EnergyEfficiency4SMEs

Increasing uptake of energy efficiency measures in small and medium sized enterprises

Grant Agreement number:

101076459

Deliverable 3.3

Summary Report of the energy upgrade measure recommendations from the Energy Audits

Document History

Date	Version	Prepared by	Organisation	Approved by	Dissemination Level
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EnergyEfficiency4SMEs

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Executive Summary

The following report is part of Work Package 3 of the EU Project EnergyEfficiency4SME, as the Deliverable 3.3, titled "Summary Report of the basic recommendations for energy upgrading per type of SME (Buildings and Processes)". In this report the measure recommendations deriving from the energy audits, that the participating countries were called to conduct, are presented. Below are the three NACE Categories that the project aims to support:

- Accommodation and food service activities (NACE Code: I55 to I56.3.0)
- Manufacturing – Agri-food (NACE Code: C10 to C11.0.7) • Manufacturing
- Metalwork (NACE Code: C24 to C25.9.9)

The SMEs were divides into two main categories, **Buildings** and **Processes** where for the former, all three NACE categories are relevant, whereas for the latter only the last two.

As with Deliverable 3.2, to homogenise the information from the 141 proposed energy audits, a standardised, easy-to-fill template was prepared and given to the contracted auditors to fill up. The measure recommendations received, were aggregated to create the summary tables shown herein. Further info can be extracted to accommodate the needs of other Work Packages of the project and very importantly the IMPAWATT Platform.

Status of Energy Audits per Country

Project's Key Performance Indicators [KPI]

As a reminder, the table included in Deliverable 3.2 is presented below that shows the percentage completion of the new energy audits, defined as the ratio of actual completed audits to the proposed audits, as stipulated in the Grant Agreement.

The Project Key Performance Indicator of 141 new Energy Audits was exceeded by 7.1% i.e. bringing the number to 151 energy audits. It is important to mention that this includes Malta's 25 bonus audits.

Country	New En. Audits Received [Actual]	Proposed En. Audits [Grant Agreement]	% Completion [KPI]
Belgium	N/A	N/A	N/A
France	29	35	82.9%
Italy	18	20	85.0%
Austria	25	25	100.0%
Cyprus	5	5	100.0%
Malta*	25	0	Bonus
Bulgaria	20	20	100.0%
Estonia	3	3	100.0%
Spain	21	28	75.0%
Germany	5	5	100.0%
TOTAL	**151**	**141**	**107.1%**

The table below is a breakdown of the above 150 new energy audits [actual], into the three NACE Categories. Out of the 150 audits, 102 lie within the Accomodation & Food Services sector, 29 within the Agri-food and 19 within the Metalworks sector.

Country	Accomodation & Food Service	Agri-food	Metalworks
Belgium	N/A	-	-
France	17	2	10
Italy	10	5	3
Austria	25	-	-
Cyprus	3	2	-
Malta*	22	3	-
Bulgaria	5	12	3
Estonia	3	-	-
Spain	12	6	3
Germany	5	-	-
TOTAL	**102**	**30**	**19**

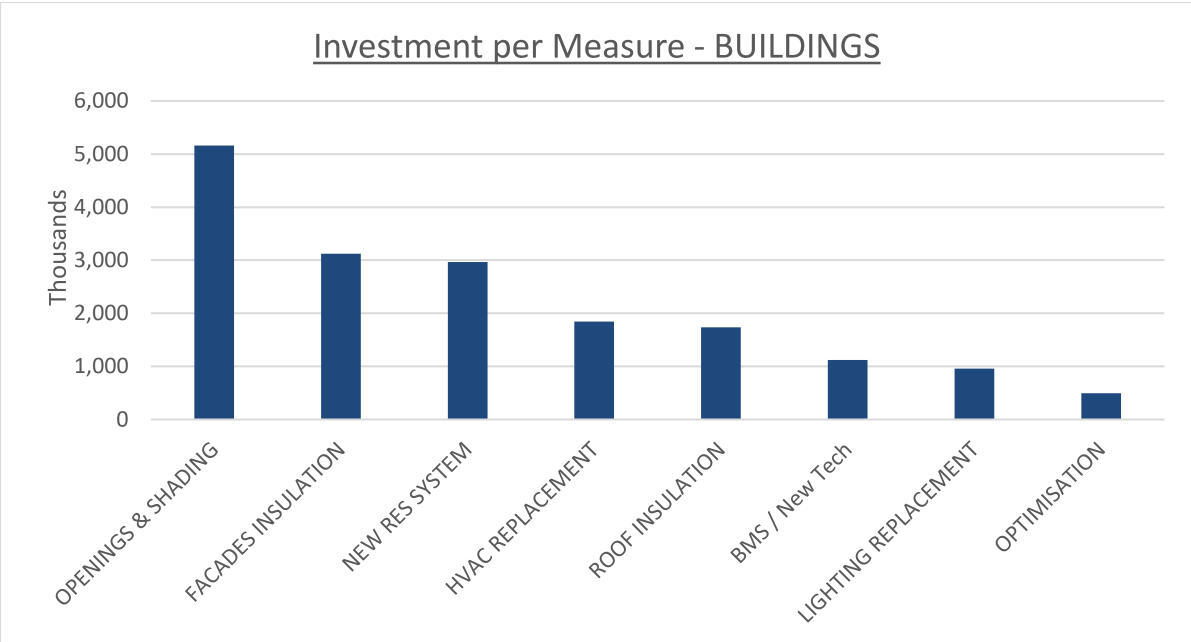
Energy Efficiency Measures Recommendations

