPC contract	Yes		
Use of the incentives for the repayment of the investment by third funders	Yes		CHAUFFAGE

TABLE17 - Key aspects of the scenario for the three projects of Messina vs EPC contract

To obtain the numerical results from a purely qualitative assessment we have adopted the following criteria to assess the impact that the single aspect identified in the baseline scenario has on the choice of the type of contract.

The application of this method is summarized in the following table in which you compare the key aspects of the scenario with the various types of EPC contracts assigning the scores of the table 6.

ASPECTS	NOTE	VALUATION	IMPACT							
			FIRST IN	FIRST OUT	GUARANTEED SAVINGS	SHARED SAVINGS	PAY FROM SAVINGS	FOUR STEPS	B. O. T.	CHAUFFAGE
Total value of the investments	>5.700 k€	High	0,00	0,00	0,00	0,00	1,00	-2,00	1,00	0,00
Payback time of the investments	9-10 years	High	0,00	0,00	0,00	1,00	0,00	-2,00	1,00	0,00
Constraints on contract duration	max 9 years	Yes	-1,00	-1,00	1,00	-1,00	-1,00	1,00	-2,00	-1,00
Knoledge of the tools (EPC contract, FTT)		Low	0,00	0,00	-1,00	0,00	-2,00	1,00	1,00	1,00
Municipality capacity to finance all the interventions		None	1,00	1,00	-2,00	1,00	-2,00	1,00	1,00	0,00
Municipality capacity to finance part of the interventions	2.000,00 k€	High	0,00	0,00	0,00	1,00	1,00	0,00	0,00	1,00
Need to obtain an immediate cost savings	2%/year	Yes	1,00	-2,00	1,00	1,00	-2,00	-2,00	-1,00	-2,00
Presence of the supply of energy carriers in EPC contract		Yes	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00	-2,00	1,00
Use of the incentives for the repayment of the investment by third funders		Yes	1,00	1,00	0,00	1,00	1,00	0,00		1,00
			0,00	-3,00	-3,00	2,00	-6,00	-5,00	-1,00	1,00

TABLE18 - Weight of the key aspects of the scenario for the three project of Messina on EPC contracts

This analysis shows that only three types of contracts described in the deliverable 3.5 "Report on existing examples and performance contracting energy service model", are best placed to meet the needs of the Municipality of Messina: First In, Shared Saving and Chauffage.

In fact all respond, even if in part, to the constraints that have been highlighted at the time of the definition of the reference scenario:

TYPE OF CONTRACTS APPLICABLE		
CONTRACT	**APPLICABILITY**	**MAIN REASON**
FIRST IN	**YES**	Meets the need of the Municipality to get immediately a small savings guaranteed in advance; normally, if they persist the economic conditions, the duration of the contract is within the previously shared constraints
SHARED SAVINGS	**YES**	Allows sharing of savings in flexible way and the contract period respects the maximun duration possible, remaining the economic conditions, the maximum possible; it is applicable in case of significant value investments through the support of a third funder (municipality) against the ESCO
CHAUFFAGE	**YES**	Provides for the payment of the energy account by the ESCO ensuring in this way the savings expected, allows that a part of the cost of the installations is paid directly by the city in order to reduce return times, the ESCO can benefit of the savings obtained, of the ability to save on the purchase of energy carriers and of incentives of the Conto Termico in order to reduce the payback time of the investments as soon as possible

TABLE19 – List of the contracts applicable to the three projects of Messina

The reasons for which the other types of contracts are not applicable are shown in the next table:

TYPE OF CONTRACTS NOT APPLICABLE		
CONTRACT	**APPLICABILITY**	**MAIN REASON**
FIRST OUT	**NO**	It provides that the municipality, for the duration of the contract, continues to spend as before interventions by not responding to the need to obtain immediate savings of 2%
GUARANTEED SAVINGS	**NO**	It expects that the investment is made entirely by the City that instead can have the ability to finanzare only part. Furthermore, this contract provides a thorough understanding of the contractual instruments in order to constantly monitor the achievement of the expected results
PAY FROM SAVINGS	**NO**	It expects that the investment is made entirely by the City through a third funder party that is refunded on the basis of the annual savings achieved; this system gives not the annual expenditure forecast certainty.
FOUR STEPS	**NO**	The contract is applicable when, with the savings of the first year obtained by an energy careful management, you get the savings to be reinvested in the following year. The projects include works of such magnitude that, as we have seen, provide considerable initial investments.
BUILD OWN OPERATE & TRANSFER	**NO**	It does not respect the constraint of a contracted maximum duration of nine years; In fact, this type of contract provides very long contract durations in order to allow the return of investments

TABLE20 - List of the contracts not applicable to the three projects of Messina

Based on the analysis previously performed, the Municipality can use the array of risks related to the three types of contracts applicable in order to compare them and to make a choice.

All three contracts transfer more than 75% of the risk to the ESCO thereby ensuring the Municipality City that, as reported above, not having wide experience in the management of such initiatives.

See figure 1.

The analysis of the differences among the three risk-arrays corresponding to the three types of contract applicable (FIRST IN, Shared savings, Chauffage) shows:

• FIRST IN = less transfer to the ESCO of counterparty risk and greater transfer of risk of construction to the ESCO

• SHARED SAVING = less transfer of external risks to the ESCO

• CHAUFFAGE = less transfer to the ESCO of counterparty risk and a greater transfer to the ESCO of environmental, construction and market risk

The optimal solution corresponds to a contract that combines the three Types of contracts, so that it can:

- secure the sharing of the savings in a defined way where only 5% of savings go to the Municipality; In fact in this way fulfils the need of the municipality itself to get an annual reduction of current expenditure by 2% and simultaneously reduces time of return borne by the ESCO investments and allow you stay within the maximum contract term of nine years;
- ensure that all works of energy renovations are executed by the ESCO, who assumes the technical risk, providing that a share of the cost of investment, 1,700,000 euro, both burden of the municipality, paid as rent to the ESCO;
- transfer to the ESCo the incentives of Conto Termico in order to reduce the amount of the investment
- insert in the contract the supply of energy carriers in order to:
  - allow the Municipality to have the implied warranty of anticipated savings; in fact, the municipality itself would not pay more energy than planned in the design phase;
  - leave to the ESCO the responsibility of optimizing the purchase prices so as to allow possible reductions of investment return times.

5.2. ALIMOS

The Municipality of Alimos is located south of Athens, precisely 8 km south of Athens city centre[5]. In the 2011 census counted 41,720 inhabitants and covers an area of 7.5 km^2, with a population density of approximately 5,600 inhabitants / km^2.

Public administration	
Municipality	Alimos
County	Attiki
Region	Central Greece
Territorial facts	
Coordinates	37°55' N 23°43' E
Altitude	10 m a.s.l.
Surface	7.5 km^2
Inhabitants	41,720
Populationdensity	5,600 hab./km^2
NeighboringMunicipalities	Elliniko-Argiroupoli, Ilioupoli, AgiosDimitrios, PalaioFaliro
Other information	
Postal code	17455 & 17456
Tel. Code	210
Time zone	CET + 1
Seismic classification	Zone 1

TABLE21 – Data of Alimos

[5] https://en.wikipedia.org/wiki/Alimos

5.2.1. Regulatory and policy framework

Following the Directive 2012/27/EU Greece established its energy saving targets by setting the final energy consumption in 2020 at 20.5 Mtoe.

With regard to the Directive 2010/31/EU Greece he has not yet implemented; technical parameters around the definition of nZBE, will be regulated by the end of 2015 and in any case will be required for existing public buildings except in the event of major restructuring.

In line with the national objectives of the Municipality Alimos has set a savings target of 30 to 40% lower consumption of municipal buildings, the forecast is that this plan can only be completed through contracts with ESCOs in which interventions will be paid through the savings achieved.

Serious obstacle to the achievement of these objectives can arise from legislation governing public contracts, such as:

- Prices for the design and implementation of measures in public buildings must be defined through the use of the price list ATOE, away from the current market prices and updated to 2007 so it can be used with new technologies and materials.
- In the public sector a contract is awarded on the basis of lowest price offered. The procedure does not take into account an indicator of cost-effectiveness. This is not required by the rules, but in practice it does not guarantee an offer the lowest price, it is very difficult to adopt.

5.2.1. Analysis of current economic conditions

As all of Europe, but Greece in particular, for several years it has to undergo a significant economic crisis which forced the central government to implement measures particularly severe reduction in public spending. Such measures have effectively reduced considerably the resources of Commons and have increased considerably the cost of borrowing for investment.

5.2.2. Main sources of financing

For the execution of the project of energy efficiency in the Municipality Alimos the past has greatly used the following sources of financing:

• Utilization of NSRF[6] fund

• Participation to the program of public investments

• Use of financial instruments as the Fund Jessica and Jeremy

• Bank loans

• Corporate Social Responsibility

Such sources are gradually going to run out; In fact, when the bottom NSRF does not issue calls for project funding, the use of funds as Jessica is very low for the difficulties they find in accessing the municipalities, the use of banks is extremely limited especially given the high cost of money, public funding programs are still moments and also channel its Corporate Social Responsibility, given the current economic crisis in the country, it is lacking because few private companies have as a priority to allocate part of their budgets for activities Corporate Social Responsibility.

This leaves only the direct funding of the municipality that, at the time, devoted most of the budget to cover current operational needs of the municipality and can't realize the energy efficiency measures.

5.2.3. Advantages and disadvantages of each energy service models

It must be stated that the Municipality of Alimos, like other municipalities, has no previous experience of working with ESCOs and identifies transparency in contractual energy and competence of the key points for a future relationship with the ESCO.

Another aspect to consider in the identification of possible types of EPC is that in 2014 in Greece were published two models of EPC contracts: Guaranteed Savings and Shared Savings.

[6] National Stronger Regions Fund (NSRF)

These aspects must be considered when choosing the most suitable type of contract along with a working hypothesis about the goals that the City will arise at the time of writing Notice.

In fact, as previously mentioned, on the basis of information gleaned about the current condition of the Municipality of Alimos is necessary to define certain conditions / willingness of the municipality that will determine the choice of one or another type of contract.

5.2.4. Technical and financial characteristics of the energy efficiency schemes

The following table summarizes the technical characteristics of the three building of Alimos audited:

Building	Surface area m²	Annual consumption kWhe	Energy costs
City Hall	1302	111965	€ 16.347,00
Municipal Offices	446	30160	€ 4.403,00
Library	611	42.123	€ 6.152,00
Total		**408.407**	**€ 26.865,00**

TABLE22 -Technical characteristics of the audited building of Alimos

It highlights that were examined three buildings of small size and with an annual consumption of energy not particularly significant.

The tables below show a list of energy-efficiency measures identified for each building with the related costs.

a) MUNICIPAL CITY HALL

FIGURE 16 – Municipal City Hall (Alimos)

The building consists of five floors and a basement. The first two levels and basement were built in 1986, while the other 3 were added in 1996. Each floor is divided into two areas: offices and the public entrance hall.

The zones are separated by insulated walls being the Hall an unheated area.

The walls have insulating layer and the windows have double glazing in an aluminium frame.

As for the HVAC there are two types of air conditioning systems used: split system and air systems that provide heating and cooling using electricity. Lighting is provided mainly by T8 fluorescent lamps with magnetic ballast.

In the renovation project they were taken into account several of interventions that form a complete mix that should lead to an approximately 93% energy saving.

INVESTMENTS	€
HVAC	65.314
Lighting system (internal)	15.370
Renewable energy	20.900
Casing Building skin	88.215
Windows - Low e Thermo Break	45.000
Control system	17.000
Passive sistem	1.000
Investment for renovation	**252.799**

TABLE23 -Investment for renovation options of the 1st building of Alimos (Source D2.5)

HVAC

The new HVAC system will be a multi-zone VRV system constituted by three external units and forty four indoor units . The internal units and the ceiling cassette will be installed in every office and will be checked by individual thermostats so that each office has the desired indoor air temperature.

Lighting system (internal)

All of the palace lamps will be replaced with new LED lamps. Furthermore brightness sensors will be installed on equipment located close to the windows of the floors up of the 3 so that the artificial lighting can be switched off automatically when the desired lighting levels are achieved.

RES

The building is located in a densely populated area that offers limited opportunities for using renewable energy sources due to shading from nearby constructions. A small photovoltaic system on the roof has been installed.

The installed capacity will be 15.26 kWp with an estimated annual production of 20,900 kWh

Building envelope

Opaque structure: The thermal insulation of the walls and roof will be enhanced by the addition of styrofoam 5cm, having nominal thermal conductivity 0.032 W/mK, which will be placed externally.

Shading system: to improve the thermal performance of transparent and reduce the cooling demand during the summer, the shading devices will be installed.

Natural ventilation at Night: vents fitted with shutters will be installed in the facades to the north and south of the building, so as to obtain a cross-ventilation on each floor. The ventilation openings automatically work when the outside temperature is sufficiently lower than inside.

Windows - Low and Thermo Break

Similar to the thermal insulation, a sensitivity analysis was performed to the windows; it was concluded that the best choice will be a window with an overall U value of 1.80 W/m^2K. A low-e coating is provided on the inner side of the outer glass sheet to reduce the heat input.

Passive System

In order to avoid any potential overheating of the offices south of the building will be executed in the proper internal walls that separate the southern and northern areas on the second and third floors to allow the circulation of the heat generated by solar radiation.

Control System

To optimize the performance of the mechanical and electrical systems such as lighting, ventilation and HVAC system, an energy management system will be installed (BMS).

b) MUNICIPAL OFFICIES

FIGURE 17 – MunicipalOfficies (Alimos)

The building houses the environmental services and hygiene of the Municipality . It is a one-storey building, surrounded by a large open space for parking, and garage. The construction completed in 1986.

The walls are built with a layer of insulation between two layers of bricks (cavity walls), the roof slab is insulated with 6 cm extruded polystyrene and there is a mineral fiber false ceiling in the office space. The windows are equipped with double glazing in an aluminum frame.

As regards the Heating and cooling systems, it consists of air-conditioning split units.

The lighting system consists mainly of T8 fluorescent lamps with magnetic ballast.

The energy efficiency project takes into account different types of interventions that form a complete mix that should lead to an energy saving of almost 100%.

The annual consumption is modest, especially for limited hours of use building.

INVESTMENTS (ESCo)	€
HVAC	17.520
Lighting system (internal)	3.285
Renewable energy	37.380
Casing Building skin	21.000
Windows - Low e Thermo Break	10.000
Control system	8.800
Ventilation systems	3.150
Investment for renovation	**101.135**

TABLE24 -Investment for renovation options of the 2nd building of Alimos (Source D2.5)

HVAC

There is a multi-zone VRV system installation and includes an outdoor unit and fourteen indoor units. The indoor units are controlled by individual thermostats so that each office has the desired indoor air temperature.

Lighting system (internal)

All lamps of the building will be replaced with new LED lamps. Light sensors will be installed in offices in the north-east side to take advantage of daylight by turning off the artificial light automatically when the desired lighting levels are achieved.

RES

A 26.7 kWp photovoltaic system will be installed on the roof for an annual production of 37,300 kWhe. The proposed system is oversized to cover the demand of electricity for heating, cooling, and lighting and is able to overcome all the electrical needs for the operation of activities that take place in the building, such as PCs, printers, etc.

Building envelope

The thermal insulation of walls and roof will be enhanced by the addition of 5 cm of polystyrene, having thermal conductivity of 0.032 W/mK, which will be placed externally.

Windows - Low and Thermo Break

Following a careful analysis it was decided to choose a window with an overall U value of 1.80 W/m^{2}K. A low-e coating is provided on the inner side of the outer glass sheet to reduce the heat input.

Control System

To optimize the performance of the mechanical and electrical systems such as lighting, ventilation and HVAC system, an energy management system will be installed (BMS).

Ventilation Systems

In order to further reduce the energy demand for cooling is provided provision for natural night ventilation. The building will be equipped with air vents fitted with dampers on the opposite sides, so as to obtain a cross ventilation. The ventilation openings automatically work only when the outside temperature is lower than the indoor.

c) MUNICIPAL LIBRARY

FIGURE 18 – Municipal Library (Alimos)

The municipal library building was built in 1984. It consists of five floors and a basement. The City uses the first three floors and the basement to house the municipal library, offices, school activities and dance classes. The rest of the building is for residential use. This aspect is a special feature because not all the building is in the availability of the municipality and the decisions regarding changes to the common areas must be taken unanimously. The outer walls are made of two layers of bricks with insulation between the two layers (cavity walls) and reinforced concrete. The roof slab is insulated with 8 cm of extruded polystyrene. The windows are equipped with double glazing in an aluminum frame.

Split and underfloor systems powered by electricity are used for the conditioning. The ground floor and first floor use even oil radiators for heating. The central heating system is currently out of use. Lighting is provided mainly by T8 fluorescent lamps with magnetic ballast.

In the energy efficiency project, they have been taken into account different types of interventions that form a complete mix that should lead to a nearly 73%.

The annual energy consumption is modest for both the limited use of the building that for the low consumption of energy of activities that take place in the same.

INVESTMENTS	€
HVAC	15.350
Lighting system (internal)	2.150
Renewable energy	8.000
Casing Building skin	30.900
Windows - Low e Thermo Break	40.650
Control system	3.010
Ventilation systems	4.000
Investment for renovation	**104.060**

TABLE25 - Investment for renovation options of the 3rd building of Alimos (Source D2.5)

HVAC

The existing cooling systems will be replaced with new and more efficient. As it regards heating the building it was decided to proceed with the conversion of the old boiler to a new pellet boiler. In addition the pipes for the heating system will be isolated and the pumps will be substituted with other inverter.

Lighting system (internal)

All of the palace lamps will be replaced with new LED lamps. Also they will be installed light sensors located on the equipment next to the windows of the three upper floors. The actions mentioned above make it possible to take advantage of the daylight as artificial lighting.

RES

In addition to central boiler biomass, it will be installed on the roof a 5.73 kWp photovoltaic plant with annual production of 8,040 kWh energy.

Building envelope

The thermal insulation of the walls and roof will be enhanced by the addition of styrofoam 5cm, having thermal consuctivity of 0.032 W/mK, which will be placed externally.

Windows - Low and Thermo Break

Following a careful analysis it was decided to choose a window with an overall U value of 1.80 W/m^{2}K. A low-e coating is provided on the inner side of the outer glass sheet to reduce the heat input.

