DEESME 2050

Developing Energy Efficiency Projects in SMEs for European 2050 targets

Project pipeline

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1. EXECUTIVE SUMMARY

The deliverable D4.2 of the DEESME 2050 project presents an assessment of energy efficiency projects developed in the four European partner countries (Bulgaria, France, Italy and Poland), with the aim of supporting Small and Medium-sized Enterprises (SMEs) in achieving the EU's 2050 climate targets. The analysis is based on the application of the CBA & RA tool, which integrates Cost-Benefit Analysis (CBA) with Risk Analysis (RA), also including multiple benefits (MB).

The CBA tool has been updated in accordance with the European technical standard EN 17463:2021, which recommends the use of economic indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), Discounted Payback (DPB), Profitability Index (PI) and Payback (PB), and considers risks and sensitivity analysis on Non-energy Benefits (NEBs). The MB section has been enriched thanks to contributions from technical working groups and parallel projects, identifying over 50 benefits across social, environmental, economic, health and safety domains.

For each project, the following aspects were analysed:

- The technical and financial characteristics of the intervention;
- The economic results with and without NEBs;
- The main risks identified (energy performance, energy price, delays, regulatory, etc.);
- The proposed mitigation measures and their impact on economic indicators;
- The assessment of the Financial Board.

In Bulgaria, all selected projects concern the installation of photovoltaic systems. In France, the interventions range from energy monitoring to heat network insulation. In Italy, solutions such as reversible heat pumps, biomass boilers and photovoltaic storage systems are analysed. In Poland, the interventions include heat pumps, thermal insulation and window replacement.

The analysis highlights how multiple benefits can significantly improve the profitability of investments, reducing payback times and increasing net present value. Moreover, proactive risk management - through mitigation measures such as performance contracts, advanced or predictive maintenance, and expert support - proves essential to ensure the economic sustainability of the projects.

The document aims to support and encourage reflection on the importance of integrating appropriate financial instruments and risk mitigation strategies to promote the adoption of energy efficiency measures among European SMEs.

2. DEESME 2050 approach

The DEESME approach has been adopted to support enterprises in embedding energy management within their operational strategies and to identify synergies between energy performance, economic gains, and sustainability outcomes.

The analysis (see Deliverable 3.1) confirms that energy efficiency measures generate not only cost savings but also numerous non-energy benefits. By applying the DEESME approach, companies have strengthened their operational resilience, competitiveness, and alignment with the European Union's long-term decarbonisation objectives.

The DEESME approach provides a structured framework for integrating energy efficiency into corporate strategies. It is organised into six progressive steps: business model analysis, energy assessment (cost structure and carbon footprint), identification and evaluation of multiple benefits, and business model improvement. This enables organisations to transform energy audits into actionable operational insights and to link energy-related decisions with operational, financial, and social performance indicators.

2.1 Walk-through audit and energy audit

The Deliverable D3.1 presents the results of the energy audits and Energy Management Systems (EMS) implemented in line with the ISO 50001 framework. These activities followed the Walk-Through Audits (WTAs) carried out under Deliverable 2.2 and involved SMEs that demonstrated both readiness and commitment to adopting structured approaches for improving energy efficiency and sustainability.

The project engaged 60 companies through surveys and selected 30 per pilot country for WTAs. From these, 10 per country received in-depth energy audits or EMS implementation support. The methodology included:

- Audit and EMS templates: Standardized reporting frameworks (in national language and English) were developed to ensure consistent outputs;
- Training programs (Levels 2 & 3): delivered in parallel with audits, these sessions deepened company staff understanding of the Multiple Benefits (MB) approach, ISO 50001 requirements;
- Documentation system: a generic ISO 50001-compliant set of documents was created to reduce barriers to EMS adoption;
- Evaluation tools: attendance sheets and evaluation forms were deployed to measure training impact and participant satisfaction.

2.2 Cost benefit analysis, including multiple benefits

The CBA & RA tool, as the name suggests, is divided into two parts, a cost benefit analysis (CBA) and the risk analysis (RA) (see chapter 2.3).

The cost benefit analysis, including multiple benefits (MBs) is based on the experience of the previous DEESME tool, with various upgrades on both parts. The CBA, to guarantee more uniformity, now follows the indications of the European technical standard EN 17463:2021 Valuation of Energy Related Investments. The Standard grounds the evaluations on net present value; it suggests to identify, qualitatively describe and possibly quantify – to be transferred in cash flows - the efforts and benefits of the investment. Among the benefits the Standard considers: incentives, lower emission allowances, less maintenance, noise reduction, enhancement of production reliability. The Standard also includes the risks and suggests evaluating them via sensitivity and scenario analysis; the first was added in the CBA tool, with the possibility to order the parameters by absolute slope, the second inspired the risk analysis tool (2.3). In the tool, according to the Standard, discount rate is related to the weighted average cost of capital (WACC) and the indicators are discounted payback (DPB), internal rate of return (IRR), net present value (NPV). In addition, simple payback time (PB) and profitability index (PI) are present too in the tool.

The MBs part of the tool was enriched by the exchanges in the CEN/CENELEC working group developing the technical standard "Values and Benefits of Decarbonisation and Energy Performance Actions" - to which two project partners are participating - plus the results of other projects, such as KNOWnNEBs, a partner is participating too. Now, the tool presents a list of over fifty MBs from the following seven domains: Social, Health, Environment, Economic, Security & Safety, Quality and Time. The sensitivity analysis represents a crucial step of the investment evaluation process. This analysis examines how variations in key parameters affect the Net Present Value (NPV) of the investment, providing crucial insights into which parameters most significantly influence the financial Key Performance Indicators (KPIs). The tool performs this analysis by varying each parameter within realistic ranges while holding others constant. This process reveals a hierarchy of parameter influence.

The results of the tool are the evaluations of the project based on the aforementioned indicators with and without considering the MBs, the list of MBs – monetizable and not - and if the MBs impacts on costs and/or value proposition and/or risks. Among the other things there are the graphs of yearly cumulative cash flow and discounted cumulative cash flow with and without non energy

benefits (NEBs) / MBs, showing the effects of discount rate and of multiple benefits (Figure 1).

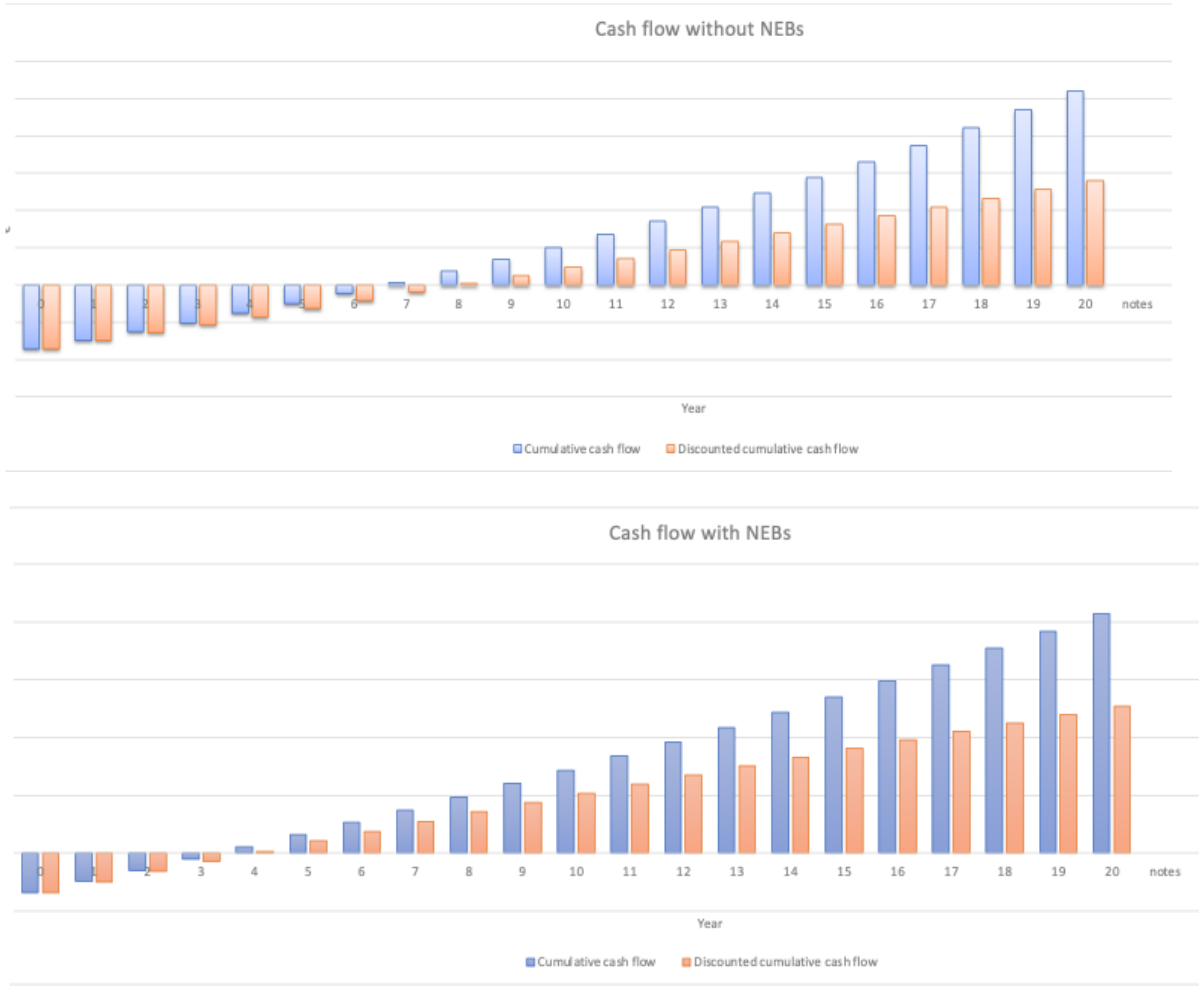

Figure 1 - Yearly cumulative and discounted cash flow without MB (left) and with MB (right)

In all the evaluations there are MBs, varying from one to ten, with an average of around six. The quantifiable MBs are not always present, but when present their number varies from one to four and rises the NPV of the project from 16% to 610% and on average 127%.

Considering the differences in investments, boundary conditions, and among the professionals who carried out the evaluations, it was deemed more representative to group the information by Member State.

The different conditions and tables 1, 3, 5 and 7 collect the MBs and the impacts on NPV for the different projects in France (FR), Bulgaria (BG), Italy (IT) and Poland (PL).

Tables 2, 4, 6 and 8 show the multiple benefits identified in each country's projects, highlighting those that appear most frequently.

Project	Solar PV installation	Solar PV installation	Solar PV installation	Solar PV installation	Solar PV installation
% MB impact on NPV	-	-	-	-	-
List of MBs	Alleviation of energy poverty	Alleviation of energy poverty	Alleviation of energy poverty	Alleviation of energy poverty	Alleviation of energy poverty
	GhG Emission reduction	GhG Emission reduction	GhG Emission reduction	GhG Emission reduction	GhG Emission reduction
	Impact of EE on RES target achievement	Impact of EE on RES target achievement	Impact of EE on RES target achievement	Impact of EE on RES target achievement	Impact of EE on RES target achievement
	Reduced local emissions (dust,, chemical agents etc.)	Reduced local emissions (dust, chemical agents etc.)	Reduced local emissions (dust, chemical agents etc.)	Reduced local emissions (dust, chemical agents etc.)	Reduced local emissions (dust, chemical agents etc.)
	Reduced use of non-renewable resources	Reduced use of non-renewable resources	Reduced use of non-renewable resources	Reduced use of non-renewable resources	Reduced use of non-renewable resources
	Reduction of (maintenance) costs	Reduction of (maintenance) cost	Reduction of (maintenance) cost	Reduction of (maintenance) cost	Reduction of (maintenance) cost
	Increased real estate value	Increased real estate value	Increased real estate value	Increased real estate value	Increased real estate value
	Energy security	Energy security	Energy security	Energy security	Energy security

Table 1 - Multiple benefits in the projects in Bulgaria

Non-energy benefits	**n.**
Alleviation of energy poverty	4
GhG emission reduction	4
Energy security	4
Impact of EE on RES targets achievement	4
Increased real estate value	4
Reduced local emissions (dust, chemical agents etc.)	4
Reduced use of non-renewable resources	4
Reduction of (maintenance) cost	4

Table 2 - Prevalence of multiple benefits in the projects in Bulgaria

Project	Energy sub-metering	Heat network insulation	Photovoltaic system	Heat network insulation	LED lighting
% MB impact on NPV	-	-	127	-	-
List of MBs	Impact of EE on RES target achievement	Customers (new, satisfaction, etc.)	Customers (new, satisfaction, etc.)	Customers (new, satisfaction, etc.)	Employee satisfaction
	Accurate monitoring	Impact of EE on RES target achievement	*Energy security*	Impact of EE on RES target achievement	Improved lighting
		Reduced emissions (dust, CO2, chemical agents etc.)	Increased corporate image	Reduced emissions (dust, CO2, chemical agents etc.)	GhG Emission reduction
					Impact of EE on RES target achievement
					Reduced local emissions (dust, chemical agents etc.)

