Energy Transition Audits towards Decarbonization

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Document History

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List of Acronyms

Acronym	Meaning
CHP	Combined Heat and Power
DAP	Decarbonization Action Plan
EE	Energy Efficiency
EED	Energy Efficiency Directive
EM	Energy Management
ETA	Energy Transition Audits
LoS	Letter of Support
LPG	Liquefied Petroleum Gas
NACE	Nomenclature of Economic Activities
NDA	Non -Disclosure Agreement
Q&A	Questions & Answers
RES	Renewable energy sources

Executive summary

The EnTRAINER project, co-financed by the EU LIFE Programme, shifts from conventional energy audits to "Energy Transition Audits" (ETA), offering a comprehensive decarbonization action plan for energy-intensive sites in Greece, Italy, Romania, and Spain.

This report, "*Report on Engagement of Clients and Initial Energy Scans*," outlines the strategies used to engage companies in testing the new ETA methodology. It details the steps taken to attract companies and the results from 41 initial energy scans conducted at various sites.

The report aims to demonstrate how energy-intensive companies can be motivated to implement energy scans and audits for decarbonization, highlighting the EnTRAINER approach and key elements of an energy scan.

Key lessons learned include the importance of clearly communicating project benefits to enhance engagement, the need to streamline administrative processes like signing letters of support and non-disclosure agreements and ensuring data availability. Proactive planning and scheduling inspections during less busy periods are crucial for smooth implementation.

The methodology involved using an internally developed energy scan tool, which covered:

1. General information
2. Overview
3. Energy management
4. Energy analysis
5. Barriers
6. Energy Efficiency (EE) and Renewable Energy Sources (RES)
7. Energy Efficiency action plan
8. Conclusions

Input data included types of energy carriers, yearly and monthly energy consumption, costs, and CO_2 emission factors. The output data provided yearly costs, total CO_2 emissions, energy consumption shares, and monthly consumption graphs. The action plan proposed measures and key performance indicators (KPIs) for energy savings, cost reductions, and emission reductions, also highlighting multiple benefits associated such as improved performance and reduced maintenance costs.

The first implementation involved 41 sites, focusing on the manufacturing sector. Key findings are:

- 80% of companies in Romania and Greece and 64% in Italy have budgets for energy efficiency projects; none in Spain do. 80% of companies in Romania and Greece, and 64% of companies in Italy, have budgets for energy efficiency projects; however, no companies in Spain have such a budget.
- 90% of companies record energy consumption data, and 93% are aware of energy costs, with Romania and Spain at 100%.
- 43% of companies know their sector-specific consumption; Romania leads with 100%, Spain has 0%.

- 30% of Greek, 73% of Italian, and 90% of Romanian companies have energy managers.
- All Romanian companies, 40% of Greek, and 55% of Italian companies have documented EE targets and action plans.
- All companies use electricity, half use natural gas, and others use LPG, petrol, diesel, propane, and biomass.
- Romania shows the highest electricity (66%) and gas (84%) consumption rates.

The proposed EE measures include smart energy management, heat recovery, advanced purification technologies, LED lighting, photovoltaic systems, and efficient system replacements. These measures offer non-energy benefits like improved efficiency and reduced costs, emphasizing a strong focus on renewable energy.

These actions support our goal of creating a sustainable future for energy-intensive companies in these countries and beyond, offering a replicable model for other EU Member States.

1. Introduction

About EnTRAINER project & scope of the report

EnTRAINER project, co-financed under the LIFE Programme, by the European Union, introduce a paradigm shift from conventional energy audits to a new, holistic approach of "Energy Transition Audits" (ETA). Through this new approach, the aim is to provide a complete action plan towards decarbonization of energy intensive sites across four countries: Greece, Italy, Romania and Spain.

The scope of this report is to presents EnTRAINER's novel approach in engaging energy intensive sites for supporting them in the decarbonisation pathway and key insights about the work done in the companies in form of energy analysis and training events. The report is dedicated to any stakeholder who is interested in working with energy-intensive industries, and companies interested in reaching the climate neutrality targets.

The aim of the engagement process of the companies for ETA implementation in the EnTRAINER project is to attract at least 20 energy-intensive industries in each partner country, selected from a pool of potential candidates, to test and implement ETAs. Through various approaches, including competitions and training sessions, top decision-makers and technical staff will be encouraged to commit to adopting decarbonization action plans (DAP) within the next 10 - 20 years. The engagement process involve preliminary energy scans and the development of roadmaps towards decarbonization using a holistic methodology developed within the project framework.

Structure of the report

The report is organized as follows: Chapter 2 outlines the approach implemented by the EnTRAINER consortium to engage energy-intensive companies and conduct energy scans as preliminary assessments for ETAs. Chapter 3 provides a detailed overview of the energy scan template and the assessment tool utilized. The subsequent section offers a global analysis of the companies engaged, accompanied by the primary findings derived from the scans. Chapter 5 discusses the training activities conducted, while the final section presents key conclusions regarding all actions taken and outlines the next steps in the EnTRAINER framework.