Control System

The use of a thermostat in each room in the building will ensure that the indoor air temperature is stable and will prevent the excessive use of energy. Furthermore, in order to record the energy consumption of installations, it will be installed electric power meters on switchboards.

Ventilation Systems

In order to further reduce the energy demand for cooling is provided a natural night ventilation. The building will be equipped with air vents fitted with dampers on the opposite sides, so as to obtain a cross ventilation on each floor. The ventilation openings automatically work only when the outside temperature is lower than the indoor.

It highlights how for all three projects the investment necessary assumes a content value of € 457,994.00 and produces an annual saving of 165,290 kWh.

By the Deliverable 2.5 "Twelve economic evaluation reports" were extracted the following economic and financial summary data related to each building that highlight as energy savings in all cases is higher than 70% and overall by 90%

Building	Square meter (m2)	Energy consumption	Energy expenditure	Cost of the Investiment	Energy Saving		Savings (Energy + Maintenance)	Payback period
		kWh/year	€/year	€	kWh/year	%	€/year	year
City Hall	1.302	111.965	€ 16.347,00	€ 252.799,00	104.537	93%	€ 18.698,00	14,00
Municipal Offices	446	30.160	€ 4.403,00	€ 101.135,00	30.160	100%	€ 3.433,00	29,00
Library	611	42.136	€ 6.152,00	€ 104.060,00	30.593	73%	€ 3.269,00	32,00
TOTALI	**2.359**	**184.261**	**€ 26.902,00**	**€ 457.994,00**	**165.290**	**90%**	**€ 25.400,00**	**18,03**

TABLE26 -Economic evaluation for renovation schemes of Alimos

The analysis from the economic point of view of the three projects shows that only for the City Hall the Payback time is below of 15 years, while in the other two buildings is particularly long.

Only through the contribution of capital by the municipality and / or recourse for a part to funds from third parties, all three projects can be economically attractive to the ESCO market.

For all three projects it was necessary to perform a profitability analysis for single intervention designed using two indices: the investment /savings ratio and therefore the relationship between IRR and savings percentage. This analysis shows that for some interventions, that are not of pure energy saving but redevelopment asset, might be appropriate to evaluate the opportunity to exclude them, in a first step, from the technical project to be implemented (see. 3.4. D2.5) to place them possibly at a later stage.

In practice, interventions were analyzed according to economic convenience: we analyzed the cost of each project and its contribution to energy saving. This analysis shows that some high-cost interventions carry a marginal contribution to overall savings.

Site	Intervention	Investment (€)	Savings (€)	Investment/	Cumulated	Invstiment
Municipal City Hall	External insulation	67.890	507	134	74%	29%
	Windows	45.000	92	488	75%	19%
		112.890	599	188	4%	49%
Municipal Officies	External insulation	21.000	148	142	74%	56%
		21.000	148	142	4%	56%
Municipal Library	Windows	40.650	95	430	55%	
	External insulation	30.900	9	3470	55%	32%
		71.550	104	688	0%	32%

TABLE 27 – Renovation schemes for Alimos

This analysis shows how a total reduction of 36% of the investments produces a reduction of the savings of only 3%.

The document D2.5, in order to finance all interventions tries to optimize the financial structure of the investment in order to make the initiative more attractive for the ESCO through the use of other sources of funding; the result of this analysis leads to the following conclusions:

a) It is necessary a non-repayable contribution of the Municipality to € 284,100.00

b) It is necessary to the finding of a loan fund subsidized by 1.5%, 14-year, to € 178,000.00 with indebtedness of the City

c) It is necessary to reduce the total value of the fund by ESCO to € 49,122.00

d) Payback time not over 15 years

FINANCIAL STRUCTURE OPTIMIZATION BY DELIVERABLE 2.5				
	Municipal City Hall	Municipal Officies	Library	TOTALE
Equity investment by the ESCo	€ 26.840,00	€ 10.991,00	€ 11.291,00	€ 49.122,00
Senior debt				€ -
Subsided Funds (duration 14 years);	€ 117.000,00	€ 30.000,00	€ 31.000,00	€ 178.000,00
Grant (Incl. VAT);	€ 134.100,00	€ 74.000,00	€ 76.000,00	€ 284.100,00
	€ 277.940,00	€ 114.991,00	€ 118.291,00	€ 511.222,00
Duration of the contract:	25 years	25 years	25 years;	

TABLE 28 – Proposal of optimization of financial structure for the three projects of Alimos

5.2.5. Phase 1 - "Definition of possible scenario"

The municipality wants to carry out a transformation intervention of some buildings in nZEB and proceed through the use of a contractual instrument such as the Energy Performance Contracting - EPC.

In order to identify the possible scenario and the possible solutions to the realization of energy renovation projects, the following documents have been used:

- D3.2 "Report on analysis of the current conditions of Alimos"
- D2.1 "Report presenting the 3 nZEB renovation schemes in Italy, fully documented with technical and economic evaluation"
- D2.5 "Twelve economic evaluation reports"

and comparing with the municipality, the choice of the type of EPC contract depends by the following elements:

1. The situation in Greece shows us contrasting situations from the point of view of development of initiatives aimed at energy saving involving ESCO and Third Funders:

a. The high cost of electricity, the climate favors the energy consumption during the long summer months and the low cost of taxation (" taxation rate is at 50% the below the average of the group of the 4 countries" - Source D2.5) aims at increasing investment related to energy conservation;

b. The high cost of money and the 61th place of Greece in the world ranking of Doing Business of the World Bank, in which it is easy realize entrepreneurial initiatives, make these projects rather complicated with a long-term funding.

2. The financial analysis of the deliverable 2.5 shows that for all three projects there is a need to separate the asset redevelopment, which doesn't produce energy savings, by the others for which you also need a direct financial contribution by Municipality:

a. the energy audits and the projects submitted for 3 buildings have high cost (more than € 450,000.00) in the face of content energy savings in absolute value ;

b. The average payback time of the investment for the two projects is nearly 30 years while the third comes close to 14 years;

c. It is necessary to use Third Party Financing or incentives.

3. The analysis of the constraints and economic and policy choices of the Municipality of Alimos identifies various situations:

a. The municipality can allocate few resources for energy saving measures in the order of 10,000 euro per year and cover energy improvements on a small scale.

b. The Municipality is exploring the possibility of receiving the grants by the Through Corporate Social Responsibility

c. There is no legal constraint on the length of the contract

d. The Municipality has no specific experience in the management of energy saving projects and EPC contract management

e. the Municipality would like to share a percentage of the savings. It is understood that this percentage would be small because the municipality does not contribute to the investments, while at the same time enjoys of a rise in property value.

f. Although there is no legal constraint, the Municipality has no intention of acquiring bank loans to implement energy improvements.

g. The Municipality has never had experience of contract that includes the supply of the energy carrier, so it would like to have more clarification.

h. The Municipality is willing to share with the ESCO the cost savings resulting from the extra production of electricity by the PV system installed in the Municipal Officies.

The scenario puts to the Municipality the need to make more attractive the projects through choices based on broad analyzes reported in Deliverable 2.5.

In particular, the Municipality will have to first create the conditions for which it is feasible the use of a public / private partnerships through an EPC contract and then locate the most suitable contract type.

These conditions can be realized through the reduction of the interventions with the exclusions of those high-cost and low energy saving, enlargement, in some cases, of the possible revenues to ESCO, the optimization of the financial structure of investments with the use of other sources of funding which take account of the constraints.

The proposals set out in the D2.5 and previously summarized, in fact are not realistically achievable especially with regard to the investment that should be ensured by the municipality; so you will need to do upstream of the choices in order to make feasible the projects respecting the above constraints listed.

The proposals set out in the D2.5 and previously summarized, in fact are not realistically achievable especially with regard to the investment share grant that should be ensured by the municipality; so you will need to make the choices in order to make feasible the projects according to the above listed constraints.

The choices could be:

A. For each building revise the interventions to be carried out in view of the elimination of those high-cost and low energy yield in order to reduce the overall cost of investment;

B. find other sources of funding because it is not possible to use own capital of the municipality, in order to reduce the investment share held by the ESCO;

C. Evaluate the opportunity to carry out projects with distinct EPC contracts or under a single contract covering all or most buildings;

D. Check the possibility of including in the project the recognition to the ESCO of a portion of the excess savings resulting from the electricity produced by the photovoltaic system installed at the Municipal Offices;

From the above situation there are two situations that we are going to analyze in different ways:

- Re-examine the situation of Municipal Offices in the light of potential increases in revenues for the ESCO for the extra production of PV energy;
- The need to make more attractive the Municipal City Hall and Municipal Library projects through choices based on the above analysis. In particular, in the latter case, the Municipality will have first to create the conditions for which it is feasible the use of a public/private partnerships through an EPC contract and then locate the most suitable contract type.

a) Municipal Officies scenario

The photovoltaic system designed meets completely the energy needs of the technological systems of the building and the electricity needs for equipment in support of the activities that take place within the building, such as, PC, monitor, copiers, etc.

As occurred in the Baseline Scenario, the Municipality is available to share with the ESCO this cost savings in order to make possible the realization of an efficiency improvement project.

It is proposed to add to the revenues of the ESCO, arising from energy savings, even those arising from the extra production of electricity, recognizing to the ESCO a fee equal to the value of the energy produced in more at market price less a discount of about 10%.

Proceeding with this hypothesis, the following solution can make attractive the project to the market by responding to the previously mentioned points:

A. The temporary exclusion of the works relating to the interventions External insulation and Night Ventilation, previously described, can produce an investment reduction of approximately 24% and energy savings of only 3%;

B. Even if through the intervention referred to in points A and D, the payback time is reduced to 9.5 years, you will definitely need the use of a fund to finance a part of the investment because it is not possible to resort to capital of the Municipality;

C. In this case the combination of this project with the others does not produce significant benefits on payback times so it is assumed to treat the building individually;

D. Availability of the Municipality to recognize to the ESCO a fee for the electricity produced and used in the building produces a rise of revenues for the ESCO by about 90%.

	Investment	Savings	Investment/Savings ratio	Cumulated saving
	(€)	(€)		
Municipal Officies	76.985	4.177	18,4	55%
Municipal Officies extra saving FV		3.861		
TOTAL	76.985	8.038	9,6	
Reducing investment/savings	-24%	92%		

TABLE 29 – Proposal of reducing investments for Municial Offices of Alimos

These interventions make the project in principle feasible to market conditions although with long contract durations.

b) Scenario for Municipal City Hall and Municipal Library

The solution that can make palatable to the market the two projects by responding to points previously indicated, consists reducing the investment costs through the spin-off of the following actions, as indicated in the table above:

- Municipal City Hall
  - External insulation
  - Windows
- Municipal Library
  - Windows

- External insulation

This reduction of interventions leads to a reduction of approximately 40% of capital to be invested with an overall reduction of about 3% energy savings.

	Investment	Savings	Investment/Savings ratio	Cumulated saving
	(€)	(€)		
Municipal City Hall	139.909	14.663	10	71%
Municipal Library	73.201	4.845	15	55%
TOTAL	213.110	19.508	11	
Reducing investment/savings	-40%	-3%		

TABLE 30 - Proposal of reducing investments for Municipal City Hall and Municipal Library of Alimos

Thus the payback time of the two projects becomes 11 years from 16 years calculated on the full intervention.

A. The Municipality proceeds to activate forms of financing through the use of Subsided Fund being very small the direct investment capacity of municipality; the total value of financing will take a considerable value to make the project palatable, at the standard conditions of the market, and the ESCO will help with the rest of its capital. This percentage may drop if the Municipality will be able to activate the tool Corporate Social Responsibility.

B. The joined the two projects produces undoubted advantages in fact the total payback time passes to 11 years with an elongation of one year as regards the Municipal Cit Hall but with a reduction of 4 years regarding the Municipal Library.

5.2.6. PHASE 2 "DEFINITION OF POSSIBLE EPC CONTRACT APPLICABLE"

Once the conditions that make applicable an EPC contract are defined, is necessary to identify the types of contract for the Municipal Offices and another for the two buildings - Municipal City Hall and Municipal Library.

The following table summarizes the aspects that can be discriminated in choosing a type of contract relative to each other. These aspects are summarized in order to synthesize them and then associate them with various types of EPC contracts previously described, to assess the impact that each of them has on each type.

a) *Municipal Offices contract*

ASPECTS	VALUATION	NOTE
Total value of the investments	Low	€ 76.985,00
Payback time of the investments	Medium	9 years
Constraints on contract duration	NO	
Knoledge of the tools (EPC contract, FTT)	Low	
Municipality capacity to finance all the interventions	None	
Municipality capacity to finance part of the interventions	None	
Possibility of the Municipality to borrow	Yes	
Need to obtain an immediate cost savings	NO	
Presence of the supply of energy carriers in EPC contract	NO	
Sharing of the cost savings resulting from the extra electricity production of photovoltaic system	Yes	

Type of EPC
FIRST IN
FIRST OUT
GUARANTEED SAVINGS
SHARED SAVINGS
PAY FROM SAVINGS
FOUR STEPS
BUILD OWN OPERATE & TRANSFER
CHAUFFAGE

TABLE 31 - Key aspects of the Alimos' Municipal Officies scenario vs EPC contracts

To obtain the numerical results from a purely qualitative assessment it has been valued, through the score of the table 6, the impact that the single aspect, identified in the reference scenario, has on the choice of the type of contract.

The application of this method is summarized in the following table in which you compare the key aspects of the scenario with the various types of EPC contracts.

ASPETTI	NOTE	VALUATION	IMPACT							
			FIRST IN	FIRST OUT	GUARANTEED SAVINGS	SHARED SAVINGS	PAY FROM SAVINGS	FOUR STEPS	B. O. T.	CHAUFFAGE
Total value of the investments	€ 76.985,00	Low	1,00	1,00	0,00	1,00	0,00	-2,00	-2,00	0,00
Payback time of the investments	9 years	Medium	1,00	1,00	1,00	1,00	0,00	-2,00	-2,00	0,00
Constraints on contract duration		NO	-1,00	-1,00	1,00	-1,00	-1,00	1,00	-2,00	-1,00
Knoledge of the tools (EPC contract, FTT)		Low	0,00	0,00	-1,00	0,00	-2,00	0,00	-1,00	0,00
Municipality capacity to finance all the interventions		None	1,00	1,00	-2,00	1,00	-2,00	1,00	1,00	0,00
Municipality capacity to finance part of the interventions		None	1,00	1,00	-2,00	1,00	-2,00	1,00	1,00	0,00
Possibility of the Municipality to borrow		Yes	0,00	0,00	1,00	0,00	1,00	0,00	1,00	0,00
Need to obtain an immediate cost savings		NO	0,00	1,00	0,00	0,00	1,00	-2,00	1,00	1,00
Presence of the supply of energy carriers in EPC contract		NO	0,00	0,00	-1,00	0,00	1,00	1,00	1,00	-2,00
Sharing of the cost savings resulting from the extra electricity production of photovoltaic system		Yes	-1,00	-1,00	-2,00	1,00	1,00	-1,00	0,00	1,00
			2,00	3,00	-5,00	4,00	-3,00	-3,00	-2,00	-1,00

TABLE 32 - Weight of the key aspects of the Alimos' Municipal Offices scenario on EPC contracts

This analysis shows that only three types of contracts, among those described in the document D.3.5, are best placed to meet the needs of the Municipality of Alimos: First In, First Out and Shared Savings. In fact all respond, even if in part, to the constraints that have been highlighted at the time of the definition of the reference scenario:

TYPE OF CONTRACTS APLICABLE		
CONTRACT	**APPLICABILITY**	**MAIN REASON**
FIRST IN	**YES**	It meets the need of the Municipality not to support investment and could enable it to obtain immediately a part of the savings.
FIRST OUT	**YES**	It provides that the municipality, for the duration of the contract, continues to spend as before intervention, fact the town has no need to share a part of the savings even if these savings can reduce the payback time.
SHARED SAVINGS	**YES**	Allows sharing of savings in extent flexible and is applicable in the case of average investment even without the contribute of the City that might allow the Municipality to reduce the payback time.

Table 33 – List of the contracts applicable to the Municipal Offices of Alimos

The reasons for which the other types of contracts are not applicable are shown in the next table:

TYPE OF CONTRACTS NOT APPLICABLE		
CONTRACT	APPLICABILITY	MAIN REASON
GUARANTEED SAVINGS	NO	It expects that the investment is made entirely by the City that instead does not have the capacity to invest.
PAY FROM SAVINGS	NO	It expects that the investment is made entirely by the City through a third funder who is repayed on the basis of the annual savings achieved; this system does not give the annual expenditure forecast certainty and provides the debt of the City. It is feasible with a banking system that invests in energy-saving projects and is viable for higher investment values
FOUR STEPS	NO	The contract is applicable when, with the savings in the first year corresponding to an energy careful management, you get the savings to be reinvested in the following year. The expected savings are based on realization of a PV system and are not feasible with management savings: is necessary initial funding.
BUILD OWN OPERATE & TRANSFER	NO	This type of contract provides very long contract durations in order to allow the return of investment, very superior with those expected.
CHAUFFAGE	NO	This type of contract provides for the payment of energy bill, mainly that of the fuel, by the ESCO; the municipality has never entrusted the management of energy carriers to a third party and does not have i

TABLE 34 - List of the contracts not applicable to the Municipal Offices of Alimos

Based on the analysis previously performed and related economic analysis, the City can apply the matrix of risks to the selected three types of contracts in order to proceed to the comparison and to a choice among these.

All three contracts transfer more than 70% of the risk to the ESCO thereby ensuring the Municipality, which has indicated that it has already had experience in managing EPC contracts. The contract that offers greater guarantees to the Municipality is First out with 78% of the risks allocated to ESCO.

See figure 1.