Table 3 - Multiple benefits in the projects in France (the monetized MB are in italics)

Non-energy benefits	n.
Customers (new, satisfaction, etc.)	3
Impact of EE on RES targets achievement	3
Reduced local emissions (dust, chemical agents etc.)	3
Employee satisfaction	1
Improved lighting	1
GhG emission reduction	1
Energy security	1
Increased corporate image	1

Table 4 - Prevalence of multiple benefits in the projects in France

Project	Biomass boiler	On-site photovoltaic storage system	Reversible Heat Pump for winter & summer	PV system 199,92 kWp	1,9 MWp PV system
% MB impact on NPV	16,5	-	86,3	-	-
List of MBs	*Usage of waste streams*	Security Safety	*Reduction of (maintenance) costs*	GhG Emission reduction	GhG Emission reduction
	GhG Emission reduction		GhG Emission reduction	Impact of EE on RES target achievement	Impact of EE on RES target achievement
	Impact of EE on RES target achievement		Impact of EE on RES target achievement	Reduced local emissions (dust, chemical agents etc.)	Reduced local emissions (dust, chemical agents etc.)
	Reduced local emissions (dust, chemical agents etc.)		Reduced local emissions (dust, chemical agents etc.)	Reduced use of non-renewable resources	Reduced use of non-renewable resources
	Reduced use of non-renewable resources		Reduced use of non-renewable resources	Increased real estate value	Increased real estate value
	Reduced waste		Increased real estate value	Energy security	Energy security
			Energy security		

Table 5 - Multiple benefits in the projects in Italy (the monetized MB are in italics)

Non-energy benefits	n.
GhG emission reduction	3
Impact of EE on RES targets achievement	3
Reduced local emissions (dust, chemical agents etc.)	3
Reduced use of non-renewable resources	3
Increased real estate value	3
Energy security	3
Reduction of (maintenance) cost	1
Security/Safety	1

Table 6 - Prevalence of multiple benefits in the projects in Italy

Project	Coal boiler replacement/Heat pump installation	Windows, walls, gates, doors, roof insulation	Windows replacement	Walls insulation	Walls insulation and gates replacement
% MB impact on NPV	20	609	25	99	38
List of MBs	*Employee satisfaction*	Health and well-being	Health and well-being	Health and well-being	*Health and well-being*
	Sickness & absenteeism	*Employee satisfaction*	*Employee satisfaction*	*Employee satisfaction*	Improved air quality
	Improved air quality	*Sickness & absenteeism*	Improved air quality	*Sickness & absenteeism*	GhG Emission reduction
	Emission reduction	Improved air quality	Reduced noise	Improved air quality	*Increased real estate value*
	Reduced use of non-renewable resources	Reduced noise	GhG Emission reduction	Reduced noise	Reduction of (operating) cost
	Reduction of (operating) cost	*Emission reduction*	Reduction of (maintenance) cost	*Emission reduction*	Increased regulatory compliance
	Reduction of (maintenance) cost	Reduced emissions (dust, CO2, chemical agents etc.)	Increased real estate value	Reduced emissions (dust, CO2, chemical agents etc.)	
		Reduction of (maintenance) cost		*Reduction of (maintenance) cost*	
		Increased real estate value		Increased real estate value	
		Reduction of (operating) cost		Reduction of (operating) cost	

Table 7 - Multiple benefits in the projects in Poland (the monetized MB are in italics)

Non-energy benefits	n.
Health and well-being	4
Improved air quality	4
Increased real estate value	4
Employee satisfaction	3
Reduced noise	3
GhG emission reduction	3
Reduction of (maintenance) cost	3
Reduction of (operating) cost	3
Sickness and absenteeism	2
Reduced local emissions (dust, chemical agents etc.)	2
Increased regulatory compliance	1

Table 8 - Prevalence of multiple benefits in the projects in Poland

The table below shows the frequency with which each multiple benefit identified across the 20 analysed projects appears. Out of the 51 available multiple benefits, only 19 were considered relevant to the implementation of these energy efficiency projects. Among these, the most frequently occurring benefits are related to (GhG or local) emission reduction, reduced use of non-renewable sources, lower maintenance costs, increased real estate value, and improved energy security.

Non-energy benefits	%
Reduced local emissions (dust, chemical agents etc.)	60%
GhG emission reduction	55%
Increased real estate value	55%
Impact of EE on RES targets achievement	50%
Reduction of (maintenance) cost	40%
Energy security	40%
Reduced use of non-renewable resources	35%
Alleviation of energy poverty	20%
Health and well-being	20%
Employee satisfaction	20%
Improved air quality	20%
Customers (new, satisfaction, etc.)	15%
Reduced noise	15%
Reduction of (operating) cost	15%
Sickness and absenteeism	10%
Improved lighting	5%
Increased corporate image	5%
Security/Safety	5%
Increased regulatory compliance	5%

Table 9 - Frequency percentage of each multiple benefit identified in the 20 reviewed projects

In the tables 10-13 we provide the ranks of the parameters in the sensitivity analysis in the investments investigated in FR, BG, IT and PL.

#	Solar PV installation	Solar PV installation	Solar PV installation	Solar PV installation	Solar PV installation
	Parameter name	Parameter name	Parameter name	Parameter name	Parameter name
1	Electricity cost	Electricity cost	Electricity cost	Electricity cost	Electricity cost
2	Electricity consumption after investment	Cost of energy efficiency measure	Electricity consumption after investment	Electricity consumption after investment	Cost of energy efficiency measure
3	Cost of energy efficiency measure	Electricity consumption after investment	Interest rate of equity capital	Cost of energy efficiency measure	Electricity consumption after investment
4	Interest rate of equity capital	Interest rate of debt	Cost of energy efficiency measure	Interest rate of equity capital	Interest rate of equity capital
5	Expected % variation in electricity cost	Expected % variation in electricity cost	Expected % variation in electricity cost	Expected % variation in electricity cost	Expected % variation in electricity cost

Table 10 - First five parameters with higher absolute slope in the risk analysis for different projects in Bulgaria

#	Energy sub-metering	Heat network insulation	Photovoltaic system	Heat network insulation	LED lighting
	Parameter name	Parameter name	Parameter name	Parameter name	Parameter name
1	Electricity consumption after investment	Gas consumption after investment	Electricity consumption after investment	Gas consumption after investment	Electricity cost
2	Electricity cost	Gas cost	Electricity cost	Gas cost	Interest rate of equity capital
3	Interest rate of equity capital	Interest rate of equity capital	MB energy security	Interest rate of equity capital	Expected % variation in electricity cost
4	Expected % variation in electricity cost	Expected % variation in gas cost	Interest rate of debt	Expected % variation in gas cost	Electricity consumption after investment
5	Cost of energy efficiency measure	Cost of energy efficiency measure	Cost of energy efficiency measure	Cost of energy efficiency measure	Cost of energy efficiency measure

Table 11 - First five parameters with higher absolute slope in the risk analysis for different projects in France (MB in Italics)

#	Biomass boiler	On-site photovoltaic and storage system	Reversible Heat Pump for winter&summer	PV system kWp	PV system MWp
	Parameter name	Parameter name	Parameter name	Parameter name	Parameter name
1	Gas cost	Electricity consumption after investment	Cost of energy efficiency measure	Electricity cost	Electricity consumption after investment
2	Cost of energy efficiency measure	Electricity cost	Gas cost	Cost of energy efficiency measure	Electricity cost
3	Expected % variation in gas cost	Cost of energy efficiency measure	Electricity consumption after investment	Electricity consumption after investment	Cost of energy efficiency measure
4	Interest rate of equity capital	Interest rate of equity capital	Interest rate of equity capital	Interest rate of equity capital	Interest rate of equity capital
5	Electricity cost	Expected % variation in electricity cost	Expected % variation in gas cost	Expected % variation in electricity cost	Expected % variation in electricity cost

Table 12 - First five parameters with higher absolute slope in the risk analysis for different projects in Italy (MB in Italics)

	Coal boiler replacement/Heat pump installation	Windows, walls, gates, doors, roof insulation	Windows	Walls insulation	Walls insulation
#	Parameter name	Parameter name	Parameter name	Parameter name	Parameter name
1	Electricity consumption after investment	MB Reduced emissions (CO_2, dust...)	Cost of energy efficiency measure	Expected % variation in other carriers	Cost of energy efficiency measure
2	Electricity cost	Interest rate of equity capital	Expected % variation in other carriers	Interest rate of equity capital	Interest rate of equity capital
3	Expected % variation in other carriers	Interest rate of debt	Interest rate of equity capital	Interest rate of debt	Interest rate of debt
4	Expected % variation in electricity cost	Cost of energy efficiency measure	Interest rate of debt	Cost of energy efficiency measure	MB Health and well-being
5	Cost of energy efficiency measure	Expected % variation in other carriers	MB Employee satisfaction	MB Reduced emissions (CO_2, dust...)	MB Increased real estate value

Table 13 - First five parameters with higher absolute slope in the risk analysis for different projects in Poland (MB in Italics)

2.3 Risk Analysis Tool

The second part of the CBA & RA tool is dedicated to the analysis of risks in energy efficiency projects. The tool begins this analysis by automatically retrieving all parameters related to the investment from the CBA spreadsheets, both in the case with and without the contribution of NEBs. In this section, the consultant has the opportunity to investigate which types of risks are potentially most impactful on the investment under analysis. The types of risk included in the tool are as follows:

- Regulatory (incentives / carbon quota);
- Delays (authorization / project timeline);
- Energy performance;
- Stakeholder engagement[1];
- Energy price;
- Operational;
- Maintenance;
- Performance Measurement and Verification (M&V)[2].

For each of the risks that the consultant considers likely to occur, it is possible to simulate their impact on economic indicators (NPV; payback time) by adjusting

[1] The lack of stakeholder engagement is considered in broad sense, inside and eventually outside the company: lack of involvement, poor/no information/training, etc.

[2] In case of performance clauses in the contract, an appropriate M&V should be in place to avoid the risk of controversies on poorly evaluated/deem savings

a series of parameters that allow the representation of the risk's impact on the investment's cash flows, such as:

- failure to obtain an incentive;
- increases in fixed costs or in the cost of capital;
- delays in project implementation;
- additional operating costs;
- percentage reductions in estimated energy performance;
- percentage variations in energy carrier prices.

For each risk, the same analysis is repeated by introducing a possible risk mitigation measure and its related costs, in order to assess its impact on economic indicators. Finally, the spreadsheet includes a section where it is possible to evaluate the combined effects (worst case scenario) of all or of a selection of risks on the main economic indicators.

The tables 14-17Table 14Table 15Table 16Table 17 indicate the risks along with the corresponding mitigation measures proposed by the consultants for each of the selected energy efficiency projects analysed in the following chapters, while Table 1818 summarizes the risks considered in the projects presented by each partner.

	Regulatory Risk	Delays Risk	Energy Performance Risk	Energy Price Risk	Operational Risk
Project 1: Solar PV installation Mitigations:	✗	✓ Expert assistance	✓ Advanced additional maintenance	✓	✗
Project 2: Solar PV installation Mitigations:	✗	✓ Expert assistance	✓ Advanced additional maintenance	✓	✗
Project 3: Solar PV installation Mitigations:	✗	✓ Expert assistance	✓ Advanced additional maintenance	✓	✗
Project 4: Solar PV installation Mitigations:	✗	✓ Expert assistance	✓ Advanced additional maintenance	✓	✗
Project 5: Solar PV installation Mitigations:	✗	✓ Expert assistance	✓ Advanced additional maintenance	✓	✗

Table 14 - Main risks and proposed mitigation measures for each project in Bulgaria

	Regulatory Risk	Delays Risk	Energy Performance Risk	Energy Price Risk	Operational Risk
Project 1: Energy sub-metering Mitigations:	✗	✗	✓ Expert to detect deviations as effectively as possible	✓	✗
Project 2: Heat network insulation Mitigations:	✗	✗	✓ To verify that the work has been carried out correctly and in accordance with best practice	✓	✗
Project 3: Solar PV installation Mitigations:	✗	✗	✓ EPC contract to effectively manage the installation	✓	✗
Project 4: Heat network insulation Mitigations:	✗	✗	✓ To verify that the work has been carried out correctly and in accordance with best practice	✓	✗
Project 5: LED lighting Mitigations:	✗	✗	✓ Advanced additional maintenance	✓	✗

Table 15 - Main risks and proposed mitigation measures for each project in France

	Regulatory Risk	Delays Risk	Energy Performance Risk	Energy Price Risk	Operational Risk
Project 1: Reversible heat pump	✓	✗	✓	✓	✗
Mitigations:	Expert assistance		Advanced additional maintenance	Fixed-price electricity contract	
Project 2: Biomass boiler	✓	✗	✓	✗	✗
Mitigations:	Expert assistance		Advanced additional maintenance		
Project 3: Photovoltaic storage system	✗	✗	✓	✗	✗
Mitigations:			Advanced additional maintenance		
Project 4: Solar PV installation	✓	✗	✓	✗	✗
Mitigations:	Expert assistance		Inverter replacment at year 5		
Project 5: PV installation	✓	✗	✓	✗	✗
Mitigations:	Expert assistance		Inverter replacment at year 10		

Table 16 - Main risks and proposed mitigation measures for each project in Italy

	Regulatory Risk	Delays Risk	Energy Performance Risk	Energy Price Risk	Operational Risk
Project 1: Heat pump installation	✓	✗	✓	✓	✓
Mitigations:	Expert assistance		EPC contract		Quality control
Project 2: Windows, walls, gates, doors, roof insulation	✓	✗	✓	✓	✓
Mitigations:	Expert assistance		EPC contract		Expert assistance
Project 3: Windows replacement	✓	✗	✗	✗	✗
Mitigations:	Expert assistance				
Project 4: Walls insulation	✓	✗	✗	✓	✗
Mitigations:	Expert assistance				
Project 5: Walls insulation and gates replacement	✓	✓	✓	✓	✓
Mitigations:	Expert assistance	Expert assistance	EPC contract		EPC contract

Table 17 - Main risks and proposed mitigation measures for each project in Poland

	Regulatory risk	Risk due to delays	Energy performance risk	Energy price risk	Operational risk
BG	0	5	5	5	0
FR	0	0	4	4	0
IT	4	0	5	0	0
PL	5	1	3	4	3
Total	*9 (19%)*	*6 (13%)*	*17 (35%)*	*13 (27%)*	*3 (6%)*

Table 18 - Risks selected in the five projects of each partner

Energy price risk is the second most present risk in the analysis, highlighting the importance of the energy prices and their fluctuations in the management of the enterprises. A rise in energy prices has a negative effect on the company energy expenditure but has a positive effect on the energy efficiency/renewable investment, rising the value of each unit of energy saved. Thus, this kind of risk should be evaluated and managed not only considering the energy efficiency/renewable investment(s), but also the share of energy efficiency improvement/generation on the total energy consumption and the way is investment is financed. If the savings are limited compared to the total energy consumption, the main effect for the enterprise is a rise in energy expenditure; the enterprise may be willing to mitigate the risk of rising energy prices with fixed price purchase contracts, power purchase agreement, etc., but this will be a benefit for the enterprise, not for the energy efficiency investments, that - with lower energy prices - will have a longer payback time. Thus, if the enterprise is

willing to mitigate the risk of rising energy price, the cost must not be on the energy efficiency measures that is already negatively affected.

If the energy efficiency/renewable investment covers a large part of the total energy consumption, this already lowers the exposition of the enterprise to higher prices/price fluctuations. If the energy efficiency/renewable are financed by ESCOs, etc. offering the energy at a fixed price, a mitigation action could be the possibility to re-negotiate the supply conditions after some years.