Potential Investment per Measure per SME Category

The Energy Auditors contracted to conduct the audits, were requested to provide their recommended energy efficiency measures according to their inspections. Along with listing the measures, the auditors were to provide the accompanying economic indicators such as the *Capital Cost, Net Present Value [NPV], Internal Rate of Return [IRR] and Break-Even Period*. While aggregating the list of measures, at country level, the sensible economic indicator to be presented, was selected to be the potential Investment Capital. Below, are the two graphs for each type of SMEs (Building / Processes) according to the NACE categories, showing the potential investments per measure.

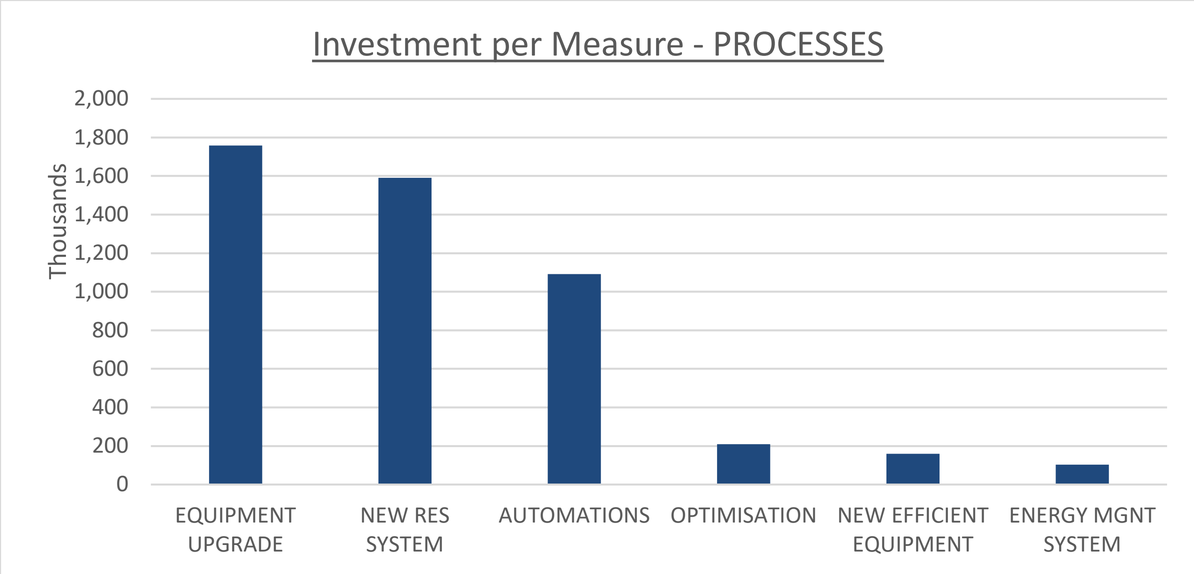
As seen in the first graph below, which regards Buildings, the primary recommended measure is the replacement of Openings (Windows, Doors etc) at 5.16 million Euros followed by the thermal Insulation of the Facades at 3.12 million Euros and Installation of a new Renewable Energy System (Photovoltaic, Solar Thermal System etc) at 2.97 million Euros.

The *Total Investment Capital* to be triggered for this category is **17.4 million Euros**.