The analysis of the difference among the three matrices risk corresponding to the three possible EPC applicable shows:

• FIRST IN = greater transfer to the ESCO of counterparty risk and a lower transfer of the technology risk

• FIRST OUT = a greater transfer to the ESCO of the market risks and a lower transfer to the ESCO of technological risk

• SHARED SAVING = lower transfer to the ESCO of the market risks

The better solution is to build a contract Shared Saving in which:

- The municipality pays a fee equal to the savings obtained, retaining a 5% plus an additional fee on energy surplus produced by the PV system calculated at market prices and discounted by 10%;
- All the interventions will be carried out and financed in part by the ESCO, who assumes the technical and financial risk.

b) Contract for Municipal City Hall e Municipal Library

ASPECTS	VALUATION	NOTE
Total value of the investments	Medium	€ 213.110,00
Payback time of the investments	High	11 years
Constraints on contract duration	NO	
Knoledge of the tools (EPC contract, FTT)	Low	
Municipality capacity to finance all the interventions	None	
Municipality capacity to finance part of the interventions	None	
Possibility of the Municipality to borrow	Yes	
Need to obtain an immediate cost savings	NO	
Presence of the supply of energy carriers in EPC contract	NO	

Type of EPC
FIRST IN
FIRST OUT
GUARANTEED SAVINGS
SHARED SAVINGS
PAY FROM SAVINGS
FOUR STEPS
BUILD OWN OPERATE & TRANSFER
CHAUFFAGE

TABLE 35 - Key aspects of the scenario of Municipal City Hall and Municipal Library of Alimos Vs EPC contract

To obtain the numerical results from a purely qualitative assessment, it has been valued, through the score of the table 6, the impact that the single aspect, identified in the reference scenario, has on the choice of the type of contract.

The application of this method is summarized in the following table in which you compare the key aspects of the scenario with the various types of EPC contracts.

ASPECTS	NOTE	VALUATION	IMPACT							
			FIRST IN	FIRST OUT	GUARANTEED SAVINGS	SHARED SAVINGS	PAY FROM SAVINGS	FOUR STEPS	B. O. T.	CHAUFFAGE
Total value of the investments	€ 213.110,00	Medium	1,00	1,00	0,00	1,00	0,00	-2,00	-2,00	0,00
Payback time of the investments	11 years	High	1,00	1,00	1,00	1,00	0,00	-2,00	-2,00	0,00
Constraints on contract duration		NO	-1,00	-1,00	1,00	-1,00	-1,00	1,00	-2,00	-1,00
Knoledge of the tools (EPC contract, FTT)		Low	0,00	0,00	-1,00	0,00	-2,00	0,00	-1,00	0,00
Municipality capacity to finance all the interventions		None	1,00	1,00	-2,00	1,00	-2,00	1,00	1,00	0,00
Municipality capacity to finance part of the interventions		None	1,00	1,00	-2,00	1,00	-2,00	1,00	1,00	0,00
Possibility of the Municipality to borrow		Yes	0,00	0,00	1,00	0,00	1,00	0,00	1,00	0,00
Need to obtain an immediate cost savings		NO	0,00	1,00	0,00	0,00	1,00	-2,00	1,00	1,00
Presence of the supply of energy carriers in EPC contract		NO	0,00	0,00	-1,00	0,00	1,00	1,00	1,00	-2,00
			3,00	4,00	-3,00	3,00	-4,00	-2,00	-2,00	-2,00

TABLE 36 – Weight of the key aspects of the scenario of Municipal City Hall e Municipal Library of Alimos on EPC contracts

This analysis shows that only three types of contracts, among those described in the document D.3.5, are best placed to meet the needs of the Municipality of Alimos: First In, First Out and Shared Savings. In fact all respond, even if in part, to the constraints that have been highlighted at the time of the definition of the reference scenario:

TYPE OF CONTRACTS APPLICABLE		
CONTRACT	**APPLICABILITY**	**MAIN REASON**
FIRST IN	**YES**	It responds to the needs of the Municipality not to support investment and could enable it to achieve some of the savings immediately. Normally the duration of these types of contracts is less than the payback schedule
FIRST OUT	**YES**	It provides that the municipality, for the duration of the contract, continues to spend as before intervention, fact the town has no need to share a part of the savings even if these savings can reduce the payback time.
SHARED SAVINGS	**YES**	Allows sharing of savings in extent flexible and is applicable in the case of average investment even without the contribute of the City that might allow the Municipality to reduce the payback time.

TABLE 37 - List of the contracts applicable to the Municipal City Hall and Municipal Library of Alimos

The reasons for which the other types of contracts are not applicable are showed in the next table:

TYPE OF CONTRACTS NOT APPLICABLE		
CONTRACT	**APPLICABILITY**	**MAIN REASON**
GUARANTEED SAVINGS	**NO**	It expects that the investment is made entirely by the City that has not the ability to invest.
PAY FROM SAVINGS	**NO**	It expects that the investment is made entirely by the City through a third funder who is repayed on the basis of the annual savings achieved; this system does not give the annual expenditure forecast certainty and provides the debt of the City. It is feasible with a banking system use to invest in energy-saving projects and is viable for higher investment values
FOUR STEPS	**NO**	The contract is applicable when, with the savings in the first year corresponding to an energy careful management, you get the savings to be reinvested in the following year and is applicable to investment low.
BUILD OWN OPERATE & TRANSFER	**NO**	This type of contract provides very long contract durations in order to allow the return of investment, very superior with those expected.
CHAUFFAGE	**NO**	This type of contract provides for the payment of energy bill, mainly that of the fuel, by the ESCO; the municipality has never entrusted the management of energy carriers to a third party and does not have it

TABLE 38 - List of the contracts not applicable to the Municipal City Hall and Municipal Library of Alimos

Based on the analysis previously performed and related economic analysis, the City can apply the matrix of risks to the selected three types of contracts in order to proceed to the comparison and to a choice among these.

All three contracts transfer more than 70% of the risk to the ESCO thereby ensuring the Municipality, which has indicated that it has already had experience in managing EPC contracts. The contract that offers greater guarantees to the Municipality is First Out with 78% of the risks allocated to ESCO.

The analysis of the difference between the three matrices risk shows us:

• FIRST IN = greater transfer to the ESCO of counterparty risk and a lower transfer of the technology risk

• FIRST OUT = a greater transfer to the ESCO of market risks and a lower transfer to the ESCO of technological risk

• SHARED SAVING = lower transfer to the ESCO of market risks

The better solution is to build a contract of type Shared Savings in which:

- The municipality pays a fee equal to the savings achieved and retains 5%.
- All the interventions will be carried out and financed by a part of the ESCO who assumes the technical and financial risk;
- The Municipality, through access to Subsided Fund, finances a part of the work receiving every year a small part of the savings.

Another possibility to be considered for this contract is to widen the intervention of the ESCO within the Municipal Library building through the involvement of the ESCo in the management of other services, in addition to those maintenance, creating a partnership with the ESCO.

5.3. ERRENTERIA

The Municipality of Errenteria is located in Spain in the province of Gipuzkoa, 7 km from San Sebastian and 476 km from Madrid. It has an extension of 32,26 km^2 and a population of 39,315 inhabitants, with a population density of 1,218.7 inhabitants / km^2.

Errenteria extends to the foothills of the Pyrenees, while it is close to the coastline.

The whole municipality is characterized by its low altimetry and the contact with the sea through the mouth of the River Oiartzun in the bay of Pasaia. This river crosses the town in its last 15 km.

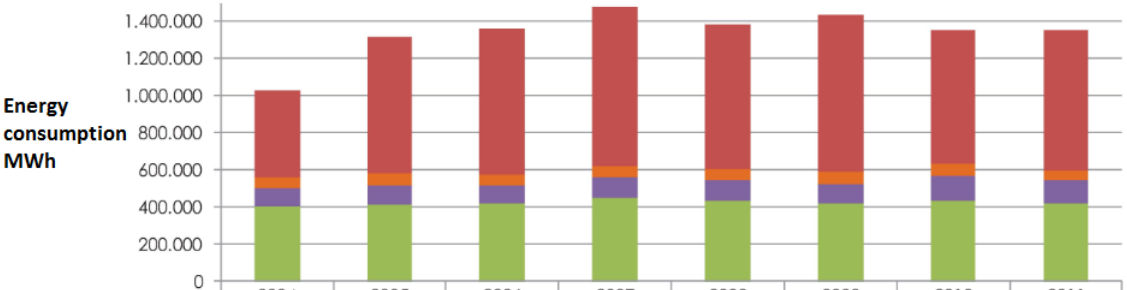
The climate is oceanic, warm (but not hot) summers and cool (but not cold) winters, with a relatively narrow annual temperature range: 18-20ºC in summer and 5-10ºC in winter. Precipitation is abundant and dispersed throughout the year.

During the studied period (2004-2011), the total energy consumption in Errenteria has been variable. 2007 was the year with the maximum amount recorded, with 1,482 GWh.

Industry is the most energy consuming sector. In all the studied years, except 2004, more than the 50% of the total was consumed by industrial activities. The second sector with more consumption is the transport and mobility. The industrial sector has increased its energy consumption by 61% in the period 2004-2011. In the same period, the consumption in the residential sector has been also increased by 25%. On the other hand, in the services sector the consumption has decreased by 7%.

The following figure shows the sectorial consumption during the period 2004-2011.

Sectorial consumption in Errenteria during the period 2004-2011.
Source: Municipality of Errenteria



	2004	2005	2006	2007	2008	2009	2010	2011
TOTAL (with industry)	1.029.929	1.315.456	1.363.037	1.481.255	1.381.006	1.432.627	1.354.669	1.356.457
Industry	471.260	734.778	789.779	858.898	772.784	841.778	721.195	756.492
Services	59.793	60.208	56.084	58.666	59.731	62.905	68.050	55.810
Residential	96.238	109.923	93.071	111.952	113.215	105.811	130.413	120.663
Transport & mobility	402.638	410.547	424.102	451.739	435.275	422.133	435.012	423.492

TABLE39 – Sectorial consumption in Errenteria during the period 2004-2011

The consumption of the Municipality is analysed. Within this figure are included:

- those buildings dependent of the municipality
- public lighting
- municipal fleet

These consumptions are summarized in the following table:

TABLE40–Energy consumption in the municipality by activity

Activity									
	2004	2005	2006	2007	2008	2009	2010	2011	2012
Buildings-public lighting	**MWh**								
Electricity	5,876,853.34	6,023,025.96	5,903,362.64	6,260,108.93	6,339,684.10	6,267,477.97	6,050,293.50	5,715,004.29	5,769,798.22
Buildings	3,437,236.50	3,549,740.61	3,383,556.29	3,741,434.91	3,847,727.05	3,801,293.21	3,683,036.60	3,672,757.24	3,679,022.08
Public lighting	2,439,616.84	2,473,285.36	2,519,806.35	2,518,674.02	2,491,957.05	2,466,184.76	2,367,256.90	2,042,247.05	2,090,776.14
Natural gas		4,359,751.00	4,584,601.00	5,432,997.00	6,047,768.00	5,185,339.00	6,573,798.00	5,064,562.00	6,316,337.00
Vehicles	**Liters**								
Diesel fuel	160,260.72	158,686.22	159,445.00	164,820.85	157,020.74	156,371.96	163,942.06	145,169.45	144,479.11
Gasoline	4,791.94	4,584.72	4,833.58	3,935.52	4,345.92	2,381.39	3,807.43	3,854.21	1,117.90
Biodisel	-	-	-	-	-	-	-	-	-

5.3.1. Regulatory and policy framework

Spain has not transposed Directive 2012/27/EU (there is a draft decree transposing) but has established its energy saving objectives stating the goal of 20% energy savings by 2020.

With regard to the Directive EC / 2010/31 Spain has defined the technical parameters for the classification of nZBE but it was not formulated a their definition.

The conclusion of the third revision of the Technical Building Code, which includes the definition of nZEB, is scheduled for 2019.

The Action Plan 2011-2020 for the Savings and Energy Efficiency of the Ministry of Industry, Tourism and Trade Spanish provides, among other things, measures to revitalize the market of ESCO (plan to promote Energy Service Contracts, known as Plan 2000 ESCO) and the proposed actions necessary to ensure the exemplary role of the public sector.

In this context, and in order to continue the initiatives undertaken in Errenteria in recent years, the mayor of Errenteria in November 2012 joined the Covenant of Mayors. The signatories of the Covenant of Mayors voluntarily commit to increasing energy efficiency and using renewable energy sources on their territories.

Since this effort was born the Action Plan for Sustainable Energy Errenteria to reduce emissions at least 20 of greenhouse gases by 2020; this plan is based on six lines of action:

- Public buildings
    1. Energy efficiency
    2. Renewable energy, mobility, water, waste
    3. Environmental, the primary sector
- Residential
    4. Energy efficiency. Renewable energies
    5. Mobility, water, waste, natural environment
- Service

6. Energy efficiency, renewable energy, mobility, water, waste

5.3.2. Analysis of current economic conditions

The economic crisis that hit Europe also involved Spain, therefore deemed necessary, for the public sector, a strong involvement of private capital in the context of investments in energy efficiency projects, on the other hand the cost of money and the long payback period of such projects is not made them attractive to investors; therefore it is necessary to develop tools such as EPC contracts and the TPF with the involvement of ESCOs.

5.3.3. Mainsources of financing

Spain in the 2011-2020 Action Plan for Energy Efficiency and Savings provides a budget for the sector of the buildings of 27,322 M € of which 2,883 M € for the public sector.

5.3.4. Advantages and disadvantages of each energy service models

It must be stated that the City of Errenteria never had previous experience of working with ESCOs and has expressed its willingness to receive a turnkey service in a future relationship with the ESCO, from design, installation and monitoring (questionnaire INNOVA BIC).

This aspect will have to guide the choice of the most suitable type of contract along with a working hypothesis about the goals that the City will arise at the time of writing Notice.

In fact, as previously mentioned, on the basis of information gleaned about the current conditions of the City of Errenteria is necessary to define certain conditions / willingness of the municipality that will determine the choice of one or another type of contract.

5.3.5. Technical and financial characteristics of the energy efficiency schemes

The following table summarizes the technical characteristics of the three audited buildings:

Building	Surface area m^2	Annual consumption kWe
City hall	2.961	279.160
Kapitain Etxea	395	68.985
Lekuona	4.406	-
Total	**4.801**	**348.145**

TABLE41 - Technical characteristics of the audited building of Errenteria

The following tables lists the energy efficiency measures identified for each building with the related costs and some considerations about the proposed projects.

a) CITY HALL

FIGURE 19 - City Hall building (Errenteria)

It is an impressive building created by the merger of three existing buildings, renovated in 2000; the casing has a good energy performance (insulated walls and almost all windows are double glazed). The actions presented in this project will mainly focus on the lighting system, the improvement of the heating system and the inclusion of photovoltaic panels, with the objective of achieving a nZEB building.

INVESTMENTS	€
HVAC	9.760
Lighting system (internal)	10.493
Renewable energy	149.430
Investment for renovation	**169.683**

TABLE42 - Investment for renovation options of the 1st building of Errenteria (Source D2.5)

HVAC

The heating system is a centralized system of radiators fed by a gas boiler that feeds also the Kapitain Etxea building. The intervention consists in the isolation of the system from that of Kapitain Etxea, which will have an independent system, with an installed

power reduction and improved efficiency of the heating system through the installation of a condensing boiler. The cooling system is divided in independent installations. The first plant cools the administrative area of the third floor, with an air / air group. The second plant is a VRV system composed by 8 condenser units located in the roof. The VRV system provides acceptable levels of energy efficiency and meets the flexibility of the user, so as not to provide for interventions.

Lighting system (internal)

In the proposed restructuring scheme, fluorescent lamps will be replaced by LED lamps. Where possible (for example in areas of sufficient natural lighting), automatic regulators will be installed.

RES

The renovation includes the installation of photovoltaic panels on the roof for an output of 40.2 kWp on an area of 332 m^2.

b) KAPITAIN ETXEA

Figure 20 – Kapitain Extea building (Errenteria)

In this case it is a particular project as compared to other foreseen under CERtuS. In fact the site has been chosen according to the will of Municipality to give back to the citizens the use of a building, to date designed to archives, to make the Basque Museum of Costume. It is obvious that this situation produces a substantial variation of the intended use, an increase in energy consumption due to the increase in volumes heated, of occupational profiles and the lighting levels required. These changes make the savings obtainable post intervention not comparable interventions with the previous situation.

The planned interventions are varied and include both the building envelope that the use of renewable sources.

INVESTMENTS	€
HVAC	21.540
Lighting system (internal)	26.624
Renewable energy	12.602
Casing Building skin	38.224
Windows - Low e Thermo Break	12.646
Investment for renovation	**111.636**

TABLE43 -Investment for renovation options of the 2nd building of Errenteria (Source D2.5)

HVAC

The system is completely renovated to cope with the new use and the detachment of the heating system from that of the City Hall. Wanting to avoid both the installation of radiators under-floor, it was decided to create an air facility operated through an air treatment unit (UTA), which combines ventilation, heating and cooling. In this way there will be a single system, overcoming the problem of lack of space. To improve efficiency, the UTA will be equipped with a heat recovery system.

Lighting system (internal)

The entire system will be replaced, and designed according to the standard values defined for a museum. Although it will be proposed a more efficient system, the installed power will increase in order to meet the conditions of comfort.

RES

The renovation includes the installation of photovoltaic panels to 3.4 kWp, due to the small size of the building.

Building Envelope

The project provides for the insulating the inner surfaces of the wall. The wooden roof, being in poor condition, will be completely replaced while maintaining the appearance, but by improving the insulation.

Windows

Glass and existing frames will be replaced with low-e, thermo break glass; wooden frames so as not to modify the aesthetics of the building. The existing skylight will be removed to include photovoltaic panels.

c) LEKUONA

FIGURE 21 - Lekuona building (Errenteria)

This project stems from the political will to recover an abandoned building, owned by the City, as a high school of Dance and Cultural Center. This restoration project has already started and financed; in order to make the building nZEB. The designers have thought of integrating the original project with the exploitation of renewable energy through the installation of photovoltaic panels. Only this intervention will be used as part of the CERtuS project to build an EPC contract. Also in this case the evaluation is problematic because the original situation of complete abandonment with zero consumption is compared with a design situation in which the energy consumptions are clearly identified.

It is expected for Lekuona only the installation of photovoltaic panels: 450 photovoltaic panels, for a solar area of 281 m^2 with a generation of 35.75 MWh / year.

INVESTMENTS	€
Renewable energy	126.587
Investment for renovation	**126.587**

TABLE44 -Investment for renovation options of the 3rd building of Errenteria (Source D2.5)

Below we analyze the total of three projects realized by the Municipality: it highlights how for all three projects the investment necessary assume an average value which totaled € 407,906.00 and produce annual savings of only 172,001 kWh.