2.4 Facilitating Financing

DEESME 2050 was designed to help the developed projects to be financed. The main lessons from the EC's Energy Efficiency Financial Institutions Group (EEFIG) that has now been replaced by the European Energy Efficiency Financing Coalition (EEEFC) were that SMEs do not have enough capacity and capital to work with energy efficiency improvements and are thus in need of a more supportive approach from intermediaries such as external experts; they lack capacity to build a business case on possible energy efficiency measure that they can take to financial institutions and funding sources; and given current economic conditions, are reluctant to take on more debt. Importantly, the recent rises in natural gas and oil prices, have motivated SMEs to reduce their energy consumption to avoid profit losses. DEESME 2050 also realized that the financial institutions needed to better understand the context SMEs work within and how important improved energy efficiency is to help their bottom line.

DEESME 2050 is designed to help facilitate financing. An external financial board was set up to help identify an investable pipeline of projects. Two board meetings were held to bridge SMEs and investors. The board reviewed a series of case studies developed from the project. They identified several common problems: there are few people working in the companies leading to a capacity issue; there is a lack of knowledge about regulations and available grants; being small, the companies could not pass on increased costs; energy often represented a small percentage of overall costs; too often the companies did not own their buildings; and investments in improved energy efficiency were often small, meaning even ESCOs showed a lack of interest. The Risk Assessment Tool partially addressed these challenges.

DEESME 2050 supported networking (match making) between the projects and financial institutions. The context has evolved recently and this should help financing. In September 2025, the European Investment Bank and the European Commission announced a €17.5 billion financing initiative to aid over 350,000 SMEs across Europe in improving energy efficiency. This works to the advantage of companies in the DEESME 2050 project. The EIB works with a range of

national banks and partners were made aware of that relationship. Also, partners arranged networking events within their own country to help establish closer links and to explain to investors how DEESME 2050 tools improved the business cases for investments.

The partners were also introduced to the European Commission's European Energy Efficiency Financing Coalition, bringing together EU countries, financial institutions and relevant stakeholders, to identify actions to concretely improve private financing for energy efficiency. EEEFC works at both the EU and national levels. There will be a working group dedicated to SMEs and that will benefit DEESME 2050 partners. EEEFC is also in the process setting up national hubs and most of them should be running before the end of 2025. Partners have been informed about these hubs and introduced to them once the hubs are established. That process is on-going, but partners can already benefit. The EEEFC will also help the financial institutions be better prepared for when our partners, and other SMEs, present their business cases.

3. Assessment of the projects

For each of the five energy efficiency projects selected through the audits carried out by each partner, the following information are provided:

- Key characteristics of the project;
- Main economic results obtained by applying the methodology described in Chapter 2.2 (Cost Benefit Analysis), including the identification and impact of multiple benefits;
- Main economic results obtained by applying the methodology described in Chapter 2.3 (Risk Analysis with possible mitigation actions), along with the impact of multiple benefits;
- Assessment of the Financial Board.

3.1 Bulgaria

Regarding the Bulgarian partner, all five projects presented involve the installation of solar PV systems. As a result, the analyses share similar elements, such as multiple benefits and mitigation actions.

Therefore, since the considerations are comparable across the projects, a detailed analysis will be carried out only for the first project, while for the others only the results from the CBA & RA analysis will be presented.

3.1.1 Project 1: Solar PV installation

3.1.1.1 Energy efficiency project description

Company 1

The energy-saving measure identified through the energy audit involves the installation of a photovoltaic system with an installed capacity of 30 kWp, configured for self-consumption.

Investment and incentives

The total capital cost is estimated to €31,000. No suitable incentives have been identified for this investment.

Performance and savings

An annual saving of almost 10,000 kWh of electricity is estimated, equivalent to about €2,400/year.

3.1.1.2 Cost benefit analysis results and multiple benefits

The results of the cost-benefit analysis indicate a reasonably profitable investment, with a payback period slightly exceeding six years (Figure 2).

In general, across the five solar PV installation projects, it is evident that the economic viability – particularly in terms of payback time – is closely linked to the scale of the project. Larger projects tend to have lower specific cost and shorter payback periods, which suggests that this type of investment involves a significant proportion of fixed costs within the total investment.

Main economic results without NEBs			Main economic results with NEBs		
Investment lifetime	20		Investment lifetime	20	
Investment	31.000	€	Investment	31.000	€
Pay Back time	6,4	years	Pay Back time	6,4	years
IRR	16	%	IRR	16	%
NPV	37.176	€	NPV	37.176	€
NPV/Investment	1,20	-	NPV/Investment	1,20	-
Cost of Saved Energy	1.180	€/tep	Cost of Saved Energy	1.180	€/tep
			Multiple benefits impact on NPV	0,0	%

Figure 2 - Project 1, Bulgaria: Main economic results without and with NEBs

As shown in Figure 2, no monetizable value has been assigned to any of the non-energy benefits identified in this project. Nevertheless, they contribute positively across each of the three core dimensions of a business, particularly in the environment domain (Figure 3).

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Alleviation of energy poverty	Social	No	No	No	- €/year
Emission reduction	Environment	No	Yes	No	- €/year
Impact of EE on RES target achievement	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	- €/year
Reduced use of non-renewable resources	Environment	Yes	Yes	Yes	- €/year
Reduction of (maintenance) costs	Economic	Yes	No	No	- €/year
Increased real estate value	Economic	No	Yes	No	- €/year
Energy security	SecuritySafety	No	No	Yes	- €/year

Figure 3 - Project 1, Bulgaria: NEBs

3.1.1.3 Risk analysis economic results

In this type of project, the consultant has identified the potential to encounter the following types of risk:

- Energy performance;
- Energy price;
- Delays.

The analysis will not be differentiated with and without NEBs, as there would be no economic differences.

Energy Price Risk

The risk associated with fluctuations in the price of energy carriers, is a common factor across the various projects, but will not be deepened due to the considerations outlined in chapter 2.3.

Energy Performance Risk

To assess this type of risk, a scenario was simulated in which the investment delivers 5% less than the initially projected energy performance.

As shown in Figure 4, the implementation of a mitigation strategy – such as advanced additional maintenance (at a cost of €400/year) – helps bring the economic indicators into reasonably close alignment. Therefore, the decision to adopt such measures will depend on the expectation of a performance shortfall greater than 5%.

However, as previously noted, when the size of the system increases, the economic viability of implementing such an action in relation to the potential risk becomes significantly greater.

Without mitigations		With mitigations:	Advanced Additional Maintenance
NPV	33.768 €	NPV	32.396 €
Pay back time (PBT)	6,7 years	Pay back time (PBT)	6,9 years
NPV/Investment (PI)	1,1 -	NPV/Investment (PI)	1,1 -
Discounted pay back time (DPBT)	8,4 years	Discounted pay back time (DPBT)	8,7 years

Figure 4 - Project 1, Bulgaria: Energy Performance Risk

Risk due to Delays

A one-year delay in the commissioning of the system has also been considered as a potential risk. This may be due primarily to construction delays, or more frequently, to extended timelines for obtaining the necessary documentation and authorisations (Figure 5). Such a delay would result in the loss of expected cash flows for the first year.

The proposed mitigation measure for this type of risk is the involvement of an expert to support the project-related procedures, at a cost of €2,000. It is clear that the benefit of such an intervention increases proportionally with the anticipated economic return in the first year. Therefore, as noted in the previous section, this consideration becomes even more relevant when the cost of the derisking action is fixed.

Without mitigations		With mitigations:	Expert assistance
NPV	31.074 €	NPV	35.176 €
Pay back time (PBT)	7,4 years	Pay back time (PBT)	6,8 years
NPV/Investment (PI)	1,0 -	NPV/Investment (PI)	1,1 -
Discounted pay back time (DPBT)	9,4 years	Discounted pay back time (DPBT)	8,5 years

Figure 5 - Project 1, Bulgaria: Risk due to Delays

Worst Case Risk Analysis

Figure 6 presents the economic indicators assuming that both discussed risks occur simultaneously, and, on the right-hand side, the scenario in which the corresponding mitigation measures are implemented.

Without mitigations		With mitigations	
NPV	29.527 €	NPV	30.396 €
Pay back time (PBT)	7,6 years	Pay back time (PBT)	7,3 years
NPV/Investment (PI)	0,95 -	NPV/Investment (PI)	0,9 -
Discounted pay back time (DPBT)	9,7 years	Discounted pay back time (DPBT)	9,3 years

Figure 6 - Project 1, Bulgaria: Worst Case Risk Analysis

3.1.1.4 Assessment of the Financial Board

This project could receive a concessional financing or a low-interest green loan facility. Despite the absence of direct incentives, the six-year payback period and consistent energy savings of around €2,400 per year make it a sound and stable investment with long-term value. To enhance bankability, it is advisable to include performance guarantees and allocate a modest reserve for potential delays or maintenance, ensuring steady returns and compliance with sustainable energy financing frameworks.

3.1.2 Project 2: Solar PV installation

3.1.2.1 Energy efficiency project description

Company 2

The energy-saving measure identified through the energy audit involves the installation of a photovoltaic system with an installed capacity of 10 kWp, configured for self-consumption.

Investment and incentives

The total capital cost is estimated in €21,800. No suitable incentives have been identified for this investment.

Performance and savings

An annual saving of about 10,000 kWh of electricity is estimated, equivalent about than €2,200/year.

3.1.2.2 Cost benefit analysis results and multiple benefits

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	20	Investment lifetime	20
Investment	21.800 €	Investment	21.800 €
Pay Back time	8,6 years	Pay Back time	8,6 years
IRR	11 %	IRR	11 %
NPV	15.408 €	NPV	15.408 €
NPV/Investment	0,71 -	NPV/Investment	0,71 -
Cost of Saved Energy	1.452 €/tep	Cost of Saved Energy	1.452 €/tep
		Multiple benefits impact on NPV	0,0 %

Figure 7 - Project 2, Bulgaria: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Alleviation of energy poverty	Social	No	No	No	- €/year
Emission reduction	Environment	No	Yes	No	- €/year
Impact of EE on RES target achievement	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	- €/year
Reduced use of non-renewable resources	Environment	Yes	Yes	Yes	- €/year
Reduction of (maintenance) costs	Economic	Yes	No	No	- €/year
Increased real estate value	Economic	No	Yes	No	- €/year
Energy security	SecuritySafety	No	No	Yes	- €/year

Figure 8 - Project 2, Bulgaria: NEBs

3.1.2.3 Risk analysis economic results

Energy Performance Risk

Without mitigations		With mitigations:	Advanced Additional Maintenance
NPV	13.548 €	NPV	10.250 €
Pay back time (PBT)	9,1 years	Pay back time (PBT)	10,0 years
NPV/Investment (PI)	0,6 -	NPV/Investment (PI)	0,5 -
Discounted pay back time (I	11,6 years	Discounted pay back time (DPBT)	13,1 years

Figure 9 - Project 2, Bulgaria: Energy Performance Risk

Risk due to Delays

Without mitigations		With mitigations: Expert assistance	
NPV	12.242 €	NPV	31.408 €
Pay back time (PBT)	9,6 years	Pay back time (PBT)	9,3 years
NPV/Investment (PI)	0,6 -	NPV/Investment (PI)	0,6 -
Discounted pay back time (I	12,5 years	Discounted pay back time (DPBT)	12,1 years

Figure 10 - Project 2, Bulgaria: Risk due to Delays

Worst Case Risk Analysis

Without mitigations		With mitigations	
NPV	13.263 €	NPV	2.850 €
Pay back time (PBT)	9,4 years	Pay back time (PBT)	10,8 years
NPV/Investment (PI)	0,06 -	NPV/Investment (PI)	0,35 -
Discounted pay back time (I	12,1 years	Discounted pay back time (DPBT)	14,4 years

Figure 11 - Project 2, Bulgaria: Worst Case Risk Analysis

3.1.2.4 Assessment of the Financial Board

A small-scale investment that aligns with national renewable energy priorities. With estimated annual savings of €2,200 and no available incentives, the project remains financially viable under self-consumption. Assessment recommends exploring preferential green credit lines to improve liquidity and mitigate minor risks related to performance or permitting delays.

3.1.3 Project 3: Solar PV installation

3.1.3.1 Energy efficiency project description

Company 3

The energy-saving measure identified through the energy audit involves the installation of a photovoltaic system with an installed capacity of 100 kWp, configured for self-consumption.

Investment and incentives

The total capital cost is estimated in €100,000. No suitable incentives have been identified for this investment.

Performance and savings

An annual saving of about 84.000 kWh of electricity is estimated, equivalent about than €21.000/year.

3.1.3.2 Cost benefit analysis results and multiple benefits

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	20	Investment lifetime	20
Investment	100.000 €	Investment	100.000 €
Pay Back time	4,5 years	Pay Back time	4,5 years
IRR	23 %	IRR	23 %
NPV	219.120 €	NPV	219.120 €
NPV/Investment	2,19 -	NPV/Investment	2,19 -
Cost of Saved Energy	847 €/tep	Cost of Saved Energ	847 €/tep
		Multiple benefits in	0,0 %

Figure 12 - Project 3, Bulgaria: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Alleviation of energy poverty	Social	No	No	No	- €/year
Emission reduction	Environment	No	Yes	No	- €/year
Impact of EE on RES target achievement	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	- €/year
Reduced use of non-renewable resources	Environment	Yes	Yes	Yes	- €/year
Reduction of (maintenance) costs	Economic	Yes	No	No	- €/year
Increased real estate value	Economic	No	Yes	No	- €/year
Energy security	SecuritySafety	No	No	Yes	- €/year

Figure 13 - Project 3, Bulgaria: NEBs

3.1.3.3 Risk analysis economic results

Energy Performance Risk

Without mitigations		With mitigations:	Advanced Additional Maintenance
NPV	203.164 €	NPV	142.340 €
Pay back time (PBT)	4,7 years	Pay back time (PBT)	4,6 years
NPV/Investment (PI)	2,0 -	NPV/Investment (PI)	2,1 -
Discounted pay back time (I	5,6 years	Discounted pay back time (DPBT)	5,4 years

Figure 14 - Project 3, Bulgaria: Energy Performance Risk

Risk due to Delays

Without mitigations		With mitigations: Expert assistance	
NPV	190.555 €	NPV	127.120 €
Pay back time (PBT)	0,6 years	Pay back time (PBT)	0,5 years
NPV/Investment (PI)	1,9 -	NPV/Investment (PI)	2,1 -
Discounted pay back time (I	6,6 years	Discounted pay back time (DPBT)	5,4 years

Figure 15 - Project 3, Bulgaria: Risk due to Delays

Worst Case Risk Analysis

Without mitigations		With mitigations	
NPV	183.316 €	NPV	122.340 €
Pay back time (PBT)	5,7 years	Pay back time (PBT)	4,7 years
NPV/Investment (PI)	1,83 -	NPV/Investment (PI)	2,08 -
Discounted pay back time (I	6,8 years	Discounted pay back time (DPBT)	5,5 years

Figure 16 - Project 3, Bulgaria: Worst Case Risk Analysis

3.1.3.4 Assessment of the Financial Board

This solar PV installation demonstrates strong potential for support through national and/or EU-level green financing instruments. With a projected annual saving of €21,000 and a payback period likely below five years, the project could align with national funding priorities for decarbonisation and energy self-sufficiency in SMEs. Although no direct incentives are currently available, the project could qualify for co-financing under future calls from EU structural funds or national recovery mechanisms, particularly those promoting renewable energy integration and carbon footprint reduction.