2. Engaging energy-intensive companies – EnTRAINER's approach

2.1. General approach

The general approach of the EnTRAINER project involves preparing a list of benefits for companies participating in the project, including collaborating to set decarbonization targets, analysing CO_2 emissions, and identifying measures to reduce energy consumption, costs, and emissions. Training events were planned for different categories of staff to enhance awareness and knowledge. Companies were selected based on criteria such as previous energy audits, energy consumption, and existing energy management (EM) practices. An evaluation method was used to choose the initial ten companies per country, requiring a letter of support to express interest in adopting a decarbonization plan, exploring innovative technologies, and engaging in training and collaboration.

The project framework for engaging companies and implementing energy scan and further the ETA followed the following main steps (*Figure 1*):

1. Development of the methodology and roadmap
2. Engaging companies in the project activities and conducting a competition
3. Implementation of the energy scans for the selected sites
4. Selection of the companies for the ETA
5. Delivery of ETA reports and decarbonization action plan (DAP)
6. Training company staff

The present report reflects the actions done for step 2, 3 and 6. The other stages will be presented in other project deliverables.

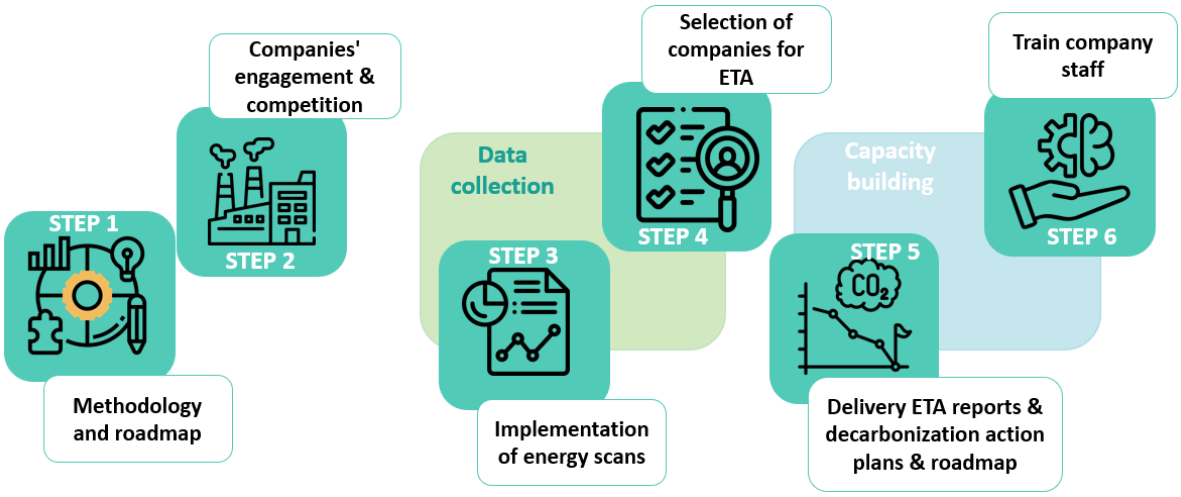


Figure 1. General EnTRAINER's approach

In different ways, a list of benefits was prepared for the companies, to understand better their benefits though the participation in the project activities.

The main benefits include collaborating with the company to define clear and achievable decarbonization targets and analysing their CO_2 emissions profile within Scope 1 and 2 to identify impactful solutions. Identifying measures to reduce energy consumption, minimize costs, and lower CO_2 emissions is another benefit. Based on the findings of the ETA, a DAP is developed for the company, including a comprehensive investment strategy for short-, medium-, and long-term investments. The multi-benefit evaluation method assesses potential cost savings, operational efficiencies, and other positive business impacts. Additionally, the project framework creates a decarbonization roadmap to guide the implementation of the proposed measures and investment strategies. To enhance awareness and knowledge, training events are conducted for the company staff, including management, administration, and technical personnel.

The selection process for companies benefiting from energy scans was based on initially established criteria and information requested from each company. Subsequently, an evaluation method was developed and internally utilized by each partner country to select the initial ten companies per country for the first edition. Notably, this evaluation process was applied only in cases where the number of interested companies exceeded the available ten slots. The main aspects and information taken into account and requested for the selection procedures of the companies are listed below:

- Has the company conducted an Energy Audit in the last 4 years?
- What is the total energy consumption of the company?
- What are the main energy sources in the company?
- Does the company have an energy manager, sustainability manager, or other personnel responsible for energy and environmental aspects?
- Does the company already have an energy monitoring system with regular data collection for energy consumption?
- Has the company implemented any energy efficiency (EE) solutions in the last 2 years?
- What are the company's future plans to reduce energy consumption and transition to renewable energy sources?
- How does the company envision incorporating the findings of the ETA into its practices?