According to the deliverable D2.5 “Twelve economic evaluation reports” the following table summarizes the economic date for each building:

Building	Square meter (m2)	Energy consumption	Energy expenditure	Cost of the Investiment	Energy Saving		Savings (Energy + Maintenance)	Payback period
		kWh/year	€/year	€	kWh/year	%	€/year	year
City Hall	2.961	279.160	€ 25.866,00	€ 169.683,00	91.337	33%	€ 21.478,00	7,90
Kapitain Etxea	395	68.985	€ 5.249,00	€ 111.636,00	44.919	65%	€ 4.971,00	22,46
Lekuona	4.406	-	€ -	€ 126.587,00	35.745		€ 3.704,00	34,18
TOTALI	**4.801**	**348.145**	**€ 31.115,00**	**€ 407.906,00**	**172.001**	**49%**	**€ 30.153,00**	**-**

TABLE45 -Economic evaluation for renovation schemes of Errenteria

In the same document, only the first project, one related to City Hall, has a payback of less than 15 years while the other two have long payback time if there are not external forms of financing or lending of capital of Municipalitiy. In fact, the plans for the redevelopment of Kapitan Etxea and Lekuona born as building restoration projects and change of intended use and not as energy efficiency projects. As it regards the obtainable savings are worth the consideration already reported previously.

In any case the deep retrofitting and the new use of the buildings have provided us a true challenge and a realistic case study that are related to the deep energy retrofitting that focus to nZEBs.

All three projects have a limited number of interventions that do not allow a specific economic analysis for single intervention that permit us to select those in which the relationship between IRR and Saving percentage is the lowest in order to evaluate the possibility to exclude them from the technical design.

5.3.6. PHASE 1 - "DEFINITION OF POSSIBLE SCENARIO"

The municipality wants to carry out a transformation intervention of some buildings in nZEB and proceed through the use of a contractual instrument such as the Energy Performance Contracting - EPC.

In order to identify the possible scenario and the possible solutions to the realization of energy renovation projects, the documents used in this phase are:

- D3.2 "Report on analysis of the current conditions of Errenteria"
- D2.1 "Report presenting the 3 nZEB renovation schemes in Spain fully documented with technical and economic evaluation"
- D2.5 "Twelve economic evaluation reports"

In addition to the study of these documents we have proceeded to a direct confrontation with the Municipality in order to clarify some aspects of the economic and political situation.

The reference scenario consists in the summary of those fundamental aspects that constitute the decision-making framework for the verification of the feasibility for the adoption of an EPC contract.

1. The situation of Spain shows two contrasting situations from the point of view of development of initiatives aimed at energy saving involving ESCO and Third Funders:

a. The high cost of electricity makes the Spain particularly attractive for energy-saving investments;

b. Spain is a country in the 33th place of the world rankings of Doing Business of the World Bank but with a tax charge that reaches the 58%, so the Spain is little attractive for business and financial initiatives;

2. The financial analysis shows that none of the three projects can be considered sustainable for an ESCO and this opens the way to the need of financing by the municipality. The analysis shows:

a. return periods longer than 15 years for two out of three projects;

b. relevant direct investments of Municipality;

c. The need to use Third financing or incentives.

3. The constraints and the economic choices of the Municipality identify various situations:

a. The Municipality has already decided and financed the restructuring plans of Kapitan Etxea and Lekuona;

b. In the case of Kapitan Etxea and Lekuona, the situation of pre-intervention and post-intervention are not comparable because the conditions of use of the buildings change. You can quantize the savings solely on project estimates.

c. The Municipality has no constraints nor legislative nor politicians about the duration of contracts, so the duration is tied only to the agreement between the parties;

d. The Municipality has no specific experience in the management of energy saving projects and EPC contract management;

e. There is the distinct possibility that the City can directly finance part of the interventions;

f. A once performed the interventions, the Municipality would like to share the savings, but this is not a constraint.

The scenario as presented puts the need to make attractive the projects; in particular, the City will have to first create the conditions for which it is feasible the use of a public / private partnerships through an EPC contract and then locate the most suitable contract type.

a) City Hall scenario

Although the project has an adequate payback time, the cash flows does not create an attractive contract to the ESCo to market conditions; to create conditions favourable to the intervention of an ESCo, the choice to do upstream is to use their own funds and /

or find other sources of funding in order to reduce the investment share held by the ESCO.

Below a solution that can respond to all points and that could make attractive the initiative of the City of Erenteria:

A. The City directly finances a part of the interventions through the funds of SEAP and the resulting savings contribute to reduce the payback time;

B. The City uses for further parts the Subsides Funds;

C. The ESCO finances a small part of the investments with equity.

The new investment plan proposed, as suggested by D2.5, would become the following:

FINANCIAL SOURCES (ESCo)	€	%
Equity	19.040	9%
Senior Debt	0	0%
Grant	81.900	40%
Subsided Funds	83.000	40%
Total Financial Sources exc. VAT	**183.940**	
VAT Facility	21.419	10%
TOTALE FINANCIAL SOURCES	**205.359**	**100%**

Table46 - Financial solution for renovation options of the 1st building of Errenteria (Source D2.5)

b) Kapitan Etxea scenario

In this case we have a project to redevelop a site that changes its intended use from archive to become a museum. In doing so the municipality has decided to make the new nZEB building and use the tool of the EPC. Therefore it is not possible a comparison with the previous situation as regards energy consumption and the corresponding savings obtainable after processing because the situation of employment, the climatic conditions, lighting levels, etc. are very different. Despite all this we can say that the restored building will produce some energy and cost savings.

For these reasons, based on what has emerged from the Deliverable 2.5, the interventions of redevelopment make it difficult intervention of ESCOs to market conditions.

Below a solution that responds to all points and that could make attractive the initiative of the City of Errenteria:

A. Municipality directly finances a large part of the interventions using the funds of the SEAP, making possible the EPC contract

B. The ESCO finances a small part of interventions.

A possible model of income statement, on this basis, by way of simplification, is that given in D2.5 "Twelve economic evaluation reports":

FINANCIAL SOURCES (ESCo)	€	%
Equity	13.294	10%
Senior Debt	0	0%
Grant	119.000	88%
Subsided Funds	0	0%
Total Financial Sources exc. VAT	**132.294**	
VAT Facility	2.791	2%
TOTALE FINANCIAL SOURCES	**135.085**	**100%**

Table47 –Financial solution for renovation options of the 2nd building of Errenteria (Source D2.5)

c) Lekuona scenario

Also in this case we have a project to redevelop a derelict site and not used that is turn it into a cultural center. This project, already approved by the City Council, is being expanded, with the aim of making the nZEB structure through the introduction of solar panels.

It was decided to extend the project, with the inclusion of photovoltaic panels and achieve it and finance it through an EPC contract. These conditions do not allow a comparison with the previous situation as regards energy consumption and the relative savings obtainable after processing but we can say that the variation to the project will

produce savings of both energy and operating costs compared to the initial expectations.

From an economic point of view, all the electricity produced from PV system is regarded as saving.

For these reasons, based on what has emerged from the Deliverable 2.5, the interventions of redevelopment make it difficult the intervention of ESCo to market conditions.

Below a solution that could make it attractive the initiative of the City of Errenteria

A. The ESCo finances a small part of the investments with equity;

B. The City directly finances a part of the interventions with the SEAP and the savings reduce the payback time;

C. The City uses for further parts the Subsides Funds.

A possible model of income statement, on this basis, by way of simplification, is that given in D2.5 "Twelve economic evaluation reports":

FINANCIAL SOURCES (ESCo)	€	%
Equity	13.729	9%
Senior Debt	0	0%
Grant	90.000	59%
Subsided Funds	38.500	25%
Total Financial Sources exc. VAT	**142.229**	
VAT Facility	10.963	7%
TOTALE FINANCIAL SOURCES	**153.192**	**100%**

Table48 - Financial solution for renovation options of the 3rd building of Errenteria (Source D2.5)

5.3.7. PHASE 2 - "DEFINITION OF POSSIBLE EPC CONTRACT APPLICABLE"

The following table summarizes the aspects that can be discriminating in choosing a contract type.

These aspects are associated with various types of EPC contracts, previously described, to assess the impact that each of them has on the single type of contract.

a) City Hall contract

The following table summarizes the aspects that can be discriminating in choosing a contract type.

These aspects are associated with various types of EPC contracts, previously described, to assess the impact that each of them has on the single type of contract:

ASPECTS	VALUATION	NOTE
Total value of the investments	Medium	€ 169.683,00
Payback time of the investments	Medium	7-9 years
Constraints on contract duration	NO	
Knoledge of the tools (EPC contract, FTT)	Low	
Municipality capacity to finance all the interventions	NO	
Municipality capacity to finance part of the interventions	High	
Possibility of the Municipality to borrow	Yes	
Need to obtain an immediate cost savings	NO	
Presence of the supply of energy carriers in EPC contract	NO	
Use of the incentives for the repayment of the investment by third funders	N/A	

Type of EPC
FIRST IN
FIRST OUT
GUARANTEED SAVINGS
SHARED SAVINGS
PAY FROM SAVINGS
FOUR STEPS
BUILD OWN OPERATE & TRANSFER
CHAUFFAGE

TABLE49 – Key aspects of the scenario for the City Hall project of Errenteria vs EPC contract

To obtain the numerical results from a purely qualitative assessment, it has been valued, through the table 6, the impact that the single aspect identified in the reference scenario has on the choice of the type of contract.

The application of this method is summarized in the following table in which you compare the key aspects of the scenario with the various types of EPC contracts.

ASPECTS	NOTE	VALUATION			IMPACT							
					FIRST IN	FIRST OUT	GUARANTEED SAVINGS	SHARED SAVINGS	PAY FROM SAVINGS	FOUR STEPS	B. O. T.	CHAUFFAGE
Total value of the investments	€ 169.683,00	Medium			1,00	1,00	0,00	0,00	0,00	-2,00	-2,00	0,00
Payback time of the investments	7-9 years	Medium			0,00	-1,00	1,00	1,00	0,00	-2,00	-2,00	0,00
Constraints on contract duration		NO			0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Knoledge of the tools (EPC contract, FTT)		Low			0,00	0,00	0,00	0,00	0,00	0,00	-1,00	0,00
Municipality capacity to finance all the interventions		NO			0,00	0,00	-2,00	1,00	-2,00	1,00	1,00	0,00
Municipality capacity to finance part of the interventions		High			0,00	0,00	-1,00	0,00	0,00	1,00	-1,00	0,00
Possibility of the Municipality to borrow		Yes			0,00	0,00	1,00	1,00	1,00	0,00	-2,00	0,00
Need to obtain an immediate cost savings		NO			0,00	1,00	0,00	0,00	0,00	-1,00	1,00	0,00
Presence of the supply of energy carriers in EPC contract		NO			1,00	1,00	1,00	1,00	1,00	1,00	1,00	-2,00
Use of the incentives for the repayment of the investment by third funders		N/A										
					2,00	2,00	0,00	4,00	0,00	-2,00	-5,00	-2,00

TABLE50 – Weight of the key aspects of the Errenteria's City Hall scenario on EPC contracts

This analysis shows that only three types of contracts described in the deliverable 3.5 "Report on existing examples and performance contracting energy service model", are best placed to meet the needs of the Municipality of Errenteria: First In, First Out and Shared Saving. In fact all respond, even if in part, to the constraints that have been highlighted at the time of the definition of the reference scenario:

TYPE OF CONTRACTS APPLICABLE		
CONTRACT	**APPLICABILITY**	**MAIN REASON**
FIRST IN	**YES**	It responds to the needs of the Municipality not to support investment and could enable it to obtain some of the savings that may be needed to finance other projects.
FIRST OUT	**YES**	It provides that the municipality, for the duration of the contract, continues to spend as before interventions. In fact the Municipality has no need to share a part of the savings. This savings could reduce the payback time.
SHARED SAVINGS	**YES**	Allows sharing of savings in extent flexible; the contract term is not binding on the City; normally this contract is applicable in the case of average investment even without the contriburo of the City: in this case the sharing lengthens the contract term but could allow the Municipality to fund other interventions with the savings .

TABLE51 - List of the contracts applicable to the City Hall project of Errenteria

The reasons for which the other types of contracts are not applicable are shown in the next table:

TYPE OF CONTRACTS NOT APPLICABLE		
CONTRACT	**APPLICABILITY**	**MAIN REASON**
GUARANTEED SAVINGS	**NO**	It expects that the investment is made entirely by the City that instead can have the ability to finanzare only a small part.
PAY FROM SAVINGS	**NO**	It expects that the investment is made entirely by the City through a third funder who is repayed on the basis of the annual savings achieved; this system doesn't give the certainty of annual expenditure forecast .
FOUR STEPS	**NO**	The contract is applicable when, with the savings in the first year corresponding to an energy careful management, you get the savings to be reinvested in the following year. The planned investments may not be supported by operational savings and an initial funding is required.
BUILD OWN OPERATE & TRANSFER	**NO**	This type of contract provides very long contract durations in order to allow the return of investments, investments very higher than those expected.
CHAUFFAGE	**NO**	This type of contract provides for the payment of energy bill, mainly that of the fuel, by the ESCO; the projects normally provide for the using renewable energy and reductions on the consumption of the electric vector

TABLE52 - List of the contracts not applicable to the City Hall project of Errenteria

Based on the analysis previously performed, the Municipality can use the array of risks related to the three types of contracts applicable in order to compare them and to make a choice.

All three contracts transfer more than 70% of the risk to the ESCO thereby ensuring the Municipality which has declared to have not experience in managing of EPC contracts. The contract that offer greater guarantees to the City is the first out with 78% of the risks allocated to ESCO.

See figure 1.

The analysis of the differences among the three risk arrays corresponding to the three EPC contracts applicable (FIRST IN, FIRST OUT and SHARED SAVINGS) shows:

• FIRST IN = a greater transfer to the ESCO of counterparty risk and a lower transfer of the technology risk

• FIRST OUT = a greater transfer to the ESCO of the market risks and a lower transfer of technological risk

• SHARED SAVING = a lower transfer to the ESCO of market risks

The optimal solution could be the Shared Saving contract in which:

- The energy savings is shared between ESCO and the Municipality (for only 5%) in order to reduce the duration of the contract that in this way would be around in 20 years;
- All of the interventions will be performed by the ESCO who assumes the technical risk and guarantees the savings;
- The Municipality finances directly part of the interventions through the funds of the SEAP and by using loan funds.

b) Contract for Kapitan Etxea and Lekuona

These contracts are treated together because they have the same scenarios and the choices to be made will be very similar. In fact, both the projects start by the political will to realize new buildings for the population without a valuation in terms of energy consumption. This situation requires the will and the ability of the Municipality to invest and finance the projetc through an EPC contract.

Therefore aspects discriminating in contractual choices are summarized in the following table:

ASPECTS	Kapitan Etxea		Lekuona	
	VALUATION	NOTE	VALUATION	NOTE
Total value of the investments	Medium	€ 111.636,00	Medium	€ 126.587,00
Payback time of the investments	High	22	High	34
Constraints on contract duration	NO		NO	
Knowledge of the tools (EPC contract, TPF)	Low		Low	
Municipality capacity to finance all the interventions	None		None	
Municipality capacity to finance part of the interventions	High		High	
Possibility of the Municipality to borrow	Yes		Yes	
Need to obtain an immediate cost savings	NO		NO	
Presence of the supply of energy carriers in EPC contract	NO		NO	
Use of the incentives for the repayment of the investment by third funders	N/A		N/A	
Definition of possible savings	Estimate		NO	

TABLE 53 - Key aspects of the scenario for Kapitan Extea and Lekuona buildings of Errenteria

To obtain the numerical results from a purely qualitative assessment, it has been valued, through the table 6, the impact that the single aspect identified in the reference scenario has on the choice of the type of contract.

The application of this method is summarized in the following table in which you compare the key aspects of the scenario with the various types of EPC contracts.

ASPECTS	Kapitan Etxea		Lekuona		IMPACT							
	NOTE	VALUATION	NOTE	VALUATION	FIRST IN	FIRST OUT	GUARANTEED SAVINGS	SHARED SAVINGS	PAY FROM SAVINGS	FOUR STEPS	B. O. T.	CHAUFFAGE
Total value of the investments	€ 111.636,00	Medium	€ 126.587,00	Medium	0,00	0,00	0,00	0,00	0,00	-2,00	-1,00	0,00
Payback time of the investments	22,00	High	34,00	High	-2,00	-2,00	0,00	0,00	-2,00	-2,00	1,00	0,00
Constraints on contract duration		NO		NO	0,00	0,00	1,00	1,00	0,00	0,00	1,00	0,00
Knoledge of the tools (EPC contract, FTT)		Low		Low	0,00	0,00	0,00	0,00	1,00	0,00	0,00	0,00
Municipality capacity to finance all the interventions		None		None	1,00	1,00	-2,00	1,00	-2,00	1,00	1,00	0,00
Municipality capacity to finance part of the interventions		High		High	0,00	0,00	1,00	0,00	-2,00	1,00	-1,00	0,00
Possibility of the Municipality to borrow		Yes		Yes	0,00	0,00	1,00	0,00	-2,00	0,00	-2,00	0,00
Need to obtain an immediate cost savings		NO		NO	0,00	0,00	0,00	-1,00	0,00	-1,00	1,00	1,00
Presence of the supply of energy carriers in EPC contract		NO		NO	1,00	1,00	1,00	1,00	1,00	1,00	0,00	-2,00
Use of the incentives for the repayment of the investment by third funders		N/A		N/A								
Definition of possible savings		Estimate		NO	-1,00	-2,00	0,00	-1,00	-2,00	-2,00	0,00	-2,00
					-1,00	-2,00	2,00	1,00	-8,00	-4,00	0,00	-3,00

TABLE54 - Weight of the key aspects of the scenario for project of Kapitan Etxea and Lekuona of Errenteria on EPC contracts

This analysis shows that only two types of contracts, among those described in D.3.5 document "Report on existing examples and performance contracting energy service model", are best placed to meet the needs of the City of Errenteria: Garanted Saving and Shared Saving.