3.1.4 Project 4: Solar PV installation

3.1.4.1 Energy efficiency project description

Company 4

The energy-saving measure identified through the energy audit involves the installation of a photovoltaic system with an installed capacity of 32.2 kWp, configured for self-consumption.

Investment and incentives

The total capital cost is estimated in €31.000. No suitable incentives have been identified for this investment.

Performance and savings

An annual saving of about 18,000 kWh of electricity is estimated, equivalent about than €4,500/year.

3.1.4.2 Cost benefit analysis results and multiple benefits

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	20	Investment lifetime	20
Investment	31.000 €	Investment	31.000 €
Pay Back time	6,4 years	Pay Back time	6,4 years
IRR	16 %	IRR	16 %
NPV	37.176 €	NPV	37.176 €
NPV/Investment	1,20 -	NPV/Investment	1,20 -
Cost of Saved Energy	1.180 €/tep	Cost of Saved Energ	1.180 €/tep
		Multiple benefits im	0,0 %

Figure 17 - Project 4, Bulgaria: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Alleviation of energy poverty	Social	No	No	No	- €/year
Emission reduction	Environment	No	Yes	No	- €/year
Impact of EE on RES target achievement	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	- €/year
Reduced use of non-renewable resources	Environment	Yes	Yes	Yes	- €/year
Reduction of (maintenance) costs	Economic	Yes	No	No	- €/year
Increased real estate value	Economic	No	Yes	No	- €/year
Energy security	SecuritySafety	No	No	Yes	- €/year

Figure 18 - Project 4, Bulgaria: NEBs

3.1.4.3 Risk analysis economic results

Energy Performance Risk

As economic indicators show, in this case the costs of mitigation measures are higher than the impact of the risk. Therefore, with these parameters, it is not advisable to undertake them.

Without mitigations		With mitigations:	Advanced Additional Maintenance
NPV	33.768 €	NPV	23.396 €
Pay back time (PBT)	6,7 years	Pay back time (PBT)	6,9 years
NPV/Investment (PI)	1,1 -	NPV/Investment (PI)	1,1 -
Discounted pay back time (I	8,4 years	Discounted pay back time (DPBT)	8,7 years

Figure 19 - Project 4, Bulgaria: Energy Performance Risk

Risk due to Delays

Without mitigations		With mitigations: Expert assistance	
NPV	31.074 €	NPV	35.176 €
Pay back time (PBT)	7,4 years	Pay back time (PBT)	6,8 years
NPV/Investment (PI)	1,0 -	NPV/Investment (PI)	1,1 -
Discounted pay back time (I	9,4 years	Discounted pay back time (DPBT)	8,5 years

Figure 20 - Project 4, Bulgaria: Risk due to Delays

Worst Case Risk Analysis

Without mitigations		With mitigations	
NPV	29.527 €	NPV	30.396 €
Pay back time (PBT)	7,6 years	Pay back time (PBT)	7,3 years
NPV/Investment (PI)	0,95 -	NPV/Investment (PI)	0,92 -
Discounted pay back time (I	9,5 years	Discounted pay back time (DPBT)	9,3 years

Figure 21 - Project 4, Bulgaria: Worst Case Risk Analysis

3.1.4.4 Assessment of the Financial Board

The project presents a feasible opportunity for implementing an energy performance contract with moderate investment risk. The expected annual savings of €4,500 provide a stable cash flow that can support repayment under a shared-savings or guaranteed-savings model. Although no incentives are available, the project's manageable scale and predictable performance make it suitable for ESCO financing, especially when coupled with proper monitoring and maintenance provisions to mitigate performance and delay risks.

3.1.5 Project 5: Solar PV installation

3.1.5.1 Energy efficiency project description

Company 5

The energy-saving measure identified through the energy audit involves the installation of a photovoltaic system with an installed capacity of 10 kWp, configured for self-consumption.

Investment and incentives

The total capital cost is estimated in €31,000. No suitable incentives have been identified for this investment.

Performance and savings

An annual saving almost of 10,000 kWh of electricity is estimated, equivalent about than €2,300/year.

3.1.5.2 Cost benefit analysis results and multiple benefits

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	20	Investment lifetime	20
Investment	31.000 €	Investment	31.000 €
Pay Back time	11,2 years	Pay Back time	11,2 years
IRR	7 %	IRR	7 %
NPV	5.027 €	NPV	5.027 €
NPV/Investment	0,16 -	NPV/Investment	0,16 -
Cost of Saved Energy	2.233 €/tep	Cost of Saved Energ	2.233 €/tep
		Multiple benefits im	0,0 %

Figure 22 - Project 5, Bulgaria: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Alleviation of energy poverty	Social	No	No	No	- €/year
Emission reduction	Environment	No	Yes	No	- €/year
Impact of EE on RES target achievement	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	- €/year
Reduced use of non-renewable resources	Environment	Yes	Yes	Yes	- €/year
Reduction of (maintenance) costs	Economic	Yes	No	No	- €/year
Increased real estate value	Economic	No	Yes	No	- €/year
Energy security	SecuritySafety	No	No	Yes	- €/year

Figure 23 - Project 5, Bulgaria: NEBs

3.1.5.3 Risk analysis economic results

Energy Performance Risk

As we can see from the economic indicators, in this case the costs required to implement mitigation measures are higher than the impact of the risk. Therefore, with these parameters, it is not advisable to undertake them.

Without mitigations		With mitigations:	Advanced Additional Maintenance
NPV	3.225 €	NPV	247 €
Pay back time (PBT)	11,7 years	Pay back time (PBT)	12,8 years
NPV/Investment (PI)	0,1 -	NPV/Investment (PI)	0,0 -
Discounted pay back time (I	17,7 years	Discounted pay back time (DPBT)	19,8 years

Figure 24 - Project 5, Bulgaria: Energy Performance Risk

Risk due to Delays

Without mitigations		With mitigations: Expert assistance	
NPV	5.027 €	NPV	1.802 €
Pay back time (PBT)	11,2 years	Pay back time (PBT)	12,2 years
NPV/Investment (PI)	0,2 -	NPV/Investment (PI)	0,1 -
Discounted pay back time (I	16,6 years	Discounted pay back time (DPBT)	18,7 years

Figure 25 - Project 5, Bulgaria: Risk due to Delays

Worst Case Risk Analysis

Without mitigations		With mitigations	
NPV	985 €	NPV	-1.753 €
Pay back time (PBT)	12,5 years	Pay back time (PBT)	13,4 years
NPV/Investment (PI)	0,03 -	NPV/Investment (PI)	-0,05 -
Discounted pay back time (I	19,3 years	Discounted pay back time (DPBT)	- years

Figure 26 - Project 5, Bulgaria: Worst Case Risk Analysis

3.1.5.4 Assessment of the Financial Board

This 10 kWp solar PV installation represents a modest but low-risk opportunity for performance-based contracting. With annual savings of approximately €2,300, the project could be bundled with similar small-scale installations to achieve better economies of scale and improve financial returns. While the standalone investment may not justify an ESCO model due to limited cash flow, it remains attractive within aggregated or portfolio-based schemes that distribute administrative and performance risks more efficiently.

3.2 France

3.2.1 Project 1: Energy sub-metering

3.2.1.1 Energy efficiency project description

Company 1

Installation of electricity sub-meters to monitor consumption by workshop and by energy use.

Investment and incentives

The total investment amounts to €38,000. The company can benefit from a France incentive scheme, the Regional aid, for an estimated amount of €5,000.

Performance and savings

An annual saving of about 27,000 kWh of electricity is estimated, equivalent about than €11,000 per year.

3.2.1.2 Cost benefit analysis results and multiple benefits

The economic indicators resulting from the cost-benefit analysis highlight the strong viability of this investment. The payback period is less than three years, which – considering the project's useful life of 30 years – makes it particularly advantageous (Figure 27).

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	30	Investment lifetime	30
Investment	38.000 €	Investment	38.000 €
Pay Back time	2,9 years	Pay Back time	2,9 years
IRR	37 %	IRR	37 %
NPV	126.014 €	NPV	126.014 €
NPV/Investment	3,32 -	NPV/Investment	3,32 -
Cost of Saved Energy	1.092 €/tep	Cost of Saved Energy	1.092 €/tep
		Multiple benefits impact on NPV	0,0 %

Figure 27 - Project 1, France: Main economic results without and with NEBs

As shown in Figure 28, the multiple benefits achievable through the implementation of this investment do not provide a quantifiable economic gain, but they do offer advantages in terms of the company's value proposition and risk structure.

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Impact of EE on RES target achievement	Environment	No	Yes	No	- €/year
Accurate monitoring	Quality	No	No	Yes	- €/year

Figure 28 - Project 1, France: NEBs

3.2.1.3 Risk analysis economic results

In this project, the consultant identified the possibility of encountering the following types of risk:

- Energy performance;
- Energy price.

Energy Performance Risk

Figure 29 simulates a scenario in which the energy performance of the implemented investment is reduced by 30% compared to the initial evaluation. This extends the payback period to up to 4,5 years, although the investment remains economically viable.

A possible mitigation strategy suggested by the consultant is the involvement of an energy manager consultant to detect deviations as effectively as possible, reducing the performance loss to 15% at a cost of €3,500 per year.

As shown by the reported results, in this case the cost of mitigation exceeds the potential impact of the identified risk, making it economically unfeasible. However, if the performance reduction reaches approximately 38%, the economic indicators break even, meaning the assessment of this mitigation measure will depend on the level of assumed investment's underperformance.

Without mitigations		With mitigations: Energy manager consultant to detect deviations as effectively as possible	
NPV	73.310 €	NPV	60.083 €
Pay back time (PBT)	4,6 years	Pay back time (PBT)	5,6 years
NPV/Investment (PI)	1,9 -	NPV/Investment (PI)	1,6 -
Discounted pay back time (DPBT)	5,6 years	Discounted pay back time (DPBT)	7,1 years

Figure 29 - Project 1, France: Energy Performance Risk

Energy Price Risk

The risk associated with fluctuations in the price of energy carriers, is a common factor across the various projects, but will not be deepened due to the considerations outlined in chapter 2.3.

3.2.1.4 Assessment of the Financial Board

This project is highly suitable for national/EU support due to its strong financial performance and alignment with regional efficiency goals. With a €38,000 investment and €5,000 in regional aid, it achieves a payback period of less than three years, yielding annual savings of about €11,000. The project effectively enhances energy monitoring and management capacity, contributing to long-term decarbonization objectives. It represents an efficient use of public funds and a replicable model for future energy management initiatives. Although the quantifiable NEBs are limited, the qualitative improvements—such as enhanced operational control, reduced energy performance risks, and improved data-driven decision-making, add strategic value to both the company and broader sustainability objectives.

3.2.2 Project 2: Heat network insulation

3.2.2.1 Energy efficiency project description

Company 2

Insulation of the heating network that supplies the air heaters with hot water produced by the boiler.

Investment and incentives

The total investment amounts to €18,100. The company can benefit from a France incentive scheme, the Regional aid, for an estimated amount of €4,800.

Performance and savings

An annual saving of over 5.200 Sm³ of natural gas is estimated, equivalent to more than €5,700 per year.

3.2.2.2 Cost benefit analysis results and multiple benefits

This energy efficiency project proves to be highly attractive, as it delivers significant benefits in terms of energy savings, while requiring only a modest investment. In fact, the estimated payback period is just over two years.

Below are the main non-energy benefits associated with the project, which do not directly affect the economic indicators but contribute to user well-being and emission reduction.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	25	Investment lifetime	25
Investment	18.100 €	Investment	18.100 €
Pay Back time	2,2 years	Pay Back time	2,2 years
IRR	47 %	IRR	47 %
NPV	70.418 €	NPV	70.418 €
NPV/Investment	3,89 -	NPV/Investment	3,89 -
Cost of Saved Energy	597 €/tep	Cost of Saved Energy	597 €/tep
		Multiple benefits impact on NPV	0,0 %

Figure 30 - Project 2, France: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Customers (new, satisfaction, etc.)	Social	Yes	No	Yes	- €/year
Impact of EE on RES target achieven	Environment	No	No	Yes	- €/year
Reduced emissions (dust, CO2, chem	Environment	No	No	Yes	- €/year

Figure 31 - Project 2, France: NEBs

3.2.2.3 Risk analysis economic results

In this project, the consultant identified the most likely risk as being related solely to energy performance. Regarding to the risk of variability in energy vector prices, the considerations made at the end of chapter 2.3 apply.

Energy Performance Risk

In this case, the consultant simulated a scenario in which the investment delivers 20% less energy performance than expected. The proposed mitigation involves engaging an inspection office to verify that the work has been carried out correctly and in accordance with best practice, at an estimated cost of €3.000. This measure is expected to limit the underperformance to 5%.

As shown by the indicators, under this assumption the decision is roughly balanced, and will therefore depend on the level of performance guarantees expected once the investment is completed.

Without mitigations		With mitigations: Inspection office	
NPV	48.874 €	NPV	58.628 €
Pay back time (PBT)	3,7 years	Pay back time (PBT)	3,6 years
NPV/Investment (PI)	2,7 -	NPV/Investment (PI)	3,2 -
Discounted pay back time (D	4,4 years	Discounted pay back time (DPBT)	4,3 years

Figure 32 - Project 2, France: Energy Performance Risk

3.2.2.4 Assessment of the Financial Board

This project offers a manageable opportunity for a short-term performance contract due to its low investment cost and relatively strong annual savings of €5,700. The payback period of just over two years ensures rapid capital recovery and reliable returns. With manageable performance risks and clear energy efficiency outcomes, it represents a possible low-risk addition to an ESCO portfolio with some other projects.

3.2.3 Project 3: Photovoltaic system

3.2.3.1 Energy efficiency project description

Company 3

Installation of a self-consumption photovoltaic power plant on the roof of the workshop, with resale of the surplus.