Once the evaluation process was completed, the EnTRAINER approach required the submission of a LoS by the company as a necessary step to benefit from a preliminary energy scan. The letter expresses a company's strong interest in adopting a DAP over the next decade to reduce its carbon footprint and promote sustainability, although it makes no legal commitments at this stage. It highlights the company's exploration of innovative technologies, energy-efficient solutions, and renewable energy sources, as well as its intent to engage in training programs and collaborate with the EnTRAINER consortium and external experts. Through the letter, the company seeks support, insights, and resources to develop a comprehensive plan with specific targets and milestones for reducing carbon emissions. The letter template is presented in *Annex A*.

2.2. Engagement of the companies in Greece, Italy, Romania and Spain

In **Greece,** the campaign to engage companies was launched by leveraging an existing network from the *SMEmPower Efficiency* project, prioritizing energy-intensive companies. The focus was on companies in Central and Western Macedonia to facilitate on-site visits. Initial outreach involved

sending a concept note outlining the project goals and expected company engagement in the energy scans. This was followed by direct communication to provide additional details and address queries. While some companies, required on-site meetings, most agreements were finalized via phone and email. However, some companies declined participation due to not wanting to engage in the competition phase or due to administrative issues and heavy workloads. Despite these challenges, ten companies were successfully engaged without needing an additional competition.

In **Italy,** multiple approaches were used to engage companies, including targeting energy-intensive companies in South Tyrol, utilizing planned EE events, contacting participants from the *SMEmPower Efficiency* project, and reaching out through the Agenzia CasaClima network. Online meetings were organised to present the project to each of the interested companies and to address their queries. Each company had a designated reference person for future communications. While larger companies showed less interest due to mandatory energy audits, smaller companies were more enthusiastic. Nevertheless, 9 companies were engaged for a total of 11 different production plants undergoing the preliminary energy scanning phase; the sectors involved included industrial laundries, biotechnology, metallurgy, and others. CasaClima facilitated data collection through online meetings and sporadic follow-ups, and conducted a final individual meeting to present the energy scan results and train employees. One company modified their letter of support to avoid confusion with their existing decarbonization plan.

In **Romania**, company engagement followed a structured approach involving interaction, evaluation, and selection. Servelect organized a successful webinar, attracting 51 participants from various sectors, including top management and technical staff. Participants were given a questionnaire to express their interest and provide necessary information for evaluation. Out of 51 companies, 42 completed the questionnaire, and 10 were selected for the energy scan. These selected companies then submitted the standard project Letter of Support (LoS) and a Non-Disclosure Agreement (NDA). For each company, a contact person was assigned, while Servelect assigned an internal responsible for the energy scan implementation. Furthermore, an individual kick-off meeting was schedules which each site, in which the following were presented:

- General aspects of the project, including the main pillars.
- The main steps of the energy scan process.
- The structure of the final energy scan report.
- Proposed timeline for the implementation of the energy scan.

After the meeting, a list of required data was sent to the company. Once the data was collected, the final energy scan report was sent, followed by a final online meeting to present the results and key conclusions for implementing a DAP.

In **Spain**, ten companies participated in the energy scans, with eight committing to undergo an ETA. These companies, all from the industrial sector, were chosen based on their energy consumption profiles, CO_2 emissions, and potential for energy and emission savings. The engagement approach was proactive and collaborative, with initial meetings and email exchanges establishing strong communication channels. The audit team emphasized the importance and benefits of the ETA, aligning with company needs and expectations. The interaction included detailed explanations of the

process, required commitments, and resource allocation. Continuous contact was maintained with top management to secure their support, and close collaboration with administrative, energy, and technical staff ensured effective data collection and validation. Specific training courses were postponed to the audit's completion for greater effectiveness. The overall cooperation from the companies has been satisfactory, with the audit team committed to delivering impactful results.

2.3. Key lessons learned.

Clearly communicating benefits

Experience across different countries underscored the importance of clearly presenting the project's benefits from the outset. Even when the benefits are free, companies need a detailed understanding of what they will receive and the required investment in terms of human and time resources. Early and transparent communication about these aspects can enhance engagement and commitment, as it was the present case.

Counting with the administrative procedures of companies

In Romania, the submission of the Letter of Support (LoS) and the signing of the Non-Disclosure Agreement (NDA) significantly delayed the project implementation. While the webinar was successful and generated substantial interest, two large companies withdrew from participation due to their internal legal procedures for signing the LoS and NDA. In Italy, some companies give up due to administrative issues and heavy workload, also other companies, having already undergone decarbonisation plans or planned interventions, did not identify additional benefits in joining the project. This highlights the need to account for and streamline administrative processes, especially with large companies, and also the anticipation and mitigation of workload is important.

Ensuring data availability

Data collection was delayed in some instances due to busy periods or insufficient human resources. However, most companies had already had the necessary data aggregated for the energy scan. It is important to note that while data for initial assessments may be readily available, more detailed data required for a comprehensive energy audit may pose additional challenges. Proactive planning and resource allocation can mitigate these issues.

In Italy, some companies have also specified that the inspection of their production facilities for the purpose of the ETA may only be carried out during certain periods, thus avoiding the months when production/workload is highest.