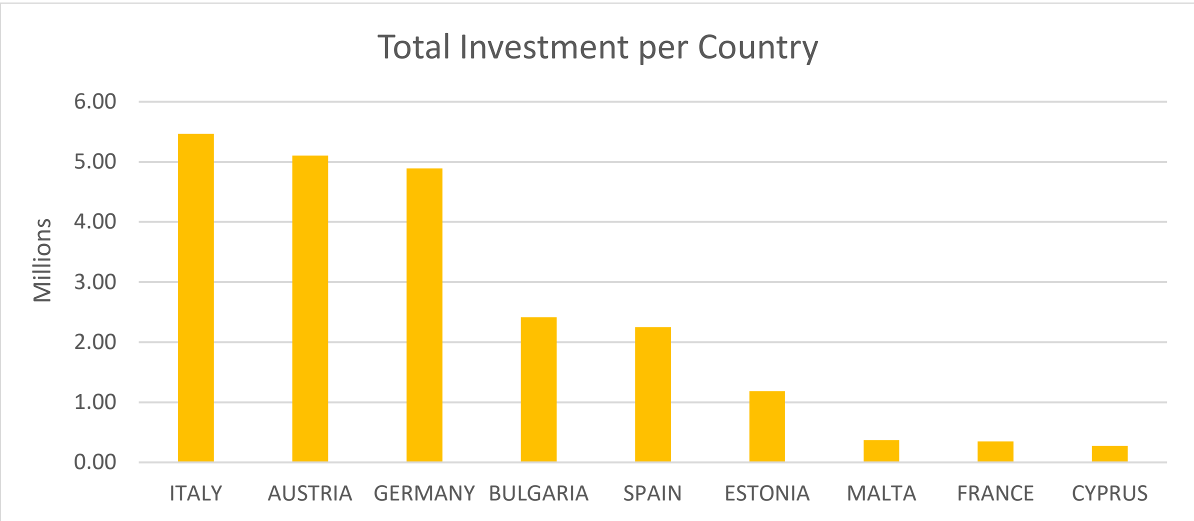
According to the 2nd graph below which regards Processes such as Manufacturing of Agrifood, as well as Metalworks, the primary recommended measure is Equipment Upgrade at 1.76 million Euros followed by Installation of a new Renewable Energy System (Photovoltaic, Solar Thermal System etc) at 1.59 million Euros and Automation (motion sensors, standby modes etc) at 1.09 million Euros.

The *Total Investment Capital* to be triggered for this category is **4.91 million Euros**.



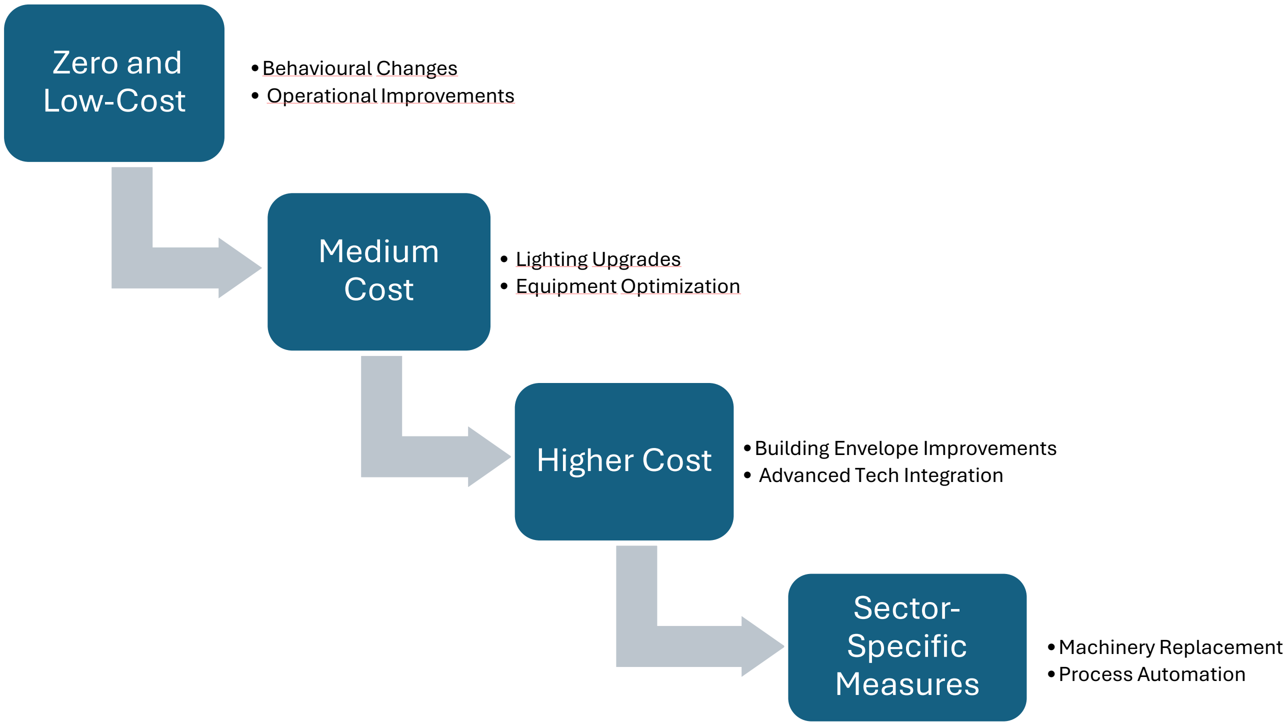
Potential Investment per Country

The graph below shows the total investment per country. This does not reflect the effort or performance of each partner country as each country proposed a particular number of SMEs to be audited, according to their role in the project.