Investment and incentives

The total investment amounts to €39,000. The company can benefit from a France incentive scheme, the Regional aid, for an estimated amount of €4,800.

Performance and savings

An annual saving of over 16,000 kWh of electricity is estimated, equivalent about than €5,000 per year.

3.2.3.2 Cost benefit analysis results and multiple benefits

Figure 33 presents the main economic indicators. In the case analysed, the investment may appear less attractive to the company due to a payback period of nearly seven years. However, in this instance, the identified non-energy benefits play a decisive role.

The consultant estimates an economic value of approximately €5,000 associated with improved energy security. This contribution nearly halves the payback period, reducing it to three and a half years, and significantly enhances the appeal of this energy efficiency project.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	25	Investment lifetime	25
Investment	39.000 €	Investment	39.000 €
Pay Back time	6,8 years	Pay Back time	3,5 years
IRR	16 %	IRR	30 %
NPV	55.961 €	NPV	127.152 €
NPV/Investment	1,43 -	NPV/Investment	3,26 -
Cost of Saved Energy	1.580 €/tep	Cost of Saved Energy	1.580 €/tep
		Multiple benefits impact on	127,2 %

Figure 33 - Project 3, France: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Customers (new, satisfaction, etc.)	Social	Yes	No	Yes	- €/year
Energy security	SecuritySafety	No	No	No	5.168 €/year
Increased corporate image	Quality	No	Yes	No	- €/year

Figure 34 - Project 3, France: NEBs

3.2.3.3 Risk analysis economic results

In this project, the consultant identified the most likely risk as being related solely to energy performance. Regarding to the risk of variability in energy vector prices, the considerations made at the end of chapter 2.3 apply.

Energy Performance Risk

The risk illustrated by the indicators in Figure 35 simulates a scenario in which the investment delivers 20% lower performance than initially expected. The mitigation proposed by the consultant is the subscription of guaranteed performance contracts at a cost of €1,000 per year, which would reduce the performance shortfall to 10%.

At first glance, this solution appears to be unfavourable. However, it is worth noting that if the performance reduction were limited to 5%, the indicators would be aligned. Therefore, the decision will depend on the extent of the potential underperformance that can be reasonably anticipated.

Without mitigations		With mitigations:	EPC contract
NPV	33.129 €	NPV	28.373 €
Pay back time (PBT)	9,1 years	Pay back time (PBT)	10,0 years
NPV/Investment (PI)	0,9 -	NPV/Investment (PI)	0,7 -
Discounted pay back time (D	11,1 years	Discounted pay back time (DPBT)	12,2 years

Without mitigations		With mitigations:	EPC contract
NPV	90.082 €	NPV	92.444 €
Pay back time (PBT)	4,9 years	Pay back time (PBT)	4,9 years
NPV/Investment (PI)	2,3 -	NPV/Investment (PI)	2,4 -
Discounted pay back time (D	5,5 years	Discounted pay back time (DPBT)	5,5 years

Figure 35 - Project 3, France: Energy Performance Risk - without NEBs (above) / with NEBs (below)

3.2.3.4 Assessment of the Financial Board

This project presents an investment opportunity, particularly when non-energy benefits are factored in. While the base payback period of seven years is lengthy, valuing the enhanced energy security reduces it to around three and a half years, improving project attractiveness and financial feasibility. The manageable performance risks can be mitigated through guaranteed performance contracts, making this project a viable candidate for ESCO financing under a shared-savings model.

3.2.4 Project 4: Heat network insulation

3.2.4.1 Energy efficiency project description

Company 4

Insulation of the heating network that supplies the air heaters with hot water produced by the boiler.

Investment and incentives

The total investment amounts to €25.000. No suitable incentives have been identified for this investment.

Performance and savings

An annual saving of over 70,000 Sm³ of natural gas is estimated, equivalent about than €77,000/year.

3.2.4.2 Cost benefit analysis results and multiple benefits

From the results of the cost-benefit analysis shown below, it is clear that this investment project is significantly more attractive than all those discussed so far. The analysis estimates a payback period of approximately four months.

Non-energy benefits have also been identified, related to emission reductions and improvements in stakeholder well-being.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	20	Investment lifetime	20
Investment	25.000 €	Investment	25.000 €
Pay Back time	0,3 years	Pay Back time	0,3 years
IRR	315 %	IRR	315 %
NPV	1.100.239 €	NPV	1.100.239 €
NPV/Investment	44,01 -	NPV/Investment	44,01 -
Cost of Saved Energy	61 €/tep	Cost of Saved Energy	61 €/tep
		Multiple benefits impact on NPV	0,0 %

Figure 36 - Project 4, France: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Customers (new, satisfaction, etc.)	Social	Yes	No	Yes	- €/year
Impact of EE on RES target achievement	Environment	No	No	Yes	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	No	Yes	- €/year

Figure 37 - Project 4, France: NEBs

3.2.4.3 Risk analysis economic results

In this project, the consultant identified the most likely risk as being related solely to energy performance. Regarding to the risk of variability in energy vector prices, the considerations made at the end of chapter 2.3 apply.

Energy Performance Risk

In this case, the consultant simulated a scenario in which the forecasted energy performance is reduced by 20%. The suggested mitigation action, at a cost of €3,000, is: Inspection office to verify that the work has been carried out correctly and in accordance with best practice.

It is clear that, in any case, the economic viability of this investment remains unaffected.

Without mitigations		With mitigations:	Inspection office to verify that the work has been carried out correctly and in accordance with best practice
NPV	976.571 €	NPV	991.309 €
Pay back time (PBT)	0,4 years	Pay back time (PBT)	0,4 years
NPV/Investment (PI)	39,1 -	NPV/Investment (PI)	39,7 -
Discounted pay back time (D	0,4 years	Discounted pay back time (DPBT)	0,4 years

Figure 38 - Project 4, France: Energy Performance Risk

3.2.4.4 Assessment of the Financial Board

This project presents a good investment case with minimal risk exposure. The estimated payback period of just four months and annual savings of €77,000 on a €25,000 investment indicate outstanding liquidity and creditworthiness. Even under performance risk scenarios, the project remains highly profitable, making it an ideal candidate for green lending instruments or low-interest sustainability loans.

3.2.5 Project 5: LED lighting

3.2.5.1 Energy efficiency project description

Company 5

Replacing existing lighting with LED lighting.

Investment and incentives

The total investment amounts to about €3,400. No suitable incentives have been identified for this investment.

Performance and savings

An annual saving of over 5,500 kWh of electricity is estimated, equivalent about than €2,300/year.

3.2.5.2 Cost benefit analysis results and multiple benefits

This type of energy efficiency intervention, as is well known, also proves to be highly cost-effective. The cost-benefit analysis confirms this, estimating a payback period of approximately one and a half years.

The main non-energy benefits achievable through such projects are clearly those related to emission reductions, thanks to a decrease in electricity consumption.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	20	Investment lifetime	20
Investment	3.398 €	Investment	3.398 €
Pay Back time	1,5 years	Pay Back time	1,5 years
IRR	72 %	IRR	72 %
NPV	30.066 €	NPV	30.066 €
NPV/Investment	8,85 -	NPV/Investment	8,85 -
Cost of Saved Energy	470 €/tep	Cost of Saved Energy	470 €/tep
		Multiple benefits impact on NPV	0,0 %

Figure 39 - Project 5, France: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Employee satisfaction	Social	Yes	No	No	- €/year
Improved lighting	Health	Yes	No	No	- €/year
Emission reduction	Environment	Yes	No	No	- €/year
Impact of EE on RES target achievement	Environment	Yes	No	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	Yes	No	No	- €/year

Figure 40 - Project 5, France: NEBs

3.2.5.3 Risk analysis economic results

In this project, the consultant identified the most likely risk as being related solely to energy performance. Regarding to the risk of variability in energy vector prices, the considerations made at the end of chapter 2.3 apply.

Energy Performance Risk

Similarly to the previously analysed project, this investment also remains quite cost-effective, even when assuming a 15% reduction in energy performance. One possible action suggested by the consultant is to carry out advanced additional maintenance to monitor and reduce any deterioration in service levels.

Although in this type of project the mitigation measure is clearly rather costly compared to the investment and the benefit achievable, it may prove useful for larger-scale investments or in specific contexts where, for example, maintaining adequate lighting levels is essential.

Without mitigations		With mitigations:	Advanced Additional Maintenance
NPV	20.027 €	NPV	22.927 €
Pay back time (PBT)	2,1 years	Pay back time (PBT)	1,9 years
NPV/Investment (PI)	5,9 -	NPV/Investment (PI)	6,8 -
Discounted pay back time (D	2,3 years	Discounted pay back time (DPBT)	2,1 years

Figure 41 - Project 5, France: Energy Performance Risk

3.2.5.4 Assessment of the Financial Board

The project represents a low-cost, low-risk investment with strong financial returns. With an investment of €3,400 and annual savings of about €2,300, the project achieves a quick payback period, ensuring reliable cash flow and credit stability. Its clear environmental benefits and resilience to performance risk make it an excellent candidate for small-scale green credit or energy efficiency financing schemes.

3.3 Italy

3.3.1 Project 1: Reversible Heat Pump for winter&summer conditioning

3.3.1.1 Energy efficiency project description

Company 1

The audit identifies the following main action: replacing the 163 kW natural-gas boiler and the two R407C chillers with one air-source reversible heat pump that uses the natural refrigerant R290. The selected unit delivers 111 kW in heating mode and works with seasonal performance factors of SCOP = 3.96 and SEER = 3.86, so it can supply both winter heating and summer cooling through the existing hydronic fan-coil network while eliminating on-site gas for HVAC and phasing out the obsolete R407C refrigerant.

Investment and incentives

The total capital cost is estimated at €70.000. Under Italy's Conto Termico scheme the project qualifies for five annual incentive payments of about €6.350, i.e. €31.800 in total, cutting the net spend by 45%.

Performance and savings

Once in operation the heat pump is expected to save 5.9 TOE of primary energy and €6.334/year, while avoiding 14.3 tCO_2 annually; these figures come from comparing the new system's electricity demand with the baseline gas-plus-chiller consumption.

3.3.1.2 Cost benefit analysis results and multiple benefits

Figure 42 presents the main economic results. As we can observe, in this project the impact of multiple benefits is highly significant from an economic perspective, nearly doubling the NPV (+86%) and reducing the payback time by more than one year.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	15	Investment lifetime	15
Investment	95.000 €	Investment	95.000 €
Pay Back time	8,4 years	Pay Back time	7,2 years
IRR	8 %	IRR	10 %
NPV	17.445 €	NPV	32.501 €
NPV/Investment	0,18 -	NPV/Investment	0,34 -
Cost of Saved Energy	2.140 €/tep	Cost of Saved Energy	2.140 €/tep
		Multiple benefits impact on NPV	86,3 %

Figure 42 - Project 1, Italy: Main economic results without and with NEBs

The multiple potential benefits that may be achieved through the implementation of this project are outlined in Figure 43. Each of the identified NEBs may have a positive impact on one or more dimensions of a business, namely the cost structure, the value proposition, and the risk structure. It is not always possible to assign an economic value to NEBs; however, in this case, the reduction in maintenance-related costs allows for an estimated saving of €1,500 per year.

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Reduction of (maintenance) costs	Economic	Yes	No	No	1.500 €/year
Emission reduction	Environment	No	Yes	No	- €/year
Impact of EE on RES target achievement	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	- €/year
Reduced use of non-renewable resources	Environment	Yes	Yes	Yes	- €/year
Increased real estate value	Economic	No	Yes	No	- €/year
Energy security	SecuritySafety	No	No	Yes	- €/year

Figure 43 - Project 1, Italy: NEBs

3.3.1.3 Risk analysis economic results

In this project, the consultant identified the possibility of encountering three types of risks:

- Regulatory;
- Energy performance;
- Energy price.

Regulatory Risk

The assumption of losing the incentive, amounting to a total of €31,800, significantly reduces the economic viability of the project, even resulting in a negative NPV in the case without NEBs (Figure 44, above).

Possible risk mitigation strategies, such as expert support, can substantially reduce this high-impact risk on the project, with a moderate cost and effect on economic indicators (e.g. €2,000).

Without mitigations		With mitigations:	Expert assistance
NPV	-9.672 €	NPV	15.445 €
Pay back time (PBT)	11,6 years	Pay back time (PBT)	8,6 years
NPV/Investment (PI)	-0,1 -	NPV/Investment (PI)	0,2 -
Discounted pay back tim	- years	Discounted pay back time (DPBT)	12,2 years

Without mitigations		With mitigations:	Expert assistance
NPV	5.385 €	NPV	30.501 €
Pay back time (PBT)	10,2 years	Pay back time (PBT)	7,4 years
NPV/Investment (PI)	0,1 -	NPV/Investment (PI)	0,3 -
Discounted pay back tim	14,1 years	Discounted pay back time (DPBT)	10,1 years

Figure 44 - Project 1, Italy: Regulatory Risk - without NEBs (above) / with NEBs (below)

Energy Performance Risk

In energy efficiency projects, the risk of reduced performance compared to the projected scenario is a common concern.

In this project, the consultant assumed a 5% reduction in performance compared to the forecast, resulting in a decrease in NPV of approximately 30%. Potential mitigation actions include advanced additional maintenance at a cost of €400/year.

As clearly shown in Figure 45, such a measure proves to be economically viable even when assuming a modest variation in performance.

Without mitigations		With mitigations:	Advanced Additional Maintenanc
NPV	11.822 €	NPV	13.430 €
Pay back time (PBT)	9,0 years	Pay back time (PBT)	8,8 years
NPV/Investment (PI)	0,1 -	NPV/Investment (PI)	0,1 -
Discounted pay back tim	12,7 years	Discounted pay back time (DPBT)	12,5 years
Without mitigations		**With mitigations:**	Advanced Additional Maintenanc
NPV	26.126 €	NPV	28.486 €
Pay back time (PBT)	7,7 years	Pay back time (PBT)	7,5 years
NPV/Investment (PI)	0,3 -	NPV/Investment (PI)	0,3 -
Discounted pay back tim	10,6 years	Discounted pay back time (DPBT)	10,3 years

Figure 45 - Project 1, Italy: Energy Performance Risk - without NEBs (above) / with NEBs (below)

Energy Price Risk

In this application, given the modest electricity consumption, an increase in energy carrier costs does not result in significant changes to the project's cash flows. Figure 46 assumes a 10% increase in electricity prices.

However, it is worth noting that in cases where energy costs are substantial, a sound risk mitigation strategy suggested by the consultant is the adoption of fixed-price electricity supply contracts. In this scenario, for the economic indicators to break even – considering mitigation costs of €200/year – the electricity price would need to more than double.