3. Energy scan – from methodology & tool to the implementation

3.1. General approach

The goal of the energy scan implementation was to produce a consistent report across the four countries by requesting the same data set and delivering uniform results. To achieve this, a straightforward approach was established from the beginning, involving the stages presented in *Figure 2.*

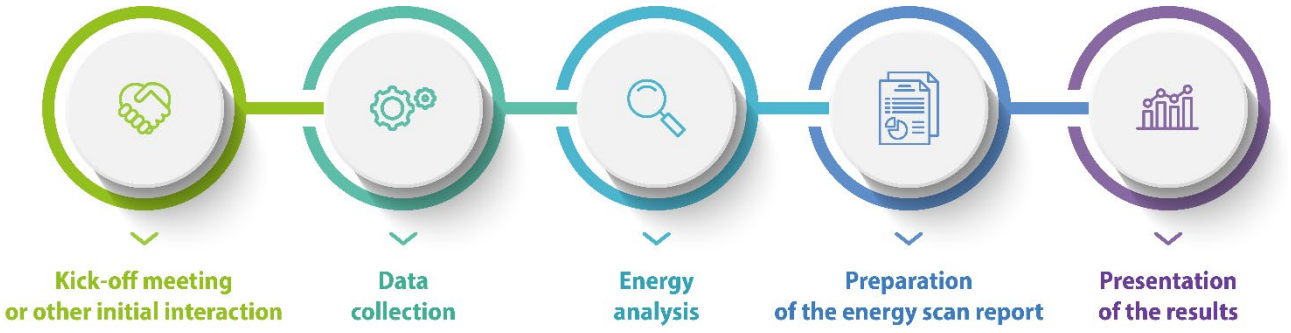


Figure 2. Main stages of the energy scan

Further the energy can tool is described, which was used across the four countries.

3.2. Energy scan tool for data collection

The energy scan tool developed internally was used to perform the necessary calculation, to collect the data and to evaluate and present the results in form of report.

The energy scan tool included the following main sections which are going to be briefly described next:

1. General information
2. Overview
3. Energy management
4. Energy analysis
5. Barriers
6. Energy efficiency and renewable energy sources
7. Energy efficiency action plan
8. Conclusions

Section 1 serves as an introduction, providing a general overview of the project and its assessment objectives. Additionally, it includes basic **company information** such as its name and NACE code. Section 2, titled "Overview," offers a **detailed description of the company's primary operations and processes**. This is followed by an **energy management section**, which focuses on answering Yes/No type questions to assess the company's commitment to EE projects, presence of personnel responsible for energy-related regulations, and establishment of EE targets. The backbone of the evaluation lies in the 4th section, "**Energy Analysis**," which examines the consumption of various

energy carriers over the past three years and the associated CO_2 emission profile. This section is subdivided into subsections, presenting the energy consumption share and assessing monthly consumption trends. Chapter 5 evaluates **barriers hindering energy efficiency improvements and decarbonization actions**, followed by a discussion of implemented EE measures, including existing renewable energy sources. The preliminary EE and DAP proposed in the energy scan outlines measures and their anticipated **impacts on energy savings, costs, CO_2 emissions,** as well as potential benefits. Furthermore, the tool includes a list of 16 **multiple benefits** to aid in selecting appropriate measures and raises awareness of their advantages. In addition to technical measures, the tool incorporates a section for **organizational measures**. Finally, a section for **key conclusions** synthesizes the main findings of the energy scan and outlines the necessary steps to reduce CO_2 emissions significantly and gradually.

Further, the tool's main components are detailed, highlighting the input and output data.

Input data for the energy analysis, section 4 of the energy scan:

- Type of energy carriers;
- Yearly energy consumption for the last 3 consecutive years, for each energy carriers;
- Yearly energy cost for the last 3 consecutive years, for each energy carriers;
- CO_2 emission factor for each energy carrier;
- Monthly energy consumption for the last available year, for each energy carrier;
- Monthly energy cost for the last available year, for each energy carrier.

In terms of the CO_2 emission factor, common factors were proposed for each country, as presented in *Annex B.*

Output data calculated by the tool:

- Yearly specific cost, Euro/MWh for the 3 consecutive years for which data is provided.
- Total yearly CO_2 emissions associated for each energy carrier for the 3 consecutive years.
- Total yearly CO_2 emissions for the 3 consecutive years
- The share of energy consumption for each year
- Graph for monthly energy consumption, for each energy carrier.

The EE action plan follows the energy analysis and the identification of the main barriers. The action plan includes a brief description of the proposed measures and a list of key performance indicators (KPIs), which are identified at this stage but not yet quantified. The KPIs to be selected for each measure, reflecting its impact, are energy savings, energy costs, CO2 emission reductions, other emission reductions, and renewable energy generation. Besides this, for each measure a list of associated multiple benefits, or non-energy benefits are associated. The completed list are multiple benefits provided in the tool is presented above:

1. Reduced malfunction or breakdown of machinery and equipment;
2. Improved equipment performance;
3. Longer equipment life (due to reduced wear and tear);
4. Reduced waste heat and associated operational costs;

5. Reduced water consumption and associated operational costs;
6. Reduced CO, CO_2, NOx, SOx emissions;
7. Reduced maintenance cost;
8. Reduced noise;
9. Air quality improvement of ambient air;
10. Reduced CO_2 and energy price risks;
11. Reduced disruption of energy supply risk and energy price changes;
12. Contribution to company's vision or strategy;
13. Increased knowledge of production/auxiliary processes;
14. Increased assets value;
15. Increased customers or staff satisfaction.