In fact these contracts look very dissimilar but they are both applicable considering the will of the Municipality to realize the interventions. Both types of contracts respond, even if in part, to the constraints that have been highlighted at the time of the definition of the reference scenario:

TYPE OF CONTRACTS APPLICABLE		
CONTRACT	**APPLICABILITY**	**MAIN REASON**
GUARANTEED SAVINGS	**YES**	It expects that the investment is made entirely by the City; in the case studied, in order to facilitate completion of the works, the municipality will be required to finance, as we have already seen through funds SEAP and subsidiary funds, respectively Kapitan Etxea to 88% of investments and Leucona to 84%.
SHARED SAVINGS	**YES**	It allows sharing savings an extent flexible, minimal in this case given the return times calculated, and particularly this contract is applicable for the portion of measurable savings pre and post intervention.

TABLE55 - List of the contracts applicable to the project of Kapitan Etxea and Lekuona of Errenteria

The reasons for which the other types of contracts are not applicable are shown in the next table:

TYPE OF CONTRACTS NOT APPLICABLE		
CONTRACT	**APPLICABILITY**	**MAIN REASON**
FIRST IN	**NO**	It provides that the municipality does not support investment and this situation is not possible in these cases. In addition normally the length of such types of contracts is less than the payback schedule
FIRST OUT	**NO**	Provides that the municipality, for the duration of the contract, continues to spend as before intervention: this is not possible when there is a change of use of the building before and after renovation.
PAY FROM SAVINGS	**NO**	It expects that the investment is made entirely by the City through a third funder who is repayed on the basis of the annual savings achieved; this system does not give by the annual expenditure forecast certainty, and above all makes it difficult to establish the savings to obtain in order to apply for funding
FOUR STEPS	**NO**	The contract is applicable when, with the savings in the first year corresponding to an energy careful management, you get the savings to be reinvested in the following year. The planned investments may not be supported by operational savings and an initial funding is required.
BUILD OWN OPERATE & TRANSFER	**NO**	This type of contract provides very long contract durations in order to allow the return of investments, investments very superioriori with those expected.
CHAUFFAGE	**NO**	This type of contract provides for the payment of energy bill, mainly that of the fuel, by the ESCO; normally the projects considered the using of renewable energy and reductions on the consumption of the electric vector

TABLE56 - List of the contracts not applicable to the project of Kapitan Etxea and Lekuona of Errenteria

Based on the analysis previously performed, the Municipality can use the array of risks related to the three types of contracts applicable in order to compare them and to make a choice.

The Shared Savings transfers more than 70% of the risk to the ESCO thereby ensuring the Municipality, while the garanted Savings contract moved to ESCO about 60% of the risks.

The analysis of the differences between the two risk arrays corresponding to the two EPC contratcs applicable (GUARANTEED SAVINGS and SHARED SAVINGS) shows:

• GUARANTEED SAVINGS = more transfer to the Municipality of financial risks and counterparty risks

• SHARED SAVINGS = less transfer to the Municipality of counterparty risks.

The optimal solution could be to build two contracts, one for building, that should be a mix of the two types previously described in which:

- all of the interventions are performed by the ESCO, who assumes the technical risk and guarantees the savings;
- most of the work is funded by the City which assumes the financial risk while a small portion is funded directly by the ESCO
- the ESCO performs maintenance and shares the savings achieved for the part that is measurable; In fact, as said previously, in these two cases is not possible to define the basic situation being different situations of use of the raw properties and after renovation.

Work arounds could be whether the municipality consider a public / private partnerships: you might think the involvement of the ESCO also in activities related to the provision of other services linked to the new use of the buildings after the restructuring (museum and cultural center).

For example with regard Kapitan Etxea: you could think of entrust to ESCO the maintenance services for the entire building and the management of some museum services (equipment, bars, libraries, etc.). This scenario would lead to a greater involvement of ESCOs in the operation of the building, to an increase in revenues by allowing the ESCo to be able to undertake more investment reducing the financing for the Municipality.

With regards Lekuona: the ESCO could be involved not only for the construction of the photovoltaic but also, for example, for the assignment of the maintenance of the entire post-restructuring structure and for the management of a part of the services inside it. This scenario could allow more investments from the ESCO with a reduction of those from the Municipality.

5.4. COIMBRA

Coimbra is the largest city in the Centre Region of Portugal which is the capital, has 143,396 inhabitants in the municipality an area of 319.41 km^2 and a population density of 448.94 inhabitants / km^2. With its universities and other higher education institutions Coimbra is designated as a "City of Knowledge".

Coimbra, located in the littoral axis of the country, is occupying a strategic and central position between the two metropolitan areas (Porto and Lisbon). The city has an excellent accessibility by motorways, railway, and seaport (Figueira da Foz) and also good traffic connections with Spain. As a historic city, Coimbra holds an important cultural and architectural heritage, which added to the fact that the city is being crossed by the River Mondego, gives to Coimbra a distinctive character and make her attractive for tourists. Coimbra's environmental quality is reinforced by a friendly climate, positive indicators on air and noise, a variety of green spaces in the urban centre and the river landscape of the Mondego.

The following table presents the general data related with the surface, population and climate.

Surface Area: 319,41 km²	PopulationDensity:448,94Inhabitants/km²
Population of the Municipality of Coimbra: 143 396 inhabitants according to census 2011	Climate Area: Medium according to DIR.2009/125/CE
Annual Heating Degree Days: 1460, Base Temperature 20 °C	Outdoor average T °C in winter: 0-15 °C
Annual Cooling Degree Days: 1200 Base Temperature 24 °C	Outdoor average T °C in summer: 18-35°C

TABLE57 - Surface, population and climate data from Coimbra

The Municipality buildings stock is constituted mainly by schools (87.5%): 56 elementary schools and 35 kindergartens, grouped in 6 clusters of schools. The other buildings are administrative and services buildings. Such buildings include the town hall, as well as several buildings where several municipal services are installed. They also include social and cultural services such as museums and the library.

Additionally, there are some Municipal services (e.g. Municipal aerodrome, IT services, Housing Department and Citizen's Bureau) installed in rented buildings.

The following table presents the distribution of the Municipal buildings by use:

Use	Quantity	%
Administrative Services	4	3.8%
Cultural Services	4	3.8%
Social Services	3	2.9%
Schools	91	87.5%
Offices	1	1.0%
Other Services	1	1.0%
Total	**104**	**100%**

TABLE58 - Distribution of the municipal buildings by use of Coimbra

The following tables show the buildings use in Coimbra and the buildings of Coimbra by year of construction.

Buildings	Quantity	%
Residential	38044	93.6%
Non-residential	309	0.8%
Residential and non-residential	2288	5.6%
Total	**40641**	**100%**

TABLE59 - Buildings use in Coimbra

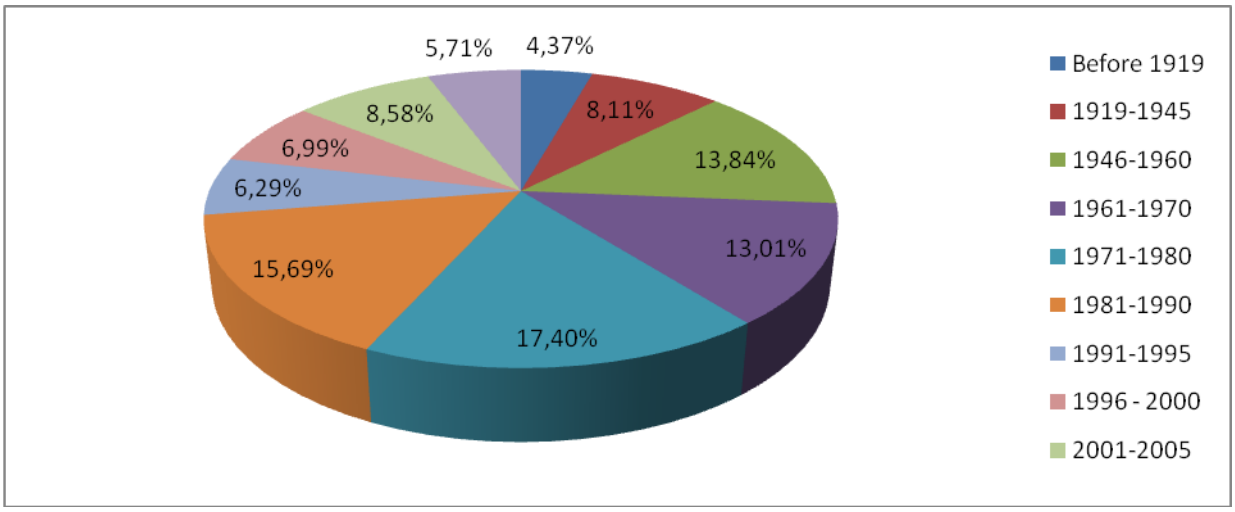


FIGURE 22 -Buildings of Coimbra by year of construction

5.4.1. Regulatory and policy framework

Portugal has implemented Directive 2012/27/UE and has set its targets for energy savings with the reduction of 25% of primary energy used in 2020 by upgrading your NEEAP.

The European Directive 2010/31/UE set up in Portugal the opportunity to improve the system of energy performance certificates and the respective regulations, born with the Directive 2002/91/UE, and to align national requirements by the impositions of the Directive. Then, the decree law 118/2013 from August 20, 2013 has ensured not only the transposition of the Directive but also the review of national legislation in one law including the system of certification of buildings (SCE), the Regulation on the energy performance residential buildings (REH), and the Regulation on the energy performance of buildings Services (RECS). In general, the directive clarifies some of the principles of the original text and introduces new provisions to strengthen the framework for promoting energy efficiency in buildings, in the light of the objectives and challenges agreed by the Member States for 2020.

Decree Law 118/2013 defines the requirements of the buildings NZEB although there are still levels of energy performance defined.

Also in 2011 it was published The energy efficiency program in Public Administration, Eco.AP2, which results in a number of energy efficiency measures to change behavior and promote the rational management of energy through the use of Energy Services Companies (ESCO).

In this context, Decree-Law No. 29/2011 establishes the legal regime for the preparation and execution of EPC contracts to be signed between the Public Administration ESCOs, with the aim of implementing measures to improve energy efficiency in public buildings and installations.

In 2013 it was published the specifications of energy performance contracting program nell'ambitodelEco.AP; such models of contracts should be adopted by institutions in all initiatives contracts EPC developed under the program.

At the regional level, the Plan of Land Management in the Centre Region, developed in 2011, provides for an evaluation of the potential of renewable energy and energy efficiency in the region. It also proposes a number of measures to promote increased energy efficiency in the region but imposes no objective in terms of increased energy efficiency and no requirement to change technologies or behaviours.

5.4.2. Analysis of current economic conditions

The economic crisis has also affected Portugal and forced the central government to implement measures to reduce public spending such as the blocking of indebtedness of Commons; Portugal, municipal debt total cannot exceed 150% of the average revenue collected in the previous three years.

The objectives of the budget 2014, the Municipality of Coimbra has confirmed the need to pursue a strategy of rigor and containment of public spending, creating the conditions for European co-financing and leverage the efforts of the EC to carry out the projects of the Municipality.

The strategy of rigor has led the reduction of 30%, compared to 2013, the funds allocated by the city for urban renewal

Moreover the economic crisis affects the market for ESCOs; In fact, on the one hand the domestic banks lack funds and on the other hand, international banks are not interested in being associated with the risk of Portugal.

5.4.3. Main sources of financing

The main source of financing in Portugal is to date the Fund for Energy Efficiency. The Fund may support projects primarily oriented technology in transport, residential and services, industry and the public sector

In the public sector, this fund has been used to support the measures included in the Programme ECO.AP[7]. Potential beneficiaries of this fund were organs of the central government, universities, public enterprises, public foundations, public and private

[7] Eco-innovation Action Plan

associations with a majority of public capital. However, the amounts available with this tool are very modest.

Other sources of funding are the FAI which funds pilot projects and energy efficiency projects; the PPEC (Consumption Efficiency Promotion Plan) that encourages saving initiatives of Electricity.

Despite the significant development of the legislation on the EPC contracts for public administration that market has not had the hoped for development, ESCOs do not have enough guarantees by governments to receive payment of the investments made.

5.4.4. Advantages and disadvantages of each energy service models

It must be stated that the City of Coimbra has no previous experience of collaboration with ESCO, the energy improvements made were always made with own funds and managed directly by the staff of the municipality. The City Council would welcome the development of EPC contracts and identifies transparency in contractual energy and expertise of the key points for a future relationship with the ESCO (questionnaire INNOVA BIC).

Another aspect to consider in the identification of possible types of EPC is that Portugal has a highly developed legislation for the creation of contracts with the government as the types are provided and Guaranteed Savings Shared Savings.

These aspects must be considered when choosing the most suitable type of contract along with a working hypothesis about the goals that the City will arise at the time of writing Notice.

In fact, as previously mentioned, on the basis of information gleaned about the current conditions of the City of Coimbra is necessary to define certain conditions / willingness of the municipality that will determine the choice of one or another type of contract.

5.4.5. Technical and financial of energy efficiency schemes

The following table summarizes the technical characteristics of the three buildings audited:

Building	Surface area m^2	Energy consumption kWh/year
Town hall	5.880	350.206
Municipal house of culture	13.225	565.980
Elementary school of solum	1.655	47.524
Total	**20.760**	**963.710**

TABLE60 -Technical characteristics of the audited building of Coimbra

a) TOWN HALL

FIGURE 23 – Town Hall (Coimbra)

The building consists of three floors and two intermediate floors, with the main facade oriented to the west. The outer walls are in stone masonry and have a thickness of 90 to 145 cm and a good thermal inertia. All windows and patio doors are of single glazing with low performance in wooden frames. The air conditioning system consists of single and multi-split heat pumps installed at different times and with different efficiency, the lighting is realized with various types of lamps: T8 linear fluorescent, T5 lamps, compact fluorescent lamps, incandescent lamps, halogen spotlights and floodlights and metal halide lamps, etc.

The redevelopment has not taken into consideration the casing but above the implants and the inclusion of renewable sources.

The following table shows the investment for each renovation options identified for the audited building:

INVESTMENTS	€
Heat pump of high temperature	80.209
LED	16.917
Photovoltaic panels	534.942
Investment for renovation	**632.068**

TABLE61 – Investment for renovation options of the 1st building of Coimbra (Source D2.5)

HVAC

The grouping of the current mono and multi-split in concentrated systems with fewer units has not been considered for the impact of the installation work on the building operation. Therefore, it is considered the replacement with the same systems, but with greater efficiency, while maintaining the same total power.

Lighting

The redevelopment project involves the replacement of all existing lamps with LED lamps.

RES

Being the building subject to the constraints, the use of traditional photovoltaic panels was not considered because of its high visual impact. Therefore, it was decided to use solar shingles, replacing the existing roof. It was considered the installation of 2,102 m2 (with the different directions of the roof) of thin-film photovoltaic panels, ensuring an installed capacity of 126.1 kWp. This should ensure a generation of 143.3 MWh / year. In this case it was considered a consumption of 90% of the total energy produced by the photovoltaic panels and the remaining 10% we suppose to sell it to the network at the market price (0.05 € / kWh).

b) MUNICIPAL HOUSE OF CULTURE

FIGURE 24 - Municipal House of Culture building (Coimbra)

The building was built in 1991-1993, it is located near the center of town and close to the University and is used as the Municipal House of Culture; welcomes different cultural uses, such as the library, auditorium and art gallery. The building has 8 floors, with 3 floors below and 4 stories above the ground floor.

The redevelopment is focused on efficiency of air conditioning systems and lighting as well as on the use of renewable energies.

The following table shows the investment for each renovation options identified for the audited building:

INVESTMENTS	€
HVAC	126.945
Lighting system	17.121
Renewable energy	194.208
Investment for renovation	**338.274**

TABLE62 -Investment for renovation options of the 2nd building of Coimbra (Source D2.5)

HVAC

The HVAC in most of the building is provided by mono-split systems with heat pumps installed in the wall or roof with a total power of 239.27 kW. The replacement of several mono-split systems to multi-split systems was not considered, since the lower cost of purchase of multi-split systems would lead to higher installation costs not compensated. Therefore, it was decided to proceed with the replacement with other mono-split systems with greater efficiency (EER of 5.2 and COP of 5.74), while maintaining the same total power.

Lighting system

The actual lighting system is mainly constituted by T8 linear fluorescent lamps with electromagnetic ballast. The planned action is to replace all lamps by LEDs.

RES

In the renovation project it was considered the installation of solar panels facing south, keeping the orientation of the building in order to minimize environmental impact. Therefore, it is planned to install 770 photovoltaic panels, for an installed capacity of 181 kWp.

This will ensure a generation of 254.2 MWh/year.

c) ELEMENTARY SCHOOL OF SOLUM

FIGURE 25 - Elementary School of Solum building (Coimbra)

The school was built in 1950 and in 1990 was converted into a primary school. The construction of the refectory and a partial renovation of the building carried out 10 years ago.

The school building complex consists of two buildings plus 1 building (cafeteria); larger buildings have two floors and the cafeteria one floor.

The outer walls are made of cinder blocks and bricks and have a thick of 55 to 60 cm , all the fixtures are in aluminium with the exception of 2 windows, that have a wooden frame. All windows are double glazed with the exception of four windows.

The lighting system consists mainly of linear T8 fluorescent lamps with electromagnetic ballast.

The buildings have no heating source. To ensure heating during the coldest days, the classrooms have an oil radiator.

The interventions have focused on the system for the exploitation of renewable energies.

The following table shows the investment for each renovation options identified for the audited building:

INVESTMENTS	€
HVAC	5.330
Lighting system	2.374
Photovoltaic panels	19.463
Investment for renovation	**27.167**

TABLE63 - Investment for renovation options of the 3rd building of Coimbra (Source D2.5)

HVAC

The gas boiler used in the canteen heating is replaced by a heat pump, without the need for a total restructuring of the system.

The other areas of the building have not a central heating because the heating of the classrooms during the coldest days is ensured by an oil radiator. The ability to replace oil radiators with heat pumps was not considered because it would increase the comfort but also the total consumption of energy.

Lighting system

The actual lighting system is mainly constituted by T8 linear fluorescent lamps with electromagnetic ballast. The planned action is to replace all lamps by T5 lamps with electronic ballasts.

RES

The building has a small photovoltaic system (18 panels with a total output of 4.23 kW) and also a solar thermal system.