Without mitigations		With mitigations:	Fixed-price electricity contract
NPV	17.411 €	NPV	15.437 €
Pay back time (PBT)	8,4 years	Pay back time (PBT)	8,6 years
NPV/Investment (PI)	0,2 -	NPV/Investment (PI)	0,2 -
Discounted pay back tim	11,4 years	Discounted pay back time (DPBT)	12,2 years
Without mitigations		**With mitigations:**	Fixed-price electricity contract
NPV	32.467 €	NPV	30.494 €
Pay back time (PBT)	7,2 years	Pay back time (PBT)	7,4 years
NPV/Investment (PI)	0,3 -	NPV/Investment (PI)	0,3 -
Discounted pay back tim	9,8 years	Discounted pay back time (DPBT)	10,1 years

Figure 46 - Project 1, Italy: Energy Price Risk - without NEBs (above) / with NEBs (below)

Worst Case Risk Analysis

In the worst-case scenario (Figure 47), it is assumed that all identified risks materialise. In this context, the impact of mitigation actions becomes even more

evident, as they enable the economic viability of the project to be maintained and are therefore crucial.

Without mitigations		With mitigations	
NPV	-15.463 €	NPV	9.422 €
Pay back time (PBT)	12,2 years	Pay back time (PBT)	9,2 years
NPV/Investment (PI)	-0,16 -	NPV/Investment (PI)	0,10 -
Discounted pay back tim	- years	Discounted pay back time (DPBT)	13,2 years

Without mitigations		With mitigations	
NPV	-1.024 €	NPV	24.479 €
Pay back time (PBT)	10,7 years	Pay back time (PBT)	7,9 years
NPV/Investment (PI)	-0,01 -	NPV/Investment (PI)	0,25 -
Discounted pay back tim	- years	Discounted pay back time (DPBT)	10,9 years

Figure 47 - Project 1, Italy: Worst case risk analysis - without NEBs (above) / with NEBs (below)

3.3.1.4 Assessment of the Financial Board

The project presents a well-balanced and bankable investment opportunity with strong sustainability credentials. The €70,000 investment benefits from substantial public incentives covering 45% of costs, ensuring an attractive payback period and stable returns. With proven energy savings, significant CO_2 reductions, and manageable regulatory and performance risks, it qualifies as an excellent candidate for green loans or climate-focused financing programs. Moreover, the inclusion of multiple non-energy benefits (NEBs), such as lower maintenance costs and enhanced reliability, further improves the project's financial profile.

3.3.2 Project 2: Biomass boiler

3.3.2.1 Energy efficiency project description

Company 2

The audit identifies one primary action: replacing the existing natural gas boilers with a 300 kW biomass boiler to provide heat for the production facilities. The new unit will be fuelled by wood chips produced onsite from the company's own wood processing scraps, which are sufficient to cover the annual demand. This intervention would valorise an internal waste stream and eliminate the on-

site use of natural gas for production heating, which currently amounts to over 23,000 Sm^3 per year.

Investment and incentives

The total capital cost for the boiler and the necessary woodchipper is estimated at €200,000. The project is eligible for Italy's Conto Termico 3.0 scheme. The audit estimates an incentive of 30% of the initial cost, amounting to €60,000 paid in five annual instalments, which would cut the net investment by 30%.

Performance and savings

Once operational, the biomass boiler is expected to save 19.8 TOE of primary energy and approximately €20,750 per year, a figure that combines the avoided cost of natural gas (€19,000) and waste disposal (€1,750). The project will also avoid 40 tCO_2 annually.

3.3.2.2 Cost benefit analysis results and multiple benefits

The cost-benefit analysis for this investment (Figure 48) shows modest results, with a return on investment of approximately seven and a half years. Among the various non-energy benefits identified (Figure 49), the use of waste heat also allows for the monetisation of the benefit, estimated at €1,750/year. This leads to an improvement in the NPV of over 16% and a reduction in the payback time by around six months.

Main economic results without NEBs	
Investment lifetime	15
Investment	202.000 €
Pay Back time	7,7 years
IRR	9 %
NPV	131.566 €
NPV/Investment	0,65 -
Cost of Saved Energy	1.262 €/tep

Main economic results with NEBs	
Investment lifetime	15
Investment	202.000 €
Pay Back time	7,1 years
IRR	11 %
NPV	153.233 €
NPV/Investment	0,76 -
Cost of Saved Energy	1.262 €/tep
Multiple benefits impact on NPV	16,5 %

Figure 48 - Project 2, Italy: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Usage of waste streams	Economic	Yes	No	No	1.750 €/year
Emission reduction	Environment	No	Yes	No	- €/year
Impact of EE on RES target achievement	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	- €/year
Reduced use of non-renewable resources	Environment	Yes	Yes	Yes	- €/year
Reduced waste	Environment	Yes	No	No	- €/year

Figure 49 - Project 2, Italy: NEBs

3.3.2.3 Risk analysis economic results

In this project, the consultant identified the possibility of encountering two types of risks:

- Regulatory;
- Energy performance;

Regulatory Risk

Among the main risks considered for this project, a scenario was simulated in which the incentive cannot be secured. In such a case (Figure 50), the economic indicators deteriorate significantly, with an extension of the payback period by approximately 2.5 years - both for the indicators excluding NEBs (above) and those including NEBs (below).

Implementing mitigation measures, such as engaging an expert to increase the likelihood of obtaining the incentive - which has a substantial economic impact on the investment - is essential. As shown by the indicators, this approach allows for the mitigation of a potentially significant risk at a relatively modest cost.

Without mitigations		With mitigations:	Expert assistance
NPV	75.816 €	NPV	129.566 €
Pay back time (PBT)	10,2 years	Pay back time (PBT)	7,8 years
NPV/Investment (PI)	0,4 -	NPV/Investment (PI)	0,6 -
Discounted pay back tim	11,5 years	Discounted pay back time (DPBT)	8,8 years

Without mitigations		With mitigations:	Expert assistance
NPV	97.483 €	NPV	151.233 €
Pay back time (PBT)	9,5 years	Pay back time (PBT)	7,2 years
NPV/Investment (PI)	0,5 -	NPV/Investment (PI)	0,7 -
Discounted pay back tim	10,7 years	Discounted pay back time (DPBT)	8,2 years

Figure 50 - Project 2, Italy: Regulatory Risk - without NEBs (above) / with NEBs (below)

Energy Performance Risk

The consultant simulated a scenario in which the investment delivers 5% less than the initially estimated performance (Figure 51). This results in an increase of approximately five months in the payback time. Although the simulated performance reduction is relatively modest, the cost of implementing mitigation measures (in this case, advanced additional maintenance at €400/year) already proves to be cost-effective when compared to the potential impact of this risk.

Without mitigations		With mitigations:	Advanced Additional Maintenance
NPV	114.887 €	NPV	126.613 €
Pay back time (PBT)	8,2 years	Pay back time (PBT)	7,8 years
NPV/Investment (PI)	0,6 -	NPV/Investment (PI)	0,6 -
Discounted pay back tim	9,3 years	Discounted pay back time (DPBT)	8,9 years
Without mitigations		**With mitigations:**	**Advanced Additional Maintenance**
NPV	135.471 €	NPV	148.281 €
Pay back time (PBT)	7,6 years	Pay back time (PBT)	7,3 years
NPV/Investment (PI)	0,7 -	NPV/Investment (PI)	0,7 -
Discounted pay back tim	8,6 years	Discounted pay back time (DPBT)	8,2 years

Figure 51 - Project 2, Italy: Energy Performance Risk - without NEBs (above) / with NEBs (below)

Worst Case Risk Analysis

In the Figure 52 are the main economic indicators in the worst-case scenario, where both risks occur simultaneously. As is clear, in this project the mitigation measures help maintain the economic indicators in line with the initial level, while safeguarding against risks with potentially much greater impact.

Without mitigations		With mitigations	
NPV	59.137 €	NPV	124.613 €
Pay back time (PBT)	10,7 years	Pay back time (PBT)	7,9 years
NPV/Investment (PI)	0,29 -	NPV/Investment (PI)	0,61 -
Discounted pay back tim	12,2 years	Discounted pay back time (DPBT)	9,0 years
Without mitigations		**With mitigations**	
NPV	79.721 €	NPV	146.281 €
Pay back time (PBT)	10,0 years	Pay back time (PBT)	7,3 years
NPV/Investment (PI)	0,39 -	NPV/Investment (PI)	0,72 -
Discounted pay back tim	11,4 years	Discounted pay back time (DPBT)	8,3 years

Figure 52 - Project 2, Italy: Worst case risk analysis - without NEBs (above) / with NEBs (below)

3.3.2.4 Assessment of the Financial Board

The integration of onsite wood waste as fuel ensures both cost savings and operational sustainability, significantly reducing dependence on natural gas and waste disposal costs. With an estimated annual saving of €20,750 and a payback period of about seven and a half years, the project is financially viable, particularly when the 30% incentive under Italy's Conto Termico is secured. The inclusion of NEBs, such as waste valorisation and CO_2 reduction, enhances the project's economic attractiveness by improving the NPV and lowering the payback

time. Overall, this project could be suited for ESCO financing under a guaranteed savings model, with moderate risks that can be effectively mitigated through proper regulatory and performance management.

3.3.3 Project 3: On-site photovoltaic storage system

3.3.3.1 Energy efficiency project description

Company 3

Installation of a 75 kWh storage system for the photovoltaic plant, to increase self-consumption.

Investment and incentives

At present, no suitable incentives have been identified for this investment.

3.3.3.2 Cost benefit analysis results and multiple benefits

The Figure 53 shows the main economic results obtained through the cost-benefit analysis. The primary non energy benefit associated with the implementation of this project is the improvement of energy security (Figure 54).

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	15	Investment lifetime	15
Investment	50.000 €	Investment	50.000 €
Pay Back time	7,9 years	Pay Back time	7,9 years
IRR	10 %	IRR	10 %
NPV	21.382 €	NPV	21.382 €
NPV/Investment	0,43 -	NPV/Investment	0,43 -
Cost of Saved Energy	1.483 €/tep	Cost of Saved Energy	1.483 €/tep
		Multiple benefits impact on NPV	0,0 %

Figure 53 - Project 3, Italy: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Energy security	SecuritySafety	No	No	Yes	- €/year

Figure 54 - Project 3, Italy: NEBs

3.3.3.3 Risk analysis economic results

In this project, the consultant identified the most likely risk as being related solely to energy performance.

The worst-case risk analysis will clearly not be presented, as it would not be meaningful.

Energy Performance Risk

In this project, the summarised economic results simulate a scenario (Figure 55) in which energy performance is reduced by 10% compared to initial estimates. If mitigation measures such as advanced additional maintenance (€400/year) are implemented, the investment becomes reasonably attractive once again.

It should be noted that the proposed mitigation measure proves cost-effective for any deviation in energy performance exceeding 5% from the originally estimated levels.

Without mitigations		With mitigations:	Advanced Additional Maintenance
NPV	14.244 €	NPV	17.231 €
Pay back time (PBT)	8,7 years	Pay back time (PBT)	8,4 years
NPV/Investment (PI)	0,3 -	NPV/Investment (PI)	0,34 -
Discounted pay back tim	11,3 years	Discounted pay back time (DPBT)	10,8 years

Figure 55 - Project 3, Italy: Energy Performance Risk

3.3.3.4 Assessment of the Financial Board

The proposal presents a moderate-risk investment with a limited short-term profitability. But has potential strategic value in enhancing energy autonomy and operational resilience. While the absence of incentives constrains returns, improved energy security and predictable cash flows under proper maintenance could support its inclusion in sustainability-linked lending portfolios (bundling). Mitigating performance risk through routine monitoring and maintenance would strengthen the credit profile.

3.3.4 Project 4: PV installation

3.3.4.1 Energy efficiency project description

Company 4

Installation of a 199.92 kWp PV system.

Investment and incentives

The total investment amounts to €211.500. The company can benefit from an Italian incentive scheme, the Invitalia Grant, for an estimated amount of €84,600.

Performance and savings

For 2024, an annual yield of approximately 1,100 kWh per installed kWp is indicated, resulting a total production of 204,382 kWh. The self-consumption has been analysed to be 165,374 kWh per year, from which the economic results presented in the following paragraph are derived. This allows for an annual saving of 249,217 kWh.

3.3.4.2 *Cost benefit analysis results and multiple benefits*

This project proves to be among the most cost-effective of all those analysed, with a payback period estimated through the cost-benefit analysis at just over two and a half years.

The multiple benefits associated with this type of project are considerable, particularly those related to emission reduction, although they cannot be monetised.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	10	Investment lifetime	10
Investment	211.500 €	Investment	211.500 €
Pay Back time	2,7 years	Pay Back time	2,7 years
IRR	31 %	IRR	31 %
NPV	262.222 €	NPV	262.222 €
NPV/Investment	1,24 -	NPV/Investment	1,24 -
Cost of Saved Energy	907 €/tep	Cost of Saved Energy	907 €/tep
		Multiple benefits impact on NPV	0,0 %

Figure 56 - Project 4, Italy: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Emission reduction	Environment	No	Yes	No	- €/year
Impact of EE on RES target achievement	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	- €/year
Reduced use of non-renewable resources	Environment	Yes	Yes	Yes	- €/year
Increased real estate value	Economic	No	Yes	No	- €/year
Energy security	SecuritySafety	No	No	Yes	- €/year

Figure 57 - Project 4, Italy: NEBs

3.3.4.3 *Risk analysis economic results*

In this project, the consultant identified the possibility of encountering the following types of risk:

- Regulatory;
- Energy performance.

Regulatory Risk

In this project, the contribution of the incentive has a significant impact. As shown by the analysis, if we assume that the incentive is not granted, the payback period would be extended by nearly two years.

In this case as well, the support of an expert who can help assess the likelihood of obtaining the incentive with greater confidence is highly beneficial. Moreover, especially for higher-value investments, such costs do not significantly affect the economic indicators.

Without mitigations		With mitigations:	Expert assistance
NPV	182.032 €	NPV	259.722 €
Pay back time (PBT)	4,4 years	Pay back time (PBT)	2,7 years
NPV/Investment (PI)	0,9 -	NPV/Investment (PI)	1,2 -
Discounted pay back tim	5,1 years	Discounted pay back time (DPBT)	3,1 years

Figure 58 - Project 3, Italy: Regulatory Risk

Energy Performance Risk

In projects of this kind, maintenance can have a significant impact on system performance. By simulating a 10% drop in performance, a notable reduction in the initially estimated NPV can be observed.