3.3. Final energy scan report

The companies received a final energy scan report incorporating the provided data and the key outputs discussed. The tool's advantage was highlighted by its ability to import data from Excel and generate a PDF report. The energy scan report template is presented in *Annex C*, without completed data. This will be further used in the second round of energy scans, without any foreseen changes. Given this context, the next section will present the key results from all the implemented energy scans and provide essential recommendations.

4. Energy evaluation outcomes

4.1. Type of companies engaged.

The first edition of the energy scan implementation attracted 41 sites across the four countries: Greece, Italy, Romania and Spain (*Table 1*).

Table 1. Number of sites engaged in each country and in total

Country	No. sites
Greece	10
Italy	11
Romania	10
Spain	10
TOTAL	**41**

The local partners collected the NACE code for each company engaged, but the data isn't presented individually in this report to avoid identifying any companies. *Figure 3* shows the share of different sectors that we engaged with, explaining the distribution and below detailing the sector. In each country, at least 50% of the companies were operating in the manufacturing sector. Romania had the highest rate, with all its companies involved in manufacturing.

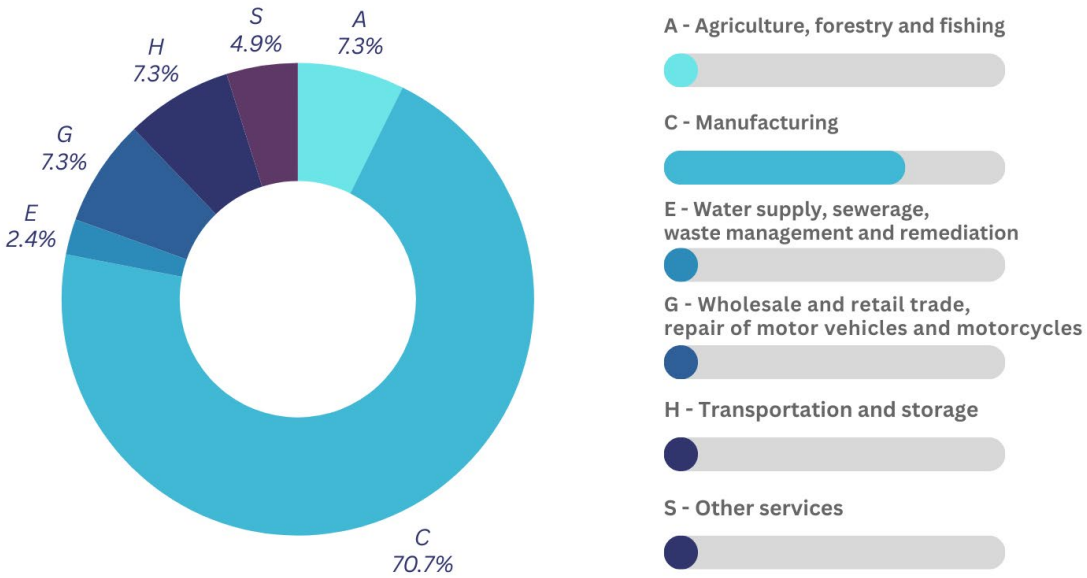


Figure 3. Share of different sectors

4.2. Energy management practices in the companies

To identify the current EM situation, we created a set of eight *Yes or No* questions. Company representatives or project partners provided the answers, which we then included in the final energy scan report. Here are the eight questions:

EM1 - Is there a budget allocated for energy saving or energy efficiency projects?

EM2 – Is energy consumption (oil, gas, electricity) recorded monthly?

EM3 – Are energy costs known and are energy bills also available to the energy manager?

EM4 – Are the bills critically analysed? (e.g. compared with the previous year's)

EM5 – Is the company aware of the specific consumptions in its sector?

EM6 – Is there a person responsible for energy-related regulations and laws, e.g. an energy manager?

EM7 – Are there written targets and action plans for energy efficiency (better performing systems) and energy saving (elimination of waste)?

EM8 – Are there written procedures for the efficient use of machines? (Work, process or company procedures)

Figure 4 shows a radar type chart, for visualisation of the overall performance of companies in each country regarding EM practices.