Best Practices for Energy Upgrade Measures

This section is dedicated to the best practices regarding energy efficiency measures for the Small and Medium Enterprises. To smoothly get involved with energy efficiency investments within an organisation, the best approach is to start with the simple and lowest cost measures, move to more essential ones and later proceed to more specific investments that may require exhaustive techno-economic evaluations. The flow diagram below shows the above visually:



Zero and Low-Cost Measures

- Train staff on energy-efficient practices such as switching-off lighting and equipment during non-operational hours
- Regular monitoring and recording of energy consumption
- Optimisation of production and/ or other energy intensive operation schedules to avoid peak energy tariffs
- Setting heat pump Heating and Cooling thermostat temperatures at 21°C and 26° C respectively, always on auto fan to engage the inverter.
- Similarly set boiler temperatures at optimal levels.
- Preventive and corrective equipment maintenance such as regulation of components.

Medium Cost Measures

Lighting Upgrades:

- Replacement of conventional lighting with LED technology
- Installation of occupancy (motion) sensors

Equipment Upgrades:

- Installation of variable speed drives on motors and pumps
- Upgrade to energy-efficient refrigeration systems
- Implementation of heat recovery systems for hot water generation and recoup of conditioned (heated/ cooled) indoor air
- Installation of Building / Energy Management Systems (BMS)

High-Cost Measures

Building Envelope Energy Upgrade:

- Insulation of the Building Envelope (Roof and Facades)
- Replacement of openings with double-glazed windows and high solar reflectivity
- Installation of shading systems, static or adjustable (manual and motorised)

Implementation of technologies:

- Installation of Photovoltaic Systems
- Installation of storage systems and V2G electric car Chargers
- Upgrade the BMS / EMS to a smarted one, integrating more devices.
- Implementation of Combined Heat and Power

Sector-Specific Measures

These are measures tailored to the specific processes and may fall within one of the aforementioned categories, however they may require specialised professionals to provide the adequate solution and provide the investment benefits.

A final remark shall signify that the distinction between energy saving measures and covering the energy demands with renewable energy is not clear and the two are often thought as the same. However, it is key to understand that the aim is to lower the energy demand first, through energy saving measures, and then proceed to cover this lower demand with energy form a renewable energy system (photovoltaics, solar thermal etc).

APPENDIX A

Aggregated Upgrade Measures

Recommendations of the Energy Audits

EASURES RECOMMENDATIONS	CAPITAL COST PER COUNTRY (€)									TOTAL INVESTMENT per MEASURE
DESCRIPTION	AUSTRIA	FRANCE	ITALY	SPAIN	MALTA	BULGARIA	GERMANY	CYPRUS	ESTONIA	
ROOF THERMAL INSULATION			135000	1190463	17342	20500	349100	21500		**1733905**
FACADES THERMAL INSULATION	929750	mostly high	470000			100280	1546600	77200		**3123830**
OPENINGS REPLACEMENT & SHADING SYSTEMS	1930525	mostly high	1027800		10500	85780	2026200	82100		**5162905**
LIGHTING REPLACEMENT W/ LED	758728	medium	64600	125505		7820				**956653**
HVAC REPLACEMENT	361000		136400	416006	168708	338320	97000	30135	296600	**1844169**
NEW RENEWABLES SYSTEM PRODUCTION	221500		737734	125937	98976	691615	720000	65000	304517	**2965279**
New Technology Installation (Building management system, electric chargers etc)	48300		714570		68025	289924				**1120819**
Optimisation (e.g. Pipe Insulation, Boiler Regulation, Hydraulic balancing, inverter replacement, thermostat setting, power factor correction etc)	132950		5200	2444	8300	36140	151000		158704	**494738**
EQUIPMENT UPGRADE	48435	medium	1168600	211493		329194	460			**1758182**
AUTOMATION INSTALLATION	588200	high	95000	21500					385880	**1090580**
ENERGY MANAGEMENT SYSTEM IMPLEMENTATION (e.g ISO 50 001 or similar)			45000	30088		28377				**103465**
NEW RENEWABLES SYSTEM PRODUCTION	62000	349900	661860	127471		389960				**1591191**
Optimisation / Regulation (power factor correction,	22300		48000			98490	800		40000	**209590**
New Installation of Efficient Equipment			159000							**159000**
TOTAL INVESTMENT per COUNTRY	5103688	349900	5468764	2250907	371851	2416400	4891160	275935	1185701	