Carrying out maintenance activities and component replacements (such as replacing an inverter after five years at a cost of €15,000) shows that the indicators return fully in line with the initial estimates, while greatly reducing the likelihood of encountering risks with a substantial impact on the investment.

Without mitigations		With mitigations:	Inverter Replacment at year 5
NPV	214.850 €	NPV	250.745 €
Pay back time (PBT)	3,2 years	Pay back time (PBT)	2,7 years
NPV/Investment (PI)	1,0 -	NPV/Investment (PI)	1,2 -
Discounted pay back tim	3,7 years	Discounted pay back time (DPBT)	3,1 years

Figure 59 - Project 4, Italy: Energy Performance Risk

Worst Case Risk Analysis

In the worst-case scenario where both identified risks materialise, the impact of the mitigation measures becomes even more evident. Without them, the payback period would be nearly twice as long and the NPV approximately half of the initially estimated value.

Without mitigations		With mitigations	
NPV	134.660 €	NPV	248.745 €
Pay back time (PBT)	5,0 years	Pay back time (PBT)	2,7 years
NPV/Investment (PI)	0,64 -	NPV/Investment (PI)	1,17 -
Discounted pay back tim	5,9 years	Discounted pay back time (DPBT)	3,1 years

Figure 60 - Project 4, Italy: Worst case risk analysis

3.3.4.4 Assessment of the Financial Board

Limited financing potential as no incentives are presently available. Still, the project delivers a clear public value by enhancing grid stability, increasing renewable energy self-consumption. Given its alignment with EU and national objectives for renewable integration and decarbonisation, it would be a strong candidate for inclusion in future funding programs targeting energy storage and smart grid technologies. Public support mechanisms such as grants or low-interest green transition loans could significantly improve its financial viability.

3.3.5 Project 5: PV installation

3.3.5.1 Energy efficiency project description

Company 5

Installation of a 1.9 MWp photovoltaic plant for self-consumption.

Investment and incentives

The total investment amounts to €1,600,000, but no suitable incentives have been identified for this investment.

Performance and savings

The system will generate approximately 2.1 GWh/year, covering nearly 24% of the company's total electricity demand and reducing annual CO_2 emissions by about 1,100 tons.

3.3.5.2 Cost benefit analysis results and multiple benefits

The results of the cost-benefit analysis reveal this investment to be quite attractive, even considering the substantial scale of the investment.

In line with the project discussed in the previous chapter, the main non-energy benefits associated with this initiative relate to emission reduction.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	15	Investment lifetime	15
Investment	1.600.000 €	Investment	1.600.000 €
Pay Back time	4,9 years	Pay Back time	4,9 years
IRR	20 %	IRR	20 %
NPV	2.142.296 €	NPV	2.142.296 €
NPV/Investment	1,34 -	NPV/Investment	1,34 -
Cost of Saved Energy	603 €/tep	Cost of Saved Energy	603 €/tep
		Multiple benefits impact on NPV	0,0 %

Figure 61 - Project 5, Italy: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Emission reduction	Environment	No	Yes	No	- €/year
Impact of EE on RES target achievement	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	- €/year
Reduced use of non-renewable resources	Environment	Yes	Yes	Yes	- €/year
Increased real estate value	Economic	No	Yes	No	- €/year
Energy security	SecuritySafety	No	No	Yes	- €/year

Figure 62 - Project 5, Italy: NEBs

3.3.5.3 Risk analysis economic results

In this project, the consultant identified the most likely risk as being related solely to energy performance.

Energy Performance Risk

In this project, a scenario was also simulated in which the system performs 10% below the forecasted level. For an investment of this kind, the economic impact is quite significant, with an NPV reduction of approximately €400,000.

The planned mitigation measure for performance-related risks in this project is the replacement of the inverter at a cost of €50,000 after ten years. As we can see, although the cost is considerable, it allows for the mitigation of a far more substantial risk.

Without mitigations		With mitigations:	Inverter Replacement at year 10
NPV	1.768.066 €	NPV	2.113.024 €
Pay back time (PBT)	5,4 years	Pay back time (PBT)	4,9 years
NPV/Investment (PI)	1,1 -	NPV/Investment (PI)	1,3 -
Discounted pay back tim	6,5 years	Discounted pay back time (DPBT)	5,8 years

Figure 63 - Project 5, Italy: Energy Performance Risk

3.3.5.4 Assessment of the Financial Board

This PV project represents a highly impactful large-scale investment with strong environmental benefits. Despite the absence of incentives, its substantial energy generation and contribution to national decarbonization goals make it an excellent candidate for future green funding or sustainability-linked financing instruments.

3.4 Poland

3.4.1 Project 1: Heat pump installation

3.4.1.1 Energy efficiency project description

Company: 2A

Replacement of the existing heat source with an air-to-water heat pump integrated into the space-heating (and DHW if applicable) system. The measure delivers stable supply temperatures, higher seasonal efficiency, and precise control/monitoring via building automation, while reducing on-site emissions and maintenance needs.

Investment and incentives

The total investment amounts to about €55,000. The company can benefit from a Poland subsidy to the loan, Kredyt Ekologiczny, for an estimated amount of 34% the total cost.

Performance and savings

An annual energy saving is estimated about €6,000/year.

3.4.1.2 Cost benefit analysis results and multiple benefits

This investment project, considering the incentive contribution, appears quite attractive, with a payback period of less than five years.

Moreover, for some of the non-energy benefits identified by the consultant, it is possible to assign an economic value to the gains achieved, which allows for a slight improvement in the calculated economic indicators.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	15	Investment lifetime	15
Investment	54.948 €	Investment	54.948 €
Pay Back time	4,9 years	Pay Back time	4,6 years
IRR	21 %	IRR	23 %
NPV	44.630 €	NPV	53.500 €
NPV/Investment	0,81 -	NPV/Investment	0,97 -
Cost of Saved Energy	1.040 €/tep	Cost of Saved Energy	1.040 €/tep
		Multiple benefits impact on NPV	19,9 %

Figure 64 - Project 1, Poland: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Employee satisfaction	Social	No	No	No	167 €/year
Sickness & absenteeism	Health	No	Yes	No	50 €/year
Improved air quality	Health	No	Yes	No	- €/year
Emission reduction	Environment	No	Yes	No	282 €/year
Reduced use of non-renewable resources	Environment	Yes	Yes	Yes	- €/year
Reduction of (operating) cost	Economic	No	Yes	No	- €/year
Reduction of (maintenance) cost	Economic	No	Yes	No	33 €/year

Figure 65 - Project 1, Poland: NEBs

3.4.1.3 Risk analysis economic results

In this project, the consultant identified the possibility of encountering the following types of risk:

- Regulatory;
- Energy performance;
- Energy price;
- Operational.

In this case, the analysis will not be carried out for each individual risk and then for the worst-case scenario but will instead follow combinations of risks as suggested by the consultant.

Regulatory Risk

In investments of this kind, the incentive has a significant impact, as shown by the indicators. Therefore, it is advisable to implement measures aimed at minimising the risk of not obtaining it. In this case as well, the proposed mitigation is expert assistance.

Without mitigations		With mitigations:	Expert assistance
NPV	27.702 €	NPV	42.630 €
Pay back time (PBT)	6,8 years	Pay back time (PBT)	5,1 years
NPV/Investment (PI)	0,5 -	NPV/Investment (PI)	0,8 -
Discounted pay back tim	9,9 years	Discounted pay back time (DPBT)	7,2 years

Without mitigations		With mitigations:	Expert assistance
NPV	63.572 €	NPV	51.500 €
Pay back time (PBT)	6,3 years	Pay back time (PBT)	4,8 years
NPV/Investment (PI)	0,7 -	NPV/Investment (PI)	0,9 -
Discounted pay back tim	9,0 years	Discounted pay back time (DPBT)	6,6 years

Figure 66 - Project 1, Poland: Regulatory Risk - without NEBs (above) / with NEBs (below)

Energy Performance - Energy Price - Operational Risk

In this case, the consultant presented a combination of several potential risks considered relevant to this energy efficiency project, introducing a 10% reduction in overall energy performance compared to initial estimates and a 5% increase in electricity prices.

The suggested mitigation actions include the subscription of guaranteed performance contracts or similar agreements, and the implementation of quality controls to maintain the expected performance standards over time, at respective costs of €2,000/year and €1,000/year.

As is evident, in this case the cost of the proposed mitigation measures would exceed the impact of the risks themselves. However, it serves as a useful evaluation example, considering that with these parameters, achieving a balance in the indicators would require only a further 5% increase in electricity prices or an additional 5% reduction in performance.

Without mitigations		With mitigations:	EPC contract; Quality control
NPV	26.303 €	NPV	20.281 €
Pay back time (PBT)	6,3 years	Pay back time (PBT)	7,1 years
NPV/Investment (PI)	0,5 -	NPV/Investment (PI)	0,4 -
Discounted pay back tim	9,2 years	Discounted pay back time (DPBT)	10,5 years

Without mitigations		With mitigations:	EPC contract; Quality control
NPV	34.286 €	NPV	29.151 €
Pay back time (PBT)	5,9 years	Pay back time (PBT)	6,5 years
NPV/Investment (PI)	0,6 -	NPV/Investment (PI)	0,5 -
Discounted pay back tim	8,3 years	Discounted pay back time (DPBT)	9,4 years

Figure 67 - Project 1, Poland: Combined Risk Scenario - without NEBs (above) / with NEBs (below)

3.4.1.4 Assessment of the Financial Board

The project demonstrates strong financial and environmental value, particularly with the Kredyt Ekologiczny subsidy covering 34% of the total €55,000 investment. The resulting payback period of under five years and annual savings of about €6,000 make it a low-risk investment in energy transition technologies. Additionally, monetisable non-energy benefits such as reduced maintenance and improved operational efficiency could further strengthen its overall cost-effectiveness and eligibility for sustainable financing programs.

3.4.2 Project 2: Windows, walls, gates, doors, roof insulation

3.4.2.1 Energy efficiency project description

Company: 2A

Thermal upgrade of the factory roof to meet current requirements. The measure adds a new insulation layer and corrects junctions (parapets, skylights, penetrations) to eliminate thermal bridges and improve airtightness, while keeping operations running.

Investment and incentives

The total investment amounts to about €147,000. The company can benefit from a Poland subsidy to the loan, Kredyt Ekologiczny, for an estimated amount of 34% the total cost.

Performance and savings

An annual energy saving is estimated about €8,000/year.

3.4.2.2 Cost benefit analysis results and multiple benefits

In this energy efficiency project, the impact of non-energy benefits on the economic indicators is clearly significant. For some of these benefits, the consultant was able to assign a monetizable value, which substantially altered the overall economic assessment. These benefits far exceeded the savings generated by improved energy efficiency, reducing the payback time from nearly nine years to around five, and increasing the net present value of the investment by approximately sixfold.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	20	Investment lifetime	20
Investment	147.305 €	Investment	147.305 €
Pay Back time	8,7 years	Pay Back time	4,9 years
IRR	12 %	IRR	25 %
NPV	37.690 €	NPV	267.314 €
NPV/Investment	0,26 -	NPV/Investment	1,81 -
Cost of Saved Energy	2.905 €/tep	Cost of Saved Energy	2.905 €/tep
		Multiple benefits impact on NPV	609,2 %

Figure 68 - Project 2, Poland: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Health and well-being	Social	No	Yes	No	- €/year
Employee satisfaction	Social	No	Yes	No	873 €/year
Sickness & absenteeism	Health	No	Yes	No	262 €/year
Improved air quality	Health	No	Yes	No	- €/year
Reduced noise	Health	No	Yes	No	- €/year
Emission reduction	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	6912 €/year
Reduction of (maintenance) cost	Economic	No	Yes	No	175 €/year
Increased real estate value	Economic	No	Yes	No	- €/year
Reduction of (operating) cost	Economic	No	Yes	No	- €/year

Figure 69 - Project 2, Poland: NEBs

3.4.2.3 Risk analysis economic results

In this project, the consultant identified the possibility of encountering the following types of risk:

- Regulatory;
- Energy performance;
- Energy price;
- Operational.

In this case as well, the analysis will follow the framework adopted for the previous project, based on the consultant's considerations.

Energy Price Risk

For risks related to fluctuations in the prices of energy carriers, the considerations outlined in Chapter 2.3 remain applicable.

Regulatory Risk

In this project, the acquisition of the incentive and the estimated value of the non-energy benefits completely transform the economic assessment of the investment.

Without mitigations		With mitigations:	Espert assistance
NPV	-11.947 €	NPV	53.690 €
Pay back time (PBT)	11,6 years	Pay back time (PBT)	8,8 years
NPV/Investment (PI)	-0,1 -	NPV/Investment (PI)	0,2 -
Discounted pay back time (DPBT)	years	Discounted pay back time (DPBT)	14,9 years

Without mitigations		With mitigations:	Espert assistance
NPV	217.677 €	NPV	265.314 €
Pay back time (PBT)	6,7 years	Pay back time (PBT)	5,0 years
NPV/Investment (PI)	0,1 -	NPV/Investment (PI)	1,8 -
Discounted pay back time (DPBT)	0,9 years	Discounted pay back time (DPBT)	6,8 years

Figure 70 - Project 2, Poland: Regulatory Risk - without NEBs (above) / with NEBs (below)

Energy Performance - Operational Risk

In this analysis, the consultant presents the scenario by introducing a 10% reduction in the projected energy performance, which would have a significant impact on the economic viability of the investment. Furthermore, in this scenario, the monetizable non-energy benefits (NEBs) play an even more decisive role, as shown by the difference in the indicators that do not account for NEBs (Figure 71, above).

The consultant has proposed two possible mitigation measures: the signing of an eight-year energy performance contract and the involvement of an expert. These measures appear to be highly effective in addressing a risk with considerable impact, and they allow the economic indicators to remain consistent with the initial evaluation, even when accounting for the associated costs.

Without mitigations		With mitigations:	Expert assistance; EPC contract
NPV	-24.051 €	NPV	73.756 €
Pay back time (PBT)	12,2 years	Pay back time (PBT)	8,8 years
NPV/Investment (PI)	-0,2 -	NPV/Investment (PI)	0,3 -
Discounted pay back time (DPBT)	- years	Discounted pay back time (DPBT)	14,7 years

Without mitigations		With mitigations:	Espert assistance; EPC contract
NPV	182.610 €	NPV	271.972 €
Pay back time (PBT)	7,2 years	Pay back time (PBT)	4,9 years
NPV/Investment (PI)	1,2 -	NPV/Investment (PI)	1,8 -
Discounted pay back time (DPBT)	10,3 years	Discounted pay back time (DPBT)	6,7 years

Figure 71 - Project 2, Poland: Combined Risk Scenario - without NEBs (above) / with NEBs (below)

3.4.2.4 Assessment of the Financial Board

This small project offers a creditworthy investment opportunity in addition to the Kredyt Ekologiczny subsidy. The integration of monetizable non-energy benefits significantly strengthens the project's financial case, reducing the payback period and enhancing long-term asset value, making it well-suited for sustainable bank loan products.