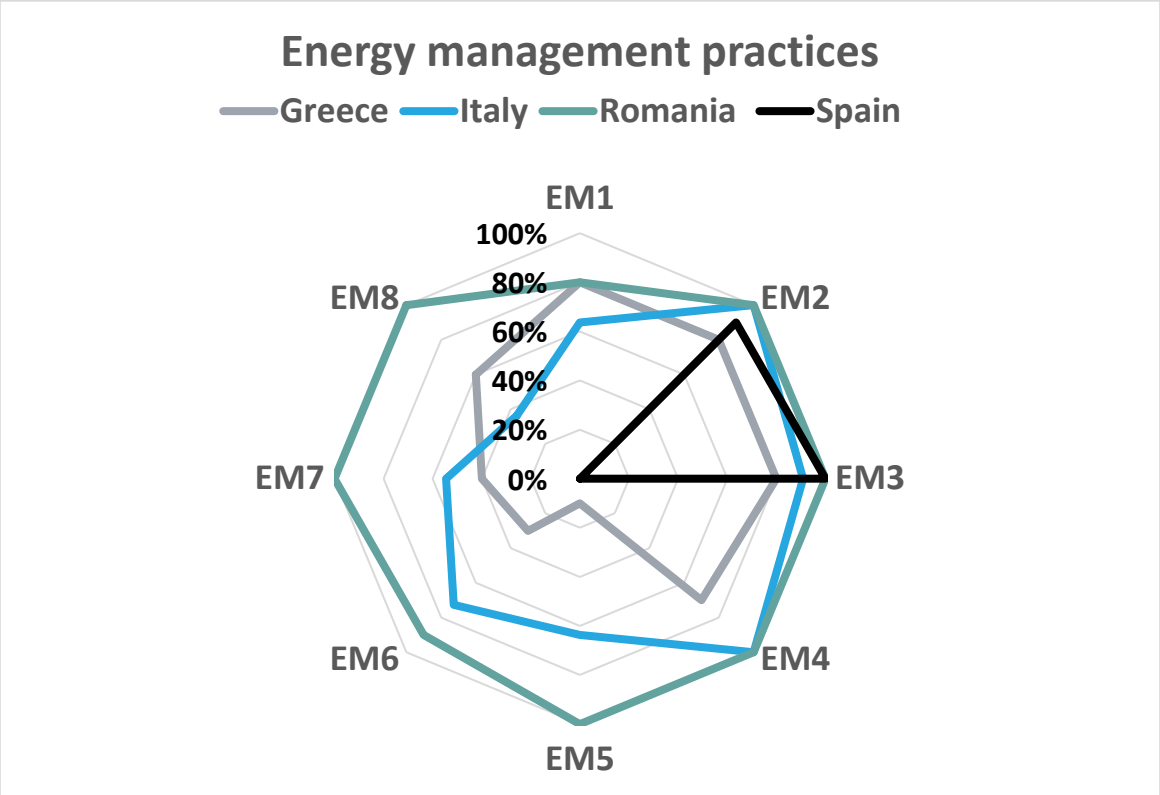


Figure 4. Visualization of the overall performance of the energy management practices

Regarding the **budget allocated for EE projects**, 80% of companies in Romania and Greece have set aside such a budget. In Italy, 64% of companies allocate internal funds for energy-saving purposes, while in Spain, none of the companies reported having such a budget.

On average, 90% of all companies surveyed **record energy consumption data**, which is a significant advantage for both the energy scan and potential ETA implementation. Additionally, 93% of the

companies are **aware of their energy costs**, with **energy managers informed about these expenses**. In Romania and Spain, this awareness is at 100%. In Romania and Italy, all companies **critically analyse these costs**, while in Spain, despite having the data, none of the companies conduct such analysis.

In average, 43% of the companies know about the **specific consumption in their sector**, the highest rate recorded in Romania, 100%, while the lowest recorded in Spain, 0%.

Regarding the **assignment of energy managers**, 30% of Greek companies and 73% of Italian companies have appointed one. In Romania, where all companies are large and energy-intensive, 90% have a person responsible for energy-related regulations and laws.

All companies in Romania, 40% of Greek companies, and 55% of Italian companies have **written targets and action plans for EE**, which is a strong point for decarbonization efforts.

Almost half of the companies involved in the project have **written procedures and action plans for the efficient use of machines**, reflecting a high interest in prioritizing measures that lead to energy savings and reduced energy demand from existing equipment.

4.3. Energy consumption pattern

The data collected, as described in *Section 3.2* of this deliverable, started with the identification of the main energy carriers in each scanned site. From the aggregated data, it appears that all of the companies use electrical energy, while only half consumes natural gas. Other energy carriers assessed are Liquefied Petroleum Gas (LPG), petrol, diesel, propane, and biomass. This distribution is reflected in *Figure 5*.

Table 2 displays the global distribution of energy carrier types, emphasizing the two primary carriers: electricity and natural gas. *Table 3* highlights the intensity of energy use among the engaged energy-intensive companies in the four countries, with electricity consumption reaching 448 GWh and natural gas consumption totalling 941 GWh across 41 sites. Furthermore, the distribution of various energy consumption levels is presented in *Table 4*, highlighting the areas with the most intensive usage. Romania has the highest rates for both electricity and gas consumption, at 66% and 84% respectively. *Table 5* shows that the emission shares reflect a similar pattern.