In the restructuring plan it was considered installing more solar panels facing south, but maintaining the orientation. Therefore, it was considered appropriate to install 72 photovoltaic panels, providing an installed capacity of 16.92 kWp and a generation of 23,316 kWh / year.

It highlights how for all three projects the value of investment amount to € 997,509.00 and produces an annual saving of 755,538 kWh.

For all three buildings a limited number of interventions have been considered: the installation of photovoltaic panels (in some cases expending the existing systems) that allow the use of renewable sources, interventions on lighting systems and energy improvement of the air conditioning systems. They never expected, for different assessments, interventions on the building envelope and on windows.

The following table contains the economic data for each building:

Building	Square meter (m2)	Energy consumption	Energy expenditure	Cost of the Investiment	Energy Saving		Savings (Energy + Maintenance)	Payback period
		kWh/year	€/year	€	kWh/year	%	€/year	year
TOWN HALL	5.880	350.206	€ 46.568,00	€ 632.068,00	249.600	71%	€ 34.270,00	18,00
MUNICIPAL HOUSE OF CULTURE	13.225	565.980	€ 63.492,00	€ 338.274,00	473.750	84%	€ 52.681,00	6,00
ELEMENTARY SCHOOL OF SOLUM	1.655	47.524	€ 7.006,00	€ 27.167,00	32.188	68%	€ 3.826,00	7,00
TOTALI	**20.760**	**963.710**	**€ 117.066,00**	**€ 997.509,00**	**755.538**	**78%**	**€ 90.777,00**	**10,99**

TABLE64 – Economic evaluation for renovation schemes of Coimbra (Source D2.5)

The economic analysis of the deliverable D2.5 “Twelve economic evaluation reports”shows as in two out of three cases the return timing are within the seven years while in only one case, with regard to the Town Hall, the time is longer than 15 years.

Thus the analysis also indicated that the energy renovation projects for the Elementary School of Solum and Municipal House of Culture are eligible for an intervention of an ESCO to market conditions while in the case of the Town Hall will be necessary to conduct a more thorough analysis assuming also the use of a portion of direct capital of the municipality or of concessional funds.

In fact in the case of the Town Hall, in order to finance all the work identified, as is clear from the document, D2.5 "Twelve economic evaluation reports", it was necessary to optimize the financial structure of the investment in order to make the initiative more attractive for the ESCO market through the use of other sources of funding; the result of this analysis leads to the following conclusions:

FINANCIAL STRUCTURE OPTIMIZATION		
	TOWN HALL	
Equity investment by the ESCo	€	72.060,00
Senior debt	€	-
Subsided Funds (duration 15 years)	€	270.000,00
Grant (Incl. VAT)	€	358.000,00
	€	700.060,00
Duration of the contract	25 years	

TABLE 65 – Proposal of optimization of financial structure for TOWN HALL project of Coimbra (Source D2.5)

5.4.6. PHASE 1 - "DEFINITION OF POSSIBLE SCENARIO"

The municipality wants to carry out a transformation intervention of some buildings in nZEB and proceed through the use of a contractual instrument such as the Energy Performance Contracting - EPC.

Now we go to synthesize all the information to identify the possible scenario and the possible solutions to the realization of energy renovation projects.

The documents used in this phase are:

- D3.4 "Report on analysis of the current conditions of Coimbra"
- D2.1 "Report on the 12 nZEB renovation schemes with technical and economic evaluation"
- D2.5 "Twelve economic evaluation reports"

In addition to the study of these documents we have proceeded to a direct confrontation with the Municipality in order to clarify some aspects of the economic and political situation.

The reference scenario consists in the summary of those fundamental aspects that constitute the decision-making framework for the verification of the feasibility for the adoption of an EPC contract.

1. The situation of Portugal shows three contrasting situations from the point of view of the development of initiatives aimed at saving energy involving ESCO and Third Funders:

a. The high cost of electricity makes attractive the energy savings;

b. The cost of borrowing to finance projects is particularly high;

c. By contrast, Portugal is at 23th place in the list drawn up by the World Bank that measures the difficulties that the companies face in doing business, making it an attractive country for carrying out entrepreneurial and financial initiatives;

2. The financial analysis showed two different situations:

a. The plans for the redevelopment of the Elementary School of Solum and Municipal House of Culture are easily fundable both for the value of the investment (€ 365,441.00) not particularly high and especially for the payback time of average 6-7 year easily sustainable for an intervention third.

b. The project on the Town Hall may be instead more difficult to achieve both for the highest investment value (€ 632,068.00) that especially for the payback time of about 18 who makes it essential financial support of the City.

3. The analysis of the constraints as well as of the economic and political choices of Municipality identifies various situations:

a. The City Council believes that EPC contracts fall within the legislative exceptions so it is possible consider forms of contracts that exceed 3 years.

b. The compulsory use of the model contract defined by Portuguese law only binds the buildings owned by the central government, leaving leeway to municipalities

c. The City has specific experience in the management of energy saving projects and EPC contract management;

d. There is no possibility that the municipality directly finance the totality of the interventions because of the restriction measures of public finance;

e. There is the distinct possibility that the City can directly finance part of the investment

f. The possibility exists that the ESCO may obtain funding grant through the national funding program Operational Programme Portugal 2020;

g. The City states that, once made interventions, if funding is a total burden of ESCO, does not have the need to share immediately the savings obtained;

h. The Municipality cannot proceed to a debt due to the measures of restriction of public finance

i. There is the possibility of selling to the grid the electricity produced by photovoltaic panels and not self-consumed to a defined price.

From the above situation there are two situations that we are going to analyse in different ways:

• the definition of the contract most suitable for the Municipality in order to implement interventions for Elementary School of Solum and Municipal House of Culture;

• the need to make some attractive way to the market the Town Hall project through choices based on analysis listed above . In particular, in the latter case, the City will have to first create the conditions for which it is feasible the use of a public / private partnerships through an EPC contract and then locate the most suitable contract type.

a) Scenario for Elementary School of Solum and Municipal House of Culture

Considering that the total investment is of average value (€ 365,441.00) and that, according to the analysis of the deliverable 2.5, just the project for Elementary School of Solum, which provides a lower investment of € 27,167, is what could be less attractive on the market, it is considered appropriate to combine the two projects and implement them through a single EPC contract.

This choice allows you to identify a single contact for both projects and the ESCO will rely on synergies that result from management simultaneously of two yards with a single contract.The payback time is of about 6,5 years as the single projects.

b) Town Hall Scenario

In order to create conditions favourable to the intervention of an ESCO, the choices to make upstream are:

A. Use their own funds and / or find other sources of funding in order to reduce the investment share held by the ESCO;

B. Enter in the income statements the incentives that may arise from the Operational Programme Portugal 2020 program for an amount up to 50% of the investment.

Below a solution that responds to all points and that could make it attractive for the market ESCo:

A. The City directly finances a small part of the operations using the budget and / or Subsided Funds and the savings flows in the total savings in order to reduce the payback time

B. The ESCO accesses the Operational Programme Portugal 2020 program to get grant incentives for about 50% of total investment (around 300,000 euro) and finances the rest of the investment.

5.4.7. PHASE 2 - "DEFINITION OF POSSIBLE EPC CONTRACT APPLICABLE"

The following table summarizes the aspects that can be discriminating in choosing a contract type.

These aspects are associated with various types of EPC contracts, previously described, to assess the impact that each of them has on the single type of contract:

a) Contract for Elementary School of Solum and Municipal House of Culture

ASPETTI	VALUATION	NOTE
Total value of the investments	Medium	€ 365.441,00
Payback time of the investments	Low	6-7 years
Constraints on contract duration	NO	
Knoledge of the tools (EPC contract, FTT)	High	
Municipality capacity to finance all the interventions	None	
Municipality capacity to finance part of the interventions	Not necessary	
Possibility of the Municipality to borrow	NO	
Need to obtain an immediate cost savings	NO	
Presence of the supply of energy carriers in EPC contract	NO	
Use of the incentives for the repayment of the investment by third funders	Yes	

Tipo EPC
FIRST IN
FIRST OUT
GUARANTEED SAVINGS
SHARED SAVINGS
PAY FROM SAVINGS
FOUR STEPS
BUILD OWN OPERATE & TRANSFER
CHAUFFAGE

TABLE66 – Key aspects of the scenario for the projects of Elementary School of Solum and Municipal House of Culture of Coimbra vs EPC contract

To obtain the numerical results from a purely qualitative assessment, it has been valued, through the score of the table 6, the impact that the single aspect identified in the reference scenario has on the choice of the type of contract.

The application of this method is summarized in the following table in which you compare the key aspects of the scenario with the various types of EPC contracts.

ASPETTI	NOTE	VALUATION	IMPACT							
			FIRST IN	FIRST OUT	GUARANTEED SAVINGS	SHARED SAVINGS	PAY FROM SAVINGS	FOUR STEPS	B. O. T.	CHAUFFAGE
Total value of the investments	€ 365.441,00	Medium	1,00	1,00	0,00	0,00	0,00	-2,00	-2,00	0,00
Payback time of the investments	6-7 years	Low	1,00	1,00	1,00	1,00	0,00	-2,00	-2,00	0,00
Constraints on contract duration		NO	-1,00	-1,00	1,00	-1,00	-1,00	1,00	-2,00	-1,00
Knoledge of the tools (EPC contract, FTT)		High	0,00	0,00	1,00	0,00	0,00	0,00	1,00	0,00
Municipality capacity to finance all the interventions		None	1,00	1,00	-2,00	1,00	-2,00	1,00	1,00	0,00
Municipality capacity to finance part of the interventions		Not necessary	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Possibility of the Municipality to borrow		NO	0,00	0,00	-2,00	0,00	-2,00	0,00	-2,00	0,00
Need to obtain an immediate cost savings		NO	0,00	1,00	0,00	0,00	1,00	-2,00	1,00	1,00
Presence of the supply of energy carriers in EPC contract		NO	1,00	1,00	1,00	1,00	1,00	1,00	1,00	-2,00
Use of the incentives for the repayment of the investment by third funders		Yes	1,00	1,00	0,00	1,00	1,00	0,00		1,00
			4,00	5,00	0,00	3,00	-2,00	-3,00	-4,00	-1,00

TABLE67 - Weight of the key aspects of the scenario for project of Elementary School of Solum and Municipal House of Culture of Coimbra on EPC contracts

This analysis shows that only three types of contracts, among those described in the document D.3.5 "Report on existing examples and performance contracting energy service model", are best placed to meet the needs of the City of Coimbra: First In, First Out and Shared Saving. In fact all respond, even if in part, to the constraints that have been highlighted at the time of the definition of the reference scenario:

TYPE OF CONTRACTS APPLICABLE		
CONTRACT	APPLICABILITY	MAIN REASON
FIRST IN	YES	It responds to the needs of the Municipality not to support investment and could enable it to obtain some of the savings that may be needed to finance other projects.
FIRST OUT	YES	It provides that the municipality, for the duration of the contract, continues to spend as before interventions. In fact the Municipality has no need to share a part of the savings. This savings could reduce the payback time.
SHARED SAVINGS	YES	Allows sharing of savings in extent flexible; the contract term is not binding on the City; normally this contract is applicable in the case of average investment even without the contriburo of the City: in this case the sharing lengthens the contract term but could allow the Municipality to fund other interventions with the savings .

TABLE68 - List of the contracts applicable to the project of Elementary School of Salum and Municipal House of Culture of Coimbra

The reasons for which the other types of contracts are not applicable are showed in the next table:

TYPE OF CONTRACTS NOT APPLICABLE		
CONTRACT	APPLICABILITY	MAIN REASON
GUARANTEED SAVINGS	NO	It expects that the investment is made entirely by the City that instead can have the ability to finanzare only a small part.
PAY FROM SAVINGS	NO	It expects that the investment is made entirely by the City through a third funder who is repayed on the basis of the annual savings achieved; this system doesn't give the certainty of annual expenditure forecast .
FOUR STEPS	NO	The contract is applicable when, with the savings in the first year corresponding to an energy careful management, you get the savings to be reinvested in the following year. The planned investments may not be supported by operational savings and an initial funding is required.
BUILD OWN OPERATE & TRANSFER	NO	This type of contract provides very long contract durations in order to allow the return of investments, investments very higher than those expected.
CHAUFFAGE	NO	This type of contract provides for the payment of energy bill, mainly that of the fuel, by the ESCO; the projects normally provide for the using renewable energy and reductions on the consumption of the electric vector

TABLE69 - List of the contracts not applicable to the project of Elementary School of Solum and Municipal House of Culture of Coimbra

Based on the previously performed analysis and on economic analysis, the Municipality can use the array of risks relating solely three types of contracts applicable in order to proceed to the comparison and to a choice.

All three contracts transfer more than 70% of the risk to the ESCO thereby ensuring the Municipality, which however said they had already had experience in managing EPC contracts. The contract that offers greater guarantees to the City is the First out with 78% of the risks allocated to ESCO.

See figure 1.

The analysis of the differences among the three risk arrays corresponding to the three type of contract applicable (First In, First Out and Shared Saving) shows:

• FIRST IN = greater transfer to the ESCO of counterparty risk and a lower transfer to the technology risk

• FIRST OUT = a greater transfer to the ESCO of the market risks and a lower transfer to the ESCO of the technological risk

• SHARED SAVING = lower transfer of market risks to the ESCO

The better solutions applicable are two:

1. The first is to build a contract of the type Shared Savings in which:

- The municipality obtains savings of 5% already from the first year
- All of the interventions will be carried out and financed by the ESCO, who assumes the technical and financial risk and receives a fee of 95% of the savings plus the maintenance costs;
- The incentives obtained through Operational Programme Portugal in 2020 will be transferred to the ESCO in order to reduce the investment value of the ESCO and the duration of the contract.

2. The second solution is to build a First Out contract in which:

- The municipality pays a fee equal to the energy bill before interventions and leaves for the duration of the contract all the savings made to the ESCO so as to reduce the duration of the contract.
- All the interventions will be carried out and financed by the ESCO who assumes the technical and financial risk;
- The incentives obtained through Operational Programme Portugal in 2020 will be transferred to the ESCO in order to reduce the investment value of the ESCO and the duration of the contract.

b) Town Hall contract

ASPECTS	VALUATION	NOTE
Total value of the investments	High	€ 632.068,00
Payback time of the investments	High	18 years
Constraints on contract duration	NO	
Knoledge of the tools (EPC contract, FTT)	High	
Municipality capacity to finance all the interventions	None	
Municipality capacity to finance part of the interventions	Low	
Possibility of the Municipality to borrow	NO	
Need to obtain an immediate cost savings	NO	
Presence of the supply of energy carriers in EPC contract	NO	
Use of the incentives for the repayment of the investment by third funders	Yes	

Type of EPC
FIRST IN
FIRST OUT
GUARANTEED SAVINGS
SHARED SAVINGS
PAY FROM SAVINGS
FOUR STEPS
BUILD OWN OPERATE & TRANSFER
CHAUFFAGE

TABLE70 - Key aspects of the scenario for the project of Town Hall of Coimbra vs EPC contract

To obtain the numerical results from a purely qualitative assessment we have adopted the following criteria to assess the impact that the single aspect identified in the reference scenario has on the choice of the type of contract.

The application of this method is summarized in the following table in which you compare the key aspects of the scenario with the various types of EPC contracts.

ASPETTI	NOTE	VALUATION	IMPACT							
			FIRST IN	FIRST OUT	GUARANTEED SAVINGS	SHARED SAVINGS	PAY FROM SAVINGS	FOUR STEPS	B. O. T.	CHAUFFAGE
Total value of the investments	€ 632.068,00	High	0,00	0,00	0,00	0,00	0,00	-2,00	-1,00	0,00
Payback time of the investments	18 years	High	-2,00	-2,00	0,00	0,00	-2,00	-2,00	1,00	0,00
Constraints on contract duration		NO	0,00	0,00	1,00	1,00	0,00	0,00	1,00	0,00
Knoledge of the tools (EPC contract, FTT)		High	0,00	0,00	1,00	0,00	1,00	0,00	0,00	0,00
Municipality capacity to finance all the interventions		None	1,00	1,00	-2,00	1,00	-2,00	1,00	1,00	0,00
Municipality capacity to finance part of the interventions		Low	0,00	0,00	0,00	0,00	-2,00	1,00	-1,00	0,00
Possibility of the Municipality to borrow		NO	0,00	0,00	-2,00	0,00	-2,00	0,00	-2,00	0,00
Need to obtain an immediate cost savings		NO	0,00	1,00	0,00	0,00	0,00	-2,00	1,00	1,00
Presence of the supply of energy carriers in EPC contract		NO	1,00	1,00	1,00	1,00	1,00	1,00	0,00	-2,00
Use of the incentives for the repayment of the investment by third funders		Yes	1,00	1,00	0,00	1,00	1,00	0,00		1,00
			1,00	2,00	-1,00	4,00	-5,00	-3,00	0,00	0,00

TABLE71 - Weight of the key aspects of Coimbra's Town Hall scenario on EPC contracts

This analysis shows that, even in this case, only three types of contracts, among those described in the document D.3.5 "Report on existing examples and performance contracting energy service model", are best placed to meet the needs of the City of Coimbra : First In, First Out and Shared Saving. In fact all respond, even if in part, to the constraints that have been highlighted at the time of the definition of the reference scenario:

TYPE OF CONTRACT APPLICABLE		
CONTRACT	**APPLICABILITY**	**MAIN REASON**
FIRST IN	**YES**	It responds to the needs of the Municipality not to support investment and could enable it to obtain some of the savings that may be needed to finance other projects.
FIRST OUT	**YES**	It provides that the municipality, for the duration of the contract, continues to spend as before interventions. In fact the Municipality has no need to share a part of the savings. This savings could reduce the payback time.
SHARED SAVINGS	**YES**	Allows sharing of savings in extent flexible; the contract term is not binding on the City; normally this contract is applicable in the case of average investment even without the contriburo of the City: in this case the sharing lengthens the contract term but could allow the Municipality to fund other interventions with the savings .