3.4.3 Project 3: Windows replacement

3.4.3.1 Energy efficiency project description

Company: 2A

Replace the existing leaky windows (current U ≈ 3.0 W/m²·K) with modern, airtight units achieving U ≤ 0.90 W/m²·K in line with WT 2021. Scope includes removal of old joinery, installation of new double/triple-glazed low-E windows with warm-edge spacers and thermally improved frames, and sealed junctions to the façade to eliminate thermal bridges. The planned window area is ~33 m², improving thermal performance, reducing infiltration, and enhancing indoor comfort while supporting the broader HVAC modernisation.

Investment and incentives

The total investment amounts to about €12,000. The company can benefit from a Poland subsidy to the loan, Kredyt Ekologiczny, for an estimated amount of 34% the total cost.

Performance and savings

An annual energy saving is estimated about €630/year.

3.4.3.2 Cost benefit analysis results and multiple benefits

The economic results indicate that this investment has a relatively long payback period – approximately eight and a half years – which is nonetheless consistent with the nature and scale of the project. In this case as well, the consultant identifies non-energy benefits (NEBs) to which a monetizable value can be assigned, slightly improving the overall assessment. For this type of investment, NEBs clearly contribute to improvements primarily in terms of emissions, due to reduced consumption, and especially in the well-being of the personnel occupying the premises.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	30	Investment lifetime	30
Investment	12.274 €	Investment	12.274 €
Pay Back time	8,8 years	Pay Back time	8,3 years
IRR	13 %	IRR	13 %
NPV	2.834 €	NPV	3.534 €
NPV/Investment	0,23 -	NPV/Investment	0,29 -
Cost of Saved Energy	3.167 €/tep	Cost of Saved Energy	3.167 €/tep
		Multiple benefits impact on NPV	24,7 %

Figure 72 - Project 3, Poland: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Health and well-being	Social	No	Yes	No	65 €/year
Employee satisfaction	Social	No	Yes	No	- €/year
Improved air quality	Health	No	Yes	No	- €/year
Reduced noise	Health	No	Yes	No	- €/year
Emission reduction	Environment	No	Yes	No	- €/year
Reduction of (maintenance) cost	Economic	No	Yes	No	- €/year
Increased real estate value	Economic	No	Yes	No	- €/year

Figure 73 - Project 3, Poland: NEBs

3.4.3.3 Risk analysis economic results

In this project, the most potentially significant risk is identified as regulatory risk, particularly related to incentive mechanisms.

Regulatory Risk

For this type of project, the failure to obtain the incentive is clearly the most significant risk, as shown by the indicators. In the absence of monetizable non-energy benefits (Figure 74, above), the investment becomes entirely unviable. In this context, the support of an expert proves particularly valuable, as it increases the likelihood of securing the anticipated incentive.

Without mitigations		With mitigations:	Espert assistance
NPV	-4.006 €	NPV	1.834 €
Pay back time (PBT)	13,9 years	Pay back time (PBT)	9,5 years
NPV/Investment (PI)	-0,3 -	NPV/Investment (PI)	0,1 -
Discounted pay back time (DPBT)	- years	Discounted pay back time (DPBT)	16,7 years

Without mitigations		With mitigations:	Espert assistance
NPV	2.834 €	NPV	3.534 €
Pay back time (PBT)	8,8 years	Pay back time (PBT)	8,3 years
NPV/Investment (PI)	0,2 -	NPV/Investment (PI)	0,3 -
Discounted pay back time (DPBT)	14,9 years	Discounted pay back time (DPBT)	13,9 years

Figure 74 - Project 3, Poland: Regulatory Risk - without NEBs (above) / with NEBs (below)

3.4.3.4 Assessment of the Financial Board

This project represents a small-scale yet sustainable investment with long-term energy and comfort benefits. Although the direct payback period is long, the Kredyt Ekologiczny subsidy and monetizable non-energy benefits enhance its overall financial and ESG appeal, making it suitable for inclusion in some green building loan portfolios.

3.4.4 Project 4: Walls insulation

3.4.4.1 Energy efficiency project description

Company: 2A

Insulate external walls with an ETICS system (EPS or mineral wool, $\lambda \leq 0.038$ W/m·K) to reach $U \leq 0.20$ W/m²·K. Works include mechanical fixing, reinforced base coat and thin-coat render, and sealed junctions at openings/parapets to remove thermal bridges while keeping production running.

Investment and incentives

The total investment amounts to about €53,400. The company can benefit from a Poland subsidy to the loan, Kredyt Ekologiczny, for an estimated amount of 34% the total cost.

Performance and savings

An annual saving is estimated about €5,700/year.

3.4.4.2 Cost benefit analysis results and multiple benefits

In this project, similar considerations apply as in the previous one. In this case, the impact of monetizable non-energy benefits is particularly significant, allowing the net present value (NPV) to be doubled and allow the payback period to fall below five years, making the investment highly attractive.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	30	Investment lifetime	30
Investment	53.462 €	Investment	53.462 €
Pay Back time	6,3 years	Pay Back time	4,8 years
IRR	19 %	IRR	26 %
NPV	54.908 €	NPV	109.507 €
NPV/Investment	1,03 -	NPV/Investment	2,05 -
Cost of Saved Energy	1.533 €/tep	Cost of Saved Energy	1.533 €/tep
		Multiple benefits impact (	99,4 %

Figure 75 - Project 4, Poland: Main economic results without and with NEBs

MB	Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Health and well-being	Social	No	Yes	No	- €/year
Employee satisfaction	Social	No	Yes	No	707 €/year
Sickness & absenteeism	Health	No	Yes	No	212 €/year
Improved air quality	Health	No	Yes	No	- €/year
Reduced noise	Health	No	Yes	No	- €/year
Emission reduction	Environment	No	Yes	No	- €/year
Reduced emissions (dust, CO2, chemical agents etc.)	Environment	No	Yes	No	1210 €/year
Reduction of (maintenance) cost	Economic	No	Yes	No	141 €/year
Increased real estate value	Economic	No	Yes	No	- €/year
Reduction of (operating) cost	Economic	No	Yes	No	- €/year

Figure 76 - Project 4, Poland: NEBs

3.4.4.3 Risk analysis economic results

In this project, the most potentially significant risk is identified as regulatory risk, particularly related to incentive mechanisms. Variations in the economic indicators may also arise due to fluctuations in energy carrier prices or the overall energy performance of the intervention, but these factors are less impactful for this type of project.

Regulatory Risk

Without mitigations		With mitigations:	Expert assistance
NPV	34.679 €	NPV	52.908 €
Pay back time (PBT)	8,0 years	Pay back time (PBT)	6,5 years
NPV/Investment (PI)	0,7 -	NPV/Investment (PI)	1,0 -
Discounted pay back time (DPBT)	12,4 years	Discounted pay back time (DPBT)	9,4 years

Without mitigations		With mitigations:	Expert assistance
NPV	81.189 €	NPV	107.507 €
Pay back time (PBT)	6,4 years	Pay back time (PBT)	4,9 years
NPV/Investment (PI)	1,5 -	NPV/Investment (PI)	1,9 -
Discounted pay back time (DPBT)	8,9 years	Discounted pay back time (DPBT)	6,6 years

Figure 77 - Project 4, Poland: Regulatory Risk - without NEBs (above) / with NEBs (below)

3.4.4.4 Assessment of the Financial Board

The inclusion of NEBs, which double the NPV and reduce the payback period below five years, enhances its attractiveness for green private lending and sustainable building finance programs.

3.4.5 Project 5: Walls insulation and gates replacement

3.4.5.1 Energy efficiency project description

Company: 6A

External wall insulation (variant 3) with 14 cm thermal layer improves U-value from 0.286 to 0-131 W/m²K and reduces heat losses by about 6.472 kWh per year. The measure has a moderate CAPEX and limits direct energy cost savings, while offering non-energy benefits such as better indoor comfort, a moderate increase in asset value, and stronger regulatory compliance. (CO_2 cost is zero under current biomass accounting; a future ESG scenario could value avoided emissions.)

Investment and incentives

The total investment amounts to about €42,000. The company can benefit from a Poland subsidy to the loan, Kredyt Ekologiczny, for an estimated amount of 34% the total cost.

Performance and savings

An annual energy saving is estimated about €9,000/year.

3.4.5.2 Cost benefit analysis results and multiple benefits

This energy efficiency project, supported in part by subsidies, proves to be highly advantageous in terms of investment payback time, which is estimated at around three years. The monetizable contribution generated by non-energy benefits further enhances the economic indicators.

Main economic results without NEBs		Main economic results with NEBs	
Investment lifetime	20	Investment lifetime	20
Investment	42.105 €	Investment	42.105 €
Pay Back time	3,1 years	Pay Back time	2,6 years
IRR	28 %	IRR	35 %
NPV	52.217 €	NPV	72.007 €
NPV/Investment	1,24 -	NPV/Investment	1,71 -
Cost of Saved Energy	614 €/tep	Cost of Saved Energy	614 €/tep
		Multiple benefits impact on NPV	37,9 %

Figure 78 - Project 5, Poland: Main economic results without and with NEBs

Domain	Impacts on costs	Impacts on value proposition	Impacts on risks	Expected Annual Saving
Social	No	Yes	No	1356 €/year
Health	No	Yes	No	- €/year
Environment	No	Yes	No	- €/year
Economic	No	Yes	No	563 €/year
Economic	No	Yes	No	- €/year
Quality	No	Yes	Yes	- €/year

Figure 79 - Project 5, Poland: NEBs

3.4.5.3 Risk analysis economic results

The consultant considers the following to be the most significant risks for this project:

- Regulatory;
- Delays;
- Energy Performance;
- Energy Price;
- Operational.

Energy Price Risk

For risks related to fluctuations in the prices of energy carriers, the considerations outlined in Chapter 2.3 remain applicable.

Regulatory – Risk due to Delays

Below are the results of the cost-benefit analysis, considering the potential impact of not obtaining the subsidies and, at the same time, a one-year delay in project completion. This scenario has the greatest effect on the economic indicators, making it essential to consider a possible mitigation measure such as the involvement of an expert who can help secure the anticipated benefit.

Without mitigations		With mitigations:	Expert assistance
NPV	30.925 €	NPV	5.217 €
Pay back time (PBT)	5,7 years	Pay back time (PBT)	3,3 years
NPV/Investment (PI)	0,7 -	NPV/Investment (PI)	1,1 -
Discounted pay back time (DPBT)	8,3 years	Discounted pay back time (DPBT)	4,4 years

Without mitigations		With mitigations:	Expert assistance
NPV	48.626 €	NPV	70.007 €
Pay back time (PBT)	4,9 years	Pay back time (PBT)	2,7 years
NPV/Investment (PI)	0,1 -	NPV/Investment (PI)	1,6 -
Discounted pay back time (DPBT)	6,6 years	Discounted pay back time (DPBT)	3,5 years

Figure 80 - Project 5, Poland: Combined Risk Scenario 1 - without NEBs (above) / with NEBs (below)

Energy Performance – Operational Risk

The consultant simulates potential issues related to the project's operational performance and achievable energy savings, indicating an overall reduction of 10% in the projected savings. Although the impact of this risk is less severe than that of failing to obtain the subsidy, it still significantly affects the attractiveness of the investment. Therefore, even in this case, a mitigation measure such as signing an Energy Performance Contract (EPC) proves to be an economically advantageous choice.

Without mitigations		With mitigations:	EPC contract
NPV	42.785 €	NPV	48.993 €
Pay back time (PBT)	3,7 years	Pay back time (PBT)	3,3 years
NPV/Investment (PI)	1,02 -	NPV/Investment (PI)	1,16 -
Discounted pay back time (DPBT)	4,8 years	Discounted pay back time (DPBT)	4,3 years

Without mitigations		With mitigations:	EPC contract
NPV	60.596 €	NPV	68.783 €
Pay back time (PBT)	3,0 years	Pay back time (PBT)	2,7 years
NPV/Investment (PI)	1,14 -	NPV/Investment (PI)	1,63 -
Discounted pay back time (DPBT)	3,8 years	Discounted pay back time (DPBT)	3,3 years

Figure 81 - Project 5, Poland: Combined Risk Scenario 2 - without NEBs (above) / with NEBs (below)

3.4.5.4 Assessment of the Financial Board

This combined wall insulation and gate replacement project offers a low-risk investment opportunity, particularly with the Kredyt Ekologiczny subsidy covering 34% of total costs. With an estimated payback period of around three years,

the project demonstrates strong eligibility for green financing instruments and ESG-focused credit lines at a local/regional funders.

4. Conclusions

The analysis carried out using the CBA & RA tool has demonstrated the effectiveness of an integrated approach to economic and risk evaluation in energy efficiency projects for SMEs. The inclusion of multiple benefits and the simulation of risk scenarios with corresponding mitigation measures provide a more comprehensive and realistic view of investment sustainability. The results show that, despite differences in national contexts and technologies adopted, it is possible to identify common strategies to improve project bankability and reduce exposure to risks. Indeed, there appears to be a consistent pattern among the main risks and mitigation measures proposed across the various selected projects, which supports the promotion of best practices and enhances project profitability. The document therefore aims to offer a concrete contribution to the dissemination of operational tools and replicable methodologies, in support of the energy transition of European SMEs towards the 2050 climate targets.

The DEESME 2050 Financial Board judged all the projects broadly bankable when paired with standard green-finance instruments (grants, concessional loans, ESCO models), especially for quick-payback efficiency and scalable self-consumption renewables. Valuing multiple non-energy benefits consistently raised NPV and shortened payback, strengthening credit cases. The most recurrent risks outlined were regulatory/incentive uncertainty, energy-performance shortfalls, and implementation delays, with energy-price volatility secondary. Recommended mitigation included expert advisory support, performance guarantees/EPCs, predictive or enhanced maintenance, and robust M&V. For small projects, the Board advised project aggregation and standardised approaches to unlock economies of scale and investor interest.

Project partners

- Website: https://ieecp.org/projects/deesme2050/
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