Table 2.Global distribution of energy carriers

Energy carrier	Share of companies
Electrical energy	100%
Natural gas	51%
LPG	12%
Petrol	10%
Diesel	29%
Propane	2%
Biomass	7%

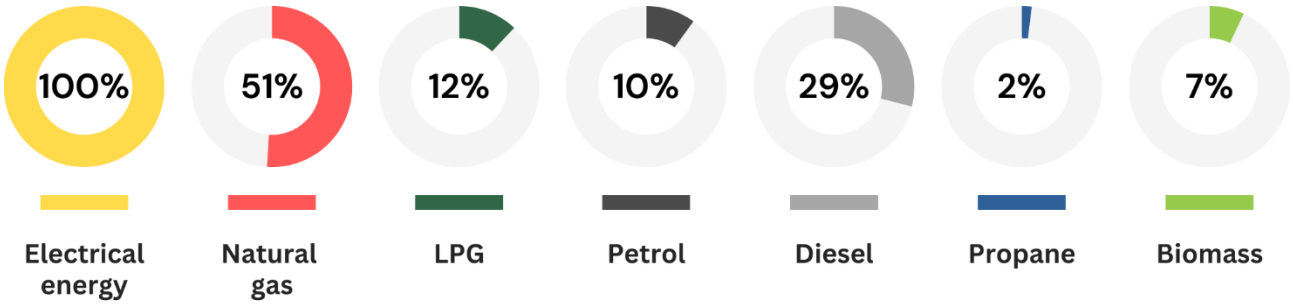


Figure 5. Global share of the different energy carriers at the companies engaged

Table 3. Total energy consumption per energy carrier

Total consumption [MWh]	Electrical energy	Natural gas	LPG	Petrol	Diesel	Propane	Biomass
	448,029	941,173	2,631	905	6,873	460	3,249

Table 4. Share of different energy consumption in the 4 countries

Energy consumption	Electrical energy	Natural gas	LPG	Petrol	Diesel	Propane	Biomass
Greece	8%	NA	10%	NA	5%	100%	NA
Italy	10%	12%	NA	NA	NA	NA	100%
Romania	66%	84%	90%	100%	92%	NA	NA
Spain	16%	4%	NA	NA	3%	NA	NA

Table 5. Share of the emissions quantified for energy consumption

CO_2 Emission	Electrical energy	Natural gas	LPG	Petrol	Diesel	Propane	Biomass
Greece	23%	NA	10%	NA	1%	NA	NA
Italy	5%	12%	NA	NA	NA	NA	NA
Romania	66%	82%	90%	100%	99%	NA	NA
Spain	6%	5%	NA	NA	NA	NA	NA

Renewable energy sources (RES) are available in 22 out of 41 sites (*Figure 6*), 20 of them being solar energy, 1 biomass source and 1 one other type, unspecified.

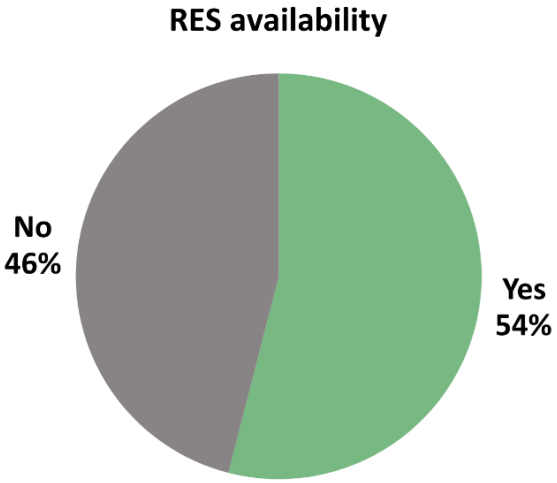


Figure 6. Share of companies

4.3.1. Impact of the measures

The energy scan aimed to provide not only an energy analysis and simplified emission inventory but also a preliminary EE plan to assist each scanned site in reducing both its energy consumption and emissions. This section intends to underscore the primary proposed measures, along with their associated energy and non-energy benefits.

Table 6.Average number of measures proposed

Country	Average no. of measures proposed per site
Greece	2
Italy	3
Romania	5
Spain	3

During the energy scans conducted in **Italy**, several measures were proposed to enhance EE and reduce emissions. These measures include:

- Implementing smart management of product storage volumes to optimize energy use.
- Recovering heat from chiller compressors for hot water production, thereby reducing energy waste.
- Developing a compressed air circuit leakage monitoring plan to detect and address leaks promptly.
- Adopting more innovative and less energy-intensive purification technologies.
- Installing LED lamps with presence sensors in common areas to reduce unnecessary lighting.
- Increasing the size of existing photovoltaic systems to boost solar energy capture.

- Establishing a comprehensive monitoring and maintenance plan for HVAC systems to ensure they operate efficiently.
- Replacing outdated lighting systems with energy-efficient LED luminaires.
- Utilizing gravity in cellar operations to avoid frequent pumping processes, saving energy.
- Checking the monthly average power factor and the need for power factor correction.
- Replacement of gas-fired systems with heat pump or biomass systems.
- Replacement of the steam generator with a gas-fired cogeneration equipped with a heat exchanger for steam production.