TABLE72 - List of the contracts applicable to the Town Hall project of Coimbra

The reasons for which the other types of contracts are not applicable are shown in the next table:

TYPE OF CONTRACTS NOT APPLICABLE		
CONTRACT	APPLICABILITY	MAIN REASON
GUARANTEED SAVINGS	NO	It expects that the investment is made entirely by the City that instead can have the ability to finanzare only a small part.
PAY FROM SAVINGS	NO	It expects that the investment is made entirely by the City through a third funder who is repayed on the basis of the annual savings achieved; this system doesn't give the certainty of annual expenditure forecast .
FOUR STEPS	NO	The contract is applicable when, with the savings in the first year corresponding to an energy careful management, you get the savings to be reinvested in the following year. The planned investments may not be supported by operational savings and an initial funding is required.
BUILD OWN OPERATE & TRANSFER	NO	This type of contract provides very long contract durations in order to allow the return of investments, investments very higher than those expected.
CHAUFFAGE	NO	This type of contract provides for the payment of energy bill, mainly that of the fuel, by the ESCO; the projects normally provide for the using renewable energy and reductions on the consumption of the electric vector

TABLE73 - List of the contracts not applicable to the Town Hall project of Coimbra

Based on the previously performed analysis and on economic analysis, the Municipality can use the array of risks referred to three types of contracts applicable in order to proceed to the comparison and to a choice.

All three contracts transfer more than 70% of the risk to the ESCO thereby ensuring the Municipality, which however said they had already had experience in managing EPC contracts. The contract that offers greater guarantees to the City is the First out with the 78% of the risks allocated to the ESCO.

The analysis of the differences among the three risk-arrays corresponding to the three EPC contracts applicable (FIRST IN, FIRST OUT and SHARED SAVINGS) shows:

• FIRST IN = greater transfer to the ESCO of counterparty risk and a lower transfer of the technology risk

• FIRST OUT = a greater transfer to the ESCO of market risks and a lower transfer of technological risk

• SHARED SAVING = lower transfer to the ESCO of market risks

The better solution for the realization of the redevelopment project NZEB of the Town Hall is the adoption of a Shared Saving contract in which:

- The Municipality finances a part of the investment and receives immediately a part of the savings; these savings must be balanced with the need to allow to the ESCO to return on its investments within a reasonable time and reduce the contract period.
- All interventions will be performed by the ESCO, even the part not financed directly, who assumes the technical risk;
- The incentives obtained through Operational Programme Portugal in 2020 will be transferred to the ESCO in order to reduce the investment value of the ESCO and the duration of the contract.

In this way the duration of the contract could be of 5-10 years.

The other contracts are not easily applicable for the need for co-financing by the Municipality.

6. CONCLUSIONS

According to the Directive on energy efficiency (Directive 2012/27/EU), Energy Performance Contracting (EPC) means a contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where investments (work, supply or service) in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or other agreed energy performance criterion, such as financial savings.

EPC has been used in the European Union (EU) since the 1980s. However, the market remains underdeveloped, notably in comparison with North America (the United States and Canada). The Energy Performance Contracting model is highly replicable in the EU and internationally recognized as a guaranteed, cost effective and scalable procurement method for reducing the operating costs and environmental impacts of buildings.

In order to promote EPC at the EU level it is necessary to address key barriers such as lack of awareness and/or lack of knowledge, lack of policies and support mechanisms, lack of common definitions and harmonized processes.

In practice, under a performance contract, an Energy Services Company (ESCO) provides a comprehensive building retrofit, which can include the replacement of boilers, insulation, cooling systems, lighting and temperature automation controls, as well as the integration of energy data management software and on-site renewable energy systems.

The ESCO takes complete “turn-key” responsibility for the project, meaning it covers all aspects of the project from start to finish: preliminary energy audits, detailed design and engineering, business case, analysis, installation, commissioning, and performance measurement and verification.

The ESCO acts as an overall project manager and will divide the retrofit works into specialized areas, which will be contracted to local specialized partners, the ESCO keeping the overall responsibility for the work and the guaranteed energy savings. For that reason, EPC projects are using local Small and Medium Enterprises (SMEs) and in turn this contributes to the development of the local job market.

Each contract must be able to adapt to current needs of both parties; therefore the EPC contract must comply with this rule.

This document suggests a tool to identify, on based of the political and economic framework, the type of EPC contract applicable to the specific renovation project.

In the first part of this deliverable, it was defined a "Matrix of Risks", to allow the Municipality to assess each type of contract on based of the allocation of the various risks between the two Parties.

It is obvious that, as in the nature of the EPC contract itself, the highest percentage of risk is allocated almost always on the ESCo with different percentages, from 85% for the "BUILD OWN OPERATE & TRANSFER" to 58% for the Guaranteed Savings; the "FOUR STEPS" type puts more risks in charge of the Municipality.

So in order to proceed to the identification of the most suitable type of EPC contract for the project and the context in which it is to be realized, a methodology has been created and a "Baseline Scenario" has been defined. Starting from the Baseline Scenario we have identify the type of EPC contract applicable.

The methodology, as illustrated below with a diagram of flows, has been created for the evaluation of the twelve projects presented but we believe it can be easily applied in a similar manner by each municipality who intends to proceed to interventions of transformation of buildings in nZEB through an EPC contract.

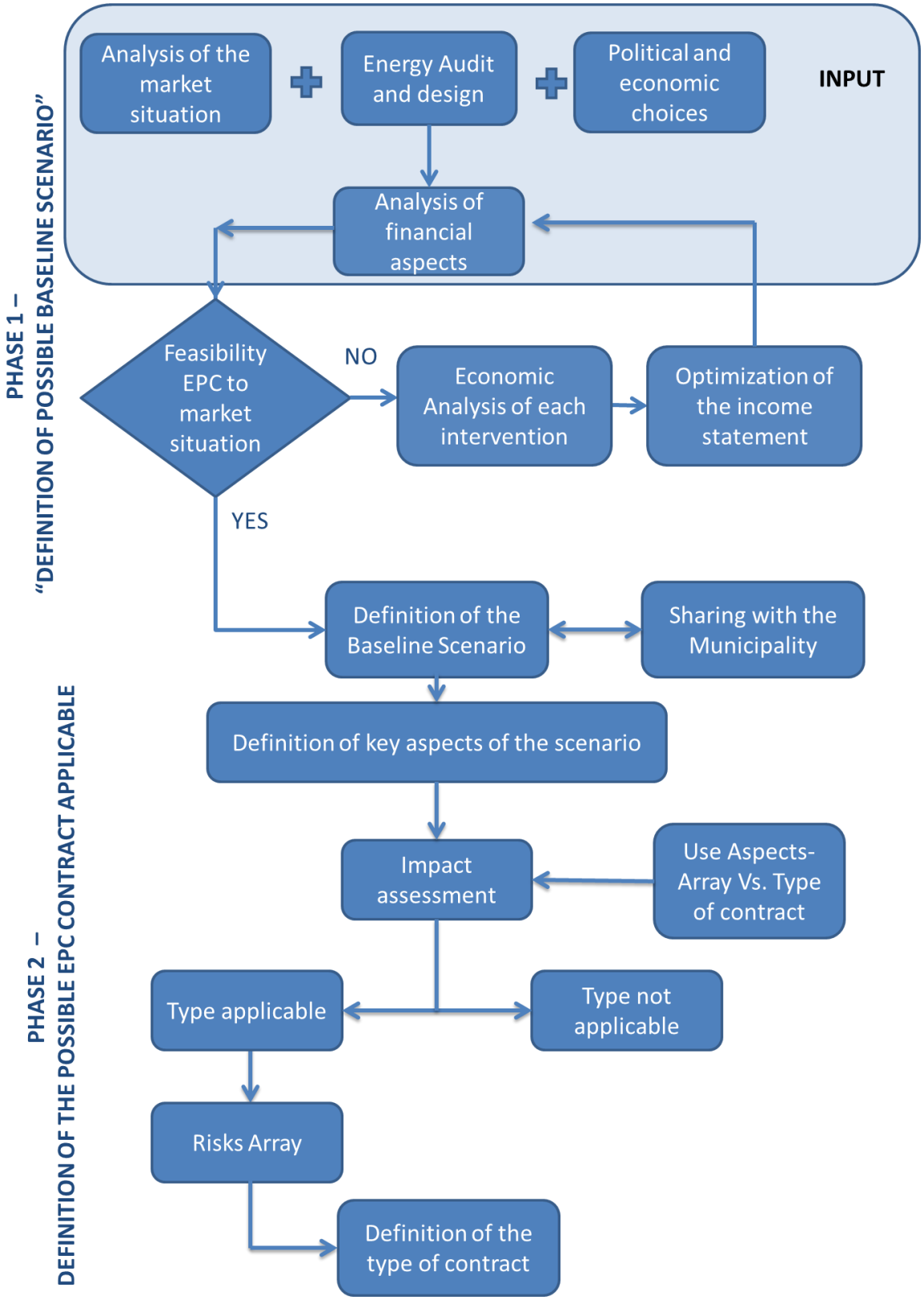


TABLE 74 – Diagram of the methodology

The application of the methodology for all twelve projects wants to be an example of the way of application thereof and of the results which may arise.

During the work, varied situations are been encountered that start right from the choice of the buildings to transform into nZEB:

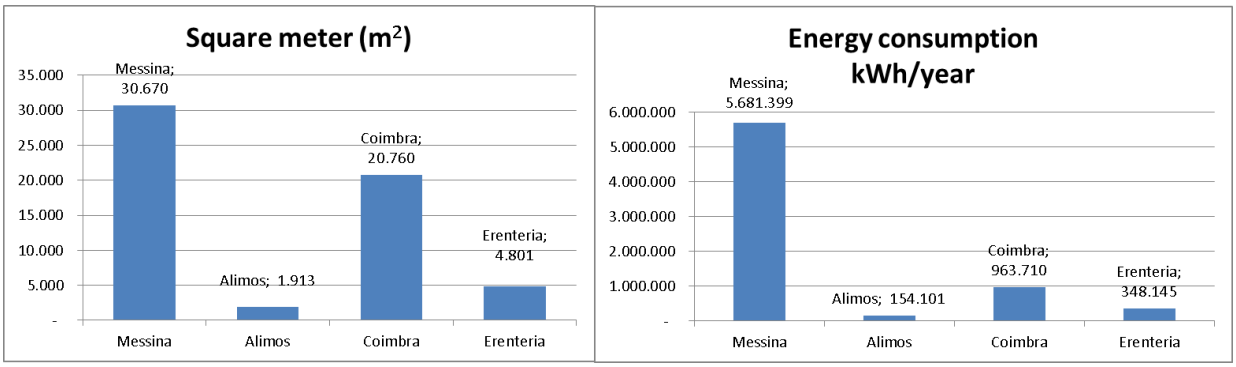


TABLE75 – Data of the buildings for the 4 CERtuS Municipalities

In all twelve cases, the municipalities did not have the resources to fully fund the planned measures from which it was necessary to resort to involvement of private partners through the instrument of the Energy Performance Contract and the TPF. Just this requirement makes it more pressing the assessment of the "technical convenience / economic" of the realization of a nZEB transformation. The assessment as to the existence of minimum conditions to ensure that projects are feasible at standard market conditions has shown us that only two of the twelve projects analyzed are in this condition.

For the remaining ten are necessary adjustments that address the reduction of the investments or the use of own capital of the municipality or the use of subsidized funds.

Comparing this figure with the park buildings analyzed, it would seem that the upstream choice should fall on energy-intensive buildings, but medium-sized precisely to find the right balance between investment value and cost savings.

The following table shows that we have assumed a reduction of investments with a slight reduction of energy savings for only 50% of the projects ; in 5 cases out of twelve it was assumed the use of own capital of the municipality, in 3 cases out of twelve the use of concessional funds and in 2 cases out of twelve both.

It is also necessary to point out that in the case in which there is a change of use of the building associated to need to make nZEB, becomes necessary to use the funds of the Municipality.

	Building	Square meter (m^2)	Energy consumption	Energy expenditure	BASE LINE					RIDUZIONE INVESTIMENTI					Ricorso a capitale del Comune	Ricorso a fondi agevolati
					Cost of the Investiment	Energy Saving		Savings (Energy + Maintenance)	Payback period	Cost of the Investiment	Energy Saving		Savings (Energy + Maintenance)	Payback period		
			kWh/year	€/year	€	kWh/year	%	€/year	year	€	kWh/year	%	€/year	year	S/N	S/N
Messina	Palazzo Zanca	13.500	2.920.798	€ 523.606,00	€ 3.507.135,00	1.518.815	52%	€ 332.311,00	11,50	€ 2.852.656,00	1.518.372	52%	€ 332.311,00	11,50	SI	NO
	Palacultura "Palantonello"	10.300	875.445	€ 159.165,00	€ 954.410,00	253.879	29%	€ 42.263,00	22,58	€ 600.200,00	199.033	23%	€ 42.263,00	14,20		
	Palazzo Satellite	6.870	1.885.156	€ 337.053,00	€ 2.622.437,00	1.281.906	68%	€ 184.899,00	15,18	€ 2.262.437,00	1.264.100	67%	€ 184.899,00	15,18		
	TOTAL	**30.670**	**5.681.399**	**€ 1.019.824,00**	**€ 7.083.982,00**	**3.054.600**	**54%**	**€ 559.473,00**	**12,66**	**€ 5.715.293,00**	**2.981.505**	**52%**	**€ 559.473,00**	**10,22**		
Alimos	Municipal Offices	446	30.160	€ 4.403,00	€ 101.135,00	28.609	100%	€ 4.177,00	24,21	€ 76.985,00	52.409	100%	€ 8.038,00	9,58	NO	SI
	City Hall	1.302	111.965	€ 16.347,00	€ 252.799,00	104.534	93%	€ 15.262,00	16,56	€ 160.809,00	100.432	90%	€ 14.663,00	10,97	NO	SI
	Library	611	42.136	€ 6.152,00	€ 104.101,00	31.171	74%	€ 4.854,00	21,45	€ 73.201,00	31.171	74%	€ 4.845,00	15,11		
	TOTALI	**1.913**	**154.101**	**€ 22.499,00**	**€ 356.900,00**	**135.705**	**88%**	**€ 20.116,00**	**17,74**	**€ 234.010,00**	**131.603**	**85%**	**€ 19.508,00**	**12,00**		
Coimbra	TOWN HALL	5.880	350.206	€ 46.568,00	€ 632.068,00	249.600	71%	€ 34.270,00	18,00	€ 632.068,00	249.600	71%	€ 34.270,00	18,00	SI	NO
	MUNICIPAL HOUSE OF CULTURE	13.225	565.980	€ 63.492,00	€ 338.274,00	473.750	84%	€ 52.681,00	6,00	€ 338.274,00	473.750	84%	€ 52.681,00	6,00	NO	NO
	ELEMENTARY SCHOOL OF SOLUM	1.655	47.524	€ 7.006,00	€ 27.167,00	32.188	68%	€ 3.826,00	7,00	€ 27.167,00	32.188	68%	€ 3.826,00	7,00		
	TOTALI	**20.760**	**963.710**	**€ 117.066,00**	**€ 997.509,00**	**755.538**	**78%**	**€ 90.777,00**	**10,99**	**€ 997.509,00**	**755.538**	**78%**	**€ 90.777,00**	**10,99**		
Erenteria	City Hall	2.961	279.160	€ 25.866,00	€ 169.683,00	91.337	33%	€ 21.478,00	7,90	€ 169.683,00	91.337	33%	€ 21.478,00	7,90	SI	SI
	Kapitain Etxea	395	68.985	€ 5.249,00	€ 111.636,00	44.919	65%	€ 4.971,00	22,46	€ 111.636,00	44.919	65%	€ 4.971,00	22,46	SI	NO
	Lekuona	4.406	-	€ -	€ 126.587,00	35.745		€ 3.704,00	34,18	€ 126.587,00	35.745		€ 3.704,00	34,18	SI	SI
	TOTALI	**4.801**	**348.145**	**€ 31.115,00**	**€ 407.906,00**	**172.001**	**49%**	**€ 30.153,00**	**-**	**€ 407.906,00**	**172.001**	**49%**	**€ 30.153,00**	**-**		

TABLE 76 – Summary of the planned investments for 12 projects CERtuS

Regarding the type Contract to be applied, it follows from the following table that the most usable contract is certainly the Shared Saving, even if in three situations is combined with the Chauffage, especially in Italy where energy supply by the ESCo is quite usual, or with Guaranteed Saving, where the renovation involves a change of use of the building and therefore is necessary to use a substantial portion of non-repayable capital of the Municipality.

Country	Building	Type of EPC contract
Messina (Italy)	Palazzo Zanca	FIRST IN + SHARED SAVING + CHAUFFAGE
	Palacultura "Palantonello"	
	Palazzo Satellite	
Alimos (Greece)	Municipal Offices	SHARED SAVING
	City Hall	SHARED SAVING
	Library	
Coimbra (Portugal)	TOWN HALL	SHARED SAVING
	MUNICIPAL HOUSE OF CULTURE	SHARED SAVING
	ELEMENTARY SCHOOL OF SOLUM	
Errenteria (Spain)	City Hall	SHARED SAVING
	Kapitain Etxea	GARANTED SAVINGS + SHARED SAVING
	Lekuona	GARANTED SAVINGS + SHARED SAVING

TABLE 77 – Summary of types of EPC contract provided for 12 projects CERtuS

It should also be pointed out that the results presented in this Deliverable should be considered only as examples to illustrate the application of a methodology of work, with tools created ad hoc; once the town will want to put into practice the projects presented, these will need to be checked in updating costs, verifying the market assumptions relating to standard conditions, rechecking the Baseline Scenario, and finally making a new economic analysis after having explored the possible concessional funds existing.

7. GLOSSARY

Certification: Procedure by which an external entity provides written guarantees that a product, process or service is compliant with specific requisites.

Energy: All forms of energy products, combustible fuels, heat, renewable energy, electricity, or any other form of energy, as defined in Article 2(d) of Regulation (EC) No 1099/2008 of the European Parliament and of the Council of 22 October 2008 on energy statistics

Energy service: The physical benefit, utility or good derived from a combination of energy with energy-efficient technology or with action, which may include the operations, maintenance and control necessary to deliver the service, which is delivered on the basis of a contract and in normal circumstances has proven to result in verifiable and measurable or estimable energy efficiency improvement or primary energy savings;

Energy audit: A systematic procedure with the purpose of obtaining adequate knowledge of the existing energy consumption profile of a building or group of buildings, an industrial or commercial operation or installation or a private or public service, identifying and quantifying cost-effective energy savings opportunities, and reporting the findings;

Energy performance contracting: A contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where investments (work, supply or service) in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or other agreed energy performance criterion, such as financial savings;

Energy service company (ESCO): A natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed performance criteria;

Qualification: The formal result (certificate, diploma, title or trademark) issued by a process of ascertainment and validation, obtained when the certifying body determines that training results have been reached for a specific standard and/or that the person has the skills necessary to undertake a task in a certain area of employment,. A

qualification is the official recognition of the validity of the results of the learning on the job market and in the education and training sector. In training, a qualification is the formal certification issued by an authority having jurisdiction upon the completion of a training path to certify that the student has acquired skills compatible with the standards established in the national educational system.

Historical Energy Bill: Energy costs flat rate, calculated on the historical cost of the energy of the system before surgery and possibly discounted compared to variation in fuel prices

Standard Energy Bill: Energy costs actually incurred in the year on which we calculate and break down sides savings

8. REFERENCES

D2.1 – Report on the 12 nZEB renovation schemes with technical and economic

D2.2 – Report on the risks, difficulties and constraints envisaged by the stakeholders regarding nZEB renovations

D2.3 – Report on the obstacles, risks and difficulties for the renovations schemes

D2.5 – Twelve economic evaluation reports

D3.1 "Report on analysis of the current conditions of Messina"

D3.2 "Report on analysis of the current conditions of Alimos"

D3.3 "Report on analysis of the current conditions of Errenteria"

D3.4 "Report on analysis of the current conditions of Coimbra"

D3.5 - Report on existing performance contracting examples and energy service models

ANNEX A

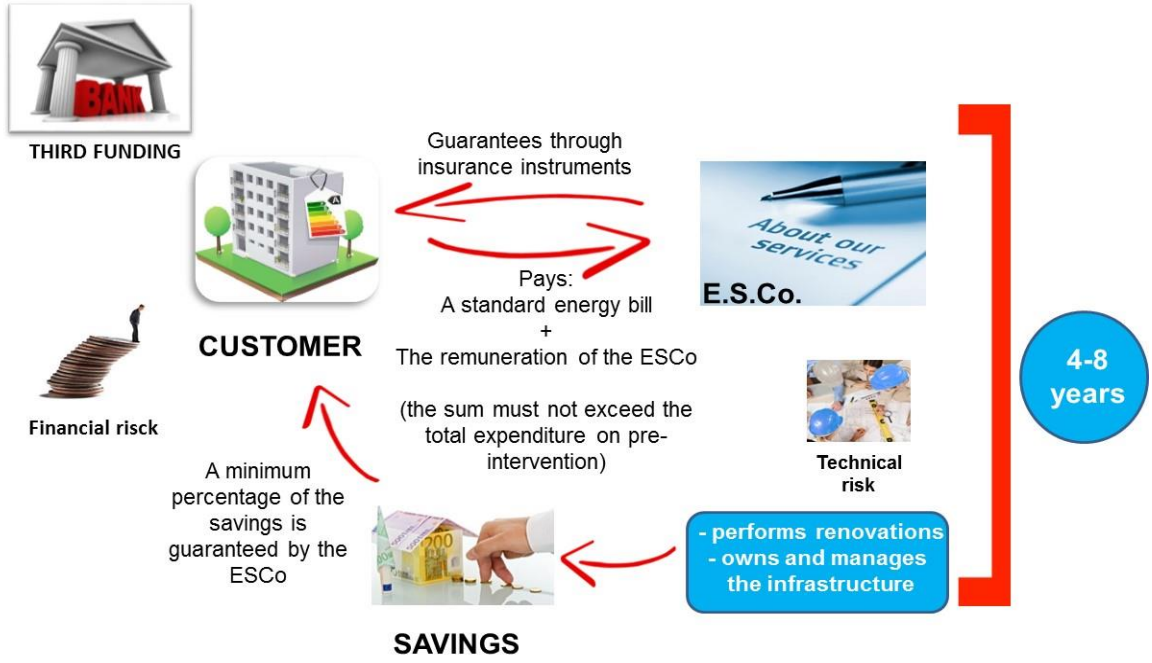
A1. FIRST IN

CONTRACT TYPE	CUSTOMER	ESCO	BANK
FIRST IN	– The customer pays a fixed fee that guarantees a guaranteed minimum saving of energy costs historical. – If the saving is major of the minimun fixed the customer have a positive adjustment at year end	- ESCO finances interventions with equity capital or through third Party Financing ("credit risk") - The ESCO makes the interventions of energy savings and governs installations, of which will maintain the property until the end of the contrac (tecnical risk) - ESCO it is for to 100% of the expected savings in contract; if the saving is major, the difference is shared with the customer	- The Bank finances the ESCO if not use the equity

A2. FIRST OUT

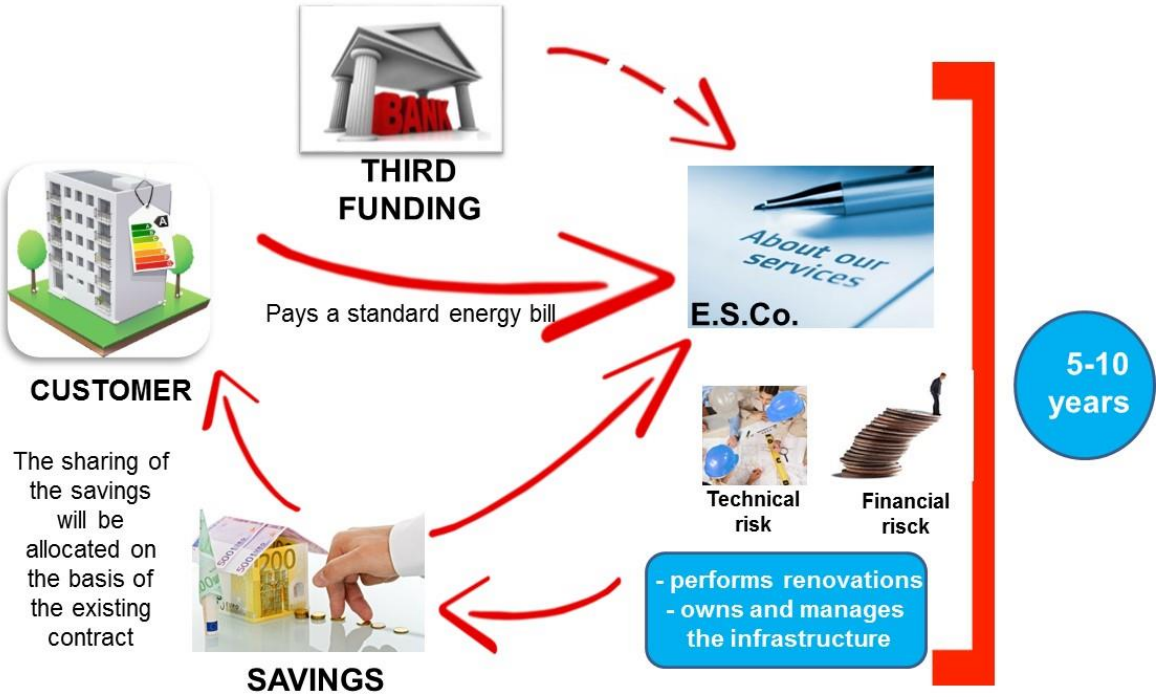
CONTRACT TYPE	CUSTOMER	ESCO	BANK
FIRST OUT	- For the duration of the contract the customer continues to spend like before upgrading the energy efficiency - At the end of the contract the customer benefits of the savings resulting from energy saving measures	ESCO finances the interventions with equity capital or through third Party Financing For the duration of the contract, receives 100% of the savings achieved by energy saving measures by which the ESCO can recover the credit, the costs and the profit	- The Bank finances the ESCO if not use the equity

A3. GUARANTEED SAVINGS



CONTRACT TYPE	CUSTOMER	ESCO	BANK
GUARANTEED SAVINGS	- The customer finances the interventions with equity capital or through third Party Financing, accept the "credit risk - For the duration of the contract, receives 100% of the savings achieved - The customer pays a fixed fee for the services of the ESCO	- ESCO finds and organises the financing - ESCO guarantees a minimum energy savings agreed with the customer - Accept only the risk to the guaranteed performance "tecnical risk"	- The Bank finances the Custumer if not use the equity

A4. SHARED SAVINGS

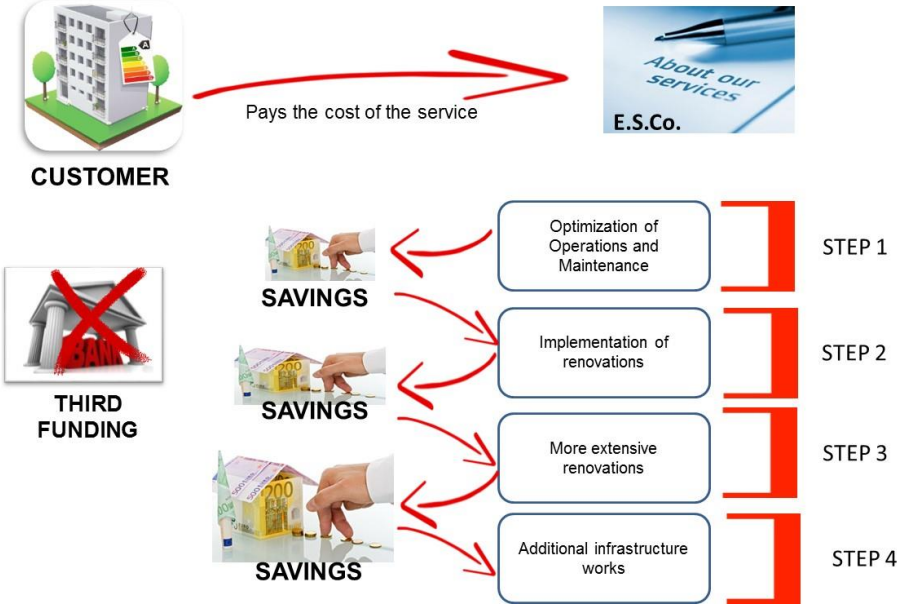


CONTRACT TYPE	CUSTOMER	ESCO	BANK
SHARED SAVINGS	- Energy saving is divided between ESCO and the customer	- ESCO finances interventions with equity capital or through third Party Financing - The ESCO accepts the risk to the guaranteed performance ("technical risk") and accepts the "credit risk" - Energy saving is divided between ESCO and the customer	- The Bank finances the ESCO if not use the equity

A5. PAY FROM SAVINGS

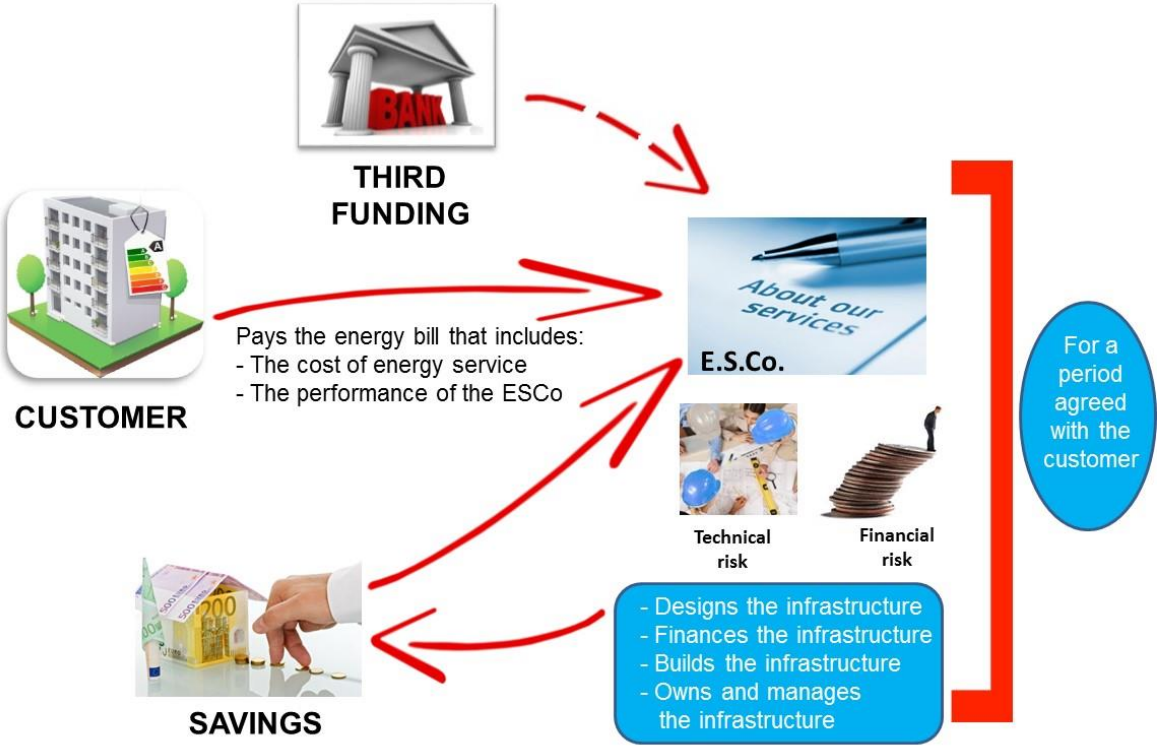
CONTRACT TYPE	CUSTOMER	ESCO	BANK
PAY FROM SAVINGS	- The customer Finance interventions through third Party Financing - The customer returns the debt in payments proportional to the savings achieved (the funder evaluates the technical project) - The customer accept the "credit risk" - For the duration of the contract, receives 100% of the savings achieved - The customer pays a fixed fee for the services of the ESCO	- Finds and organizes the financing - ESCO guarantees a minimum energy savings agreed with the customer - Accept only the risk to the guaranteed performance "technical risk"	- The Bank participates in the project and finances the customer, accepts a financial risk since it is reimbursed annually based on the cost savings achieved

A6. FOUR STEPS



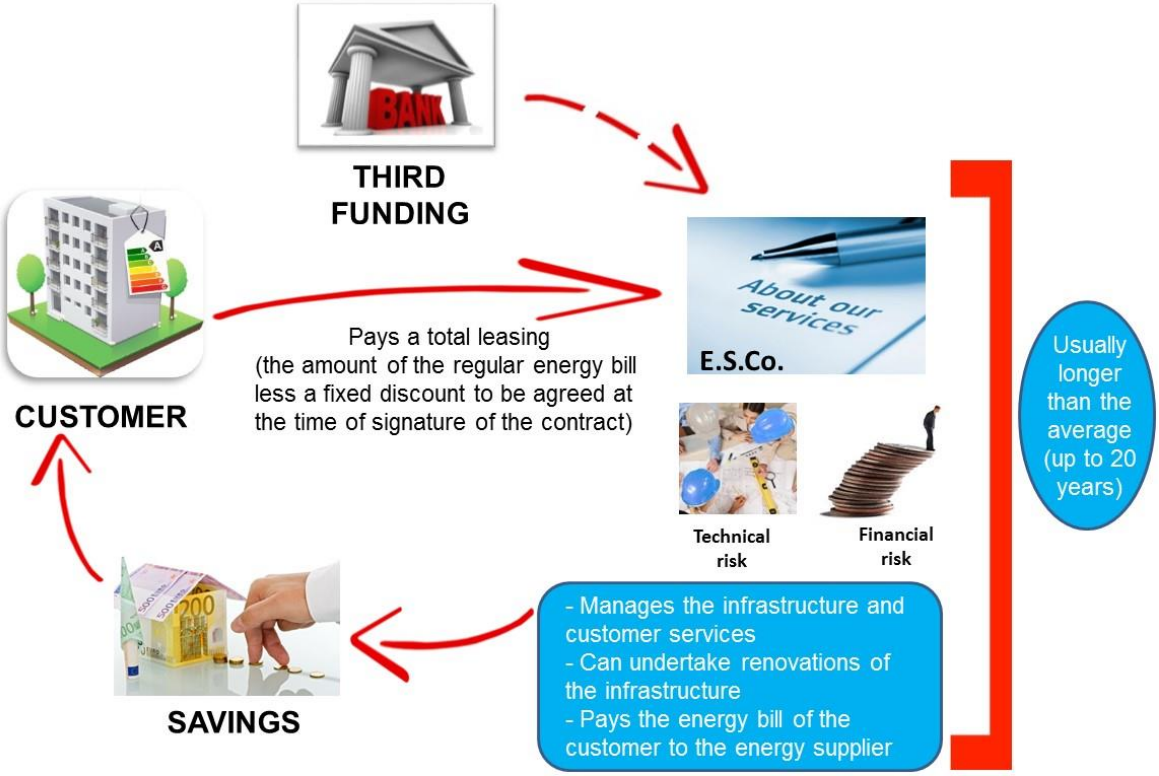
CONTRACT TYPE	CUSTOMER	ESCO	BANK
FOUR STEPS	- The customer pays a fixed fee for the services of the ESCO	ESCO finances the interventions according to the following mechanism: - Step 1: optimization of operation and maintenance (no investment) - Step 2: the saving obtained from Step 1 finances measures of energy saving simple and low cost - Step 3: the saving obtained from Step 1 and Step 2 finances energy saving measures medium size - Step 4: the saving obtained from preceding steps finance large energy saving measures and with return times longer	- There is not third-party financing

A7. BOOT



CONTRACT TYPE	CUSTOMER	ESCO	BANK
Build-Own-Operate & Transfer (BOOT);	- The customer pays the energy bill and the service provided to the ESCO - At the end of the contract, the customer has the ownership of the property	- The ESCO designs, builds, finances, governs the new plants and owns the property for a defined period of time (usually with Purpose companies); when the period of time established is finished, it transfers ownership to the customer (technical and credit risk) - For the duration of the contract, receives 100% of the savings achieved	- The Bank finances the ESCO

A8. CHAUFFAGE



CONTRACT TYPE	CUSTOMER	ESCO	BANK
CHAUFFAGE	- the customer entrusts the management of its plants to the ESCO and it pays a fee equal to the historical spending or lower	- ESCO pays the energetic bills and bills of fuel for the duration for the contract (technical risk) - ESCO finances the maintenance/ redevelopment / upgrading interventions of the existing installations - For the duration of the contract, receives 100% of the savings achieved	- The Bank finances the ESCO if not use the equity

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Municipality of Coimbra (PT)

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SINLOC - Sistema Inizative Locali Spa (IT)

ETVA VI.PE. S.A. (EL)

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