These measures aim to significantly reduce energy consumption and emissions while also providing various non-energy benefits, such as improved operational efficiency and reduced maintenance costs.

In **Greece, Romania and Spain**, the most proposed measure were the photovoltaic system installation for local energy generation. Also, heat pumps were secondly preferred by Romania and Greece.

Other measures proposed in **Greece**:

- Power quality improvement, minimization of losses
- Reactive power compensation
- Heat recovery from air compressors
- Solar thermal system
- Replacement of lighting by LED lamps.

In **Romania**, several measures were proposed to reduce thermal energy consumption, which was identified as a significant share in the total energy consumption in all the companies. The proposed measures include:

- Implementing a combined heat and power (CHP) unit using 30% green hydrogen.
- Replacing gas-consuming equipment with electric equipment.
- Utilizing heat recovery techniques.

For reducing electrical energy consumption, the proposed measures were implementing an energy monitoring system and retrofitting lighting systems.

Besides renewable energy sources, EM system and heat pumps were proposed to the sites in **Spain**. Besides the technical measure, the EE courses were highly recommended to almost all sites.

4.4. Multiple benefits associated to the energy efficiency measures

The *Table 7* illustrates the top three most commonly used multiple benefits associated with EE measures proposed in four countries (Greece, Italy, Romania, Spain) and at a global project level. In summary, across all regions and globally, the reduction of CO_2 emissions and energy price risks are consistently seen as the top benefits of EE measures. Contributions to company strategies and visions, improved equipment performance, and reduced maintenance costs are also commonly

valued, with slight variations in prioritization across different countries. Spain uniquely highlights the importance of reducing disruption risks in energy supply, indicating regional priorities.

Table 7. Most commonly associated multiple benefits

Multiple Benefits	1st	2nd	3rd
Greece	Reduced CO2 and energy price risks & Contribution to company's vision or strategy	Reduced CO, CO2, NOx, SOx emissions & Reduced risk due to energy supply disruption and energy price changes	Reduced maintenance cost & Increased assets value
Italy	Reduced CO, CO2, NOx, SOx emissions	Improved equipment performance	Reduced CO2 and energy price risks
Romania	Reduced CO2 and energy price risks	Reduced CO, CO2, NOx, SOx emissions & Contribution to company's vision or strategy	Improved equipment performance
Spain	Reduced CO2 and energy price risks & Contribution to company's vision or strategy	Reduced disruption of energy supply risk and energy price changes	-
Globally	Reduced CO2 and energy price risks	Contribution to company's vision or strategy	Reduced CO, CO2, NOx, SOx emissions

5. Training the company staff

The second stage of the energy scan approach involved organizing training events for the engaged companies, targeting several categories of staff, including top management, technical, financial, and general staff. The training sessions, through interaction with people involved in various operations of the companies, aimed to increase awareness and provide tailored information about various topics related to energy transition. The approach in each country remained flexible, aiming to attract as many participants as possible and to provide targeted materials in line with the companies' needs. Below, the individual approaches for each country are presented.

5.1. Training in Greece

In **Greece**, short training sessions were conducted in engaged companies following the energy scan phase of the project, either through on-site visits or teleconference meetings, with the latter chosen to accommodate busy schedules, especially during the Easter Holidays period. Top decision-makers, such as company owners or CEOs, were consistently present in these meetings, alongside engineers and technicians directly involved in production processes and machinery control. Some administrative staff also participated to understand the economic aspects, funding mechanisms, and anticipated benefits of proposed measures. Aiming to trigger the discussions in all meetings we selected three (3) key-questions, presented as follows, something that facilitated us to come up with useful conclusions about the interest of the companies to the next steps of the project.

1. What is the source of funding for the proposed actions (using equity, getting a loan, inclusion in a subsidized program)?
2. What is the maximum acceptable payback period for investments according to the company's management?
3. What are the company's corporate targets and commitments for reducing energy costs and emissions of CO_2?

Each company's main outcomes from the Energy Scans, proposed measures, anticipated benefits, and their perspective on the trainings and measure adoption were briefly presented during the sessions.

5.2. Training in Italy

Trainings in **Italy** were organized with flexibility to accommodate company schedules, offering online meetings lasting one hour. Each session consisted of two parts: the first 30 minutes focused on presenting energy scan results, attended by a minimum of the internal manager from each company, while the following 30 minutes covered training on national-level incentives and updates from the new Energy Efficiency Directive (EED), requiring at least five participants. For smaller companies, the option to involve fewer staff members was provided, with training materials distributed to ensure minimum participation. Training topics were chosen based on previous company meetings and included key points from the new EED and national-level financing measures for EE and decarbonization. General feedback from participants was also collected post-training.

5.3. Training in Romania

In **Romania**, the in-house trainings were scheduled together with the presentation of the energy scan results. Each of the company had to complete a short questionnaire, choosing two topics from a predefined list, in which they are interested in, and to indicate the number of staff and the categories from which the participants are going to be. The topics included were the following:

- Current Energy Efficiency legislation. The new EU Energy Efficiency Directive.
- Transition of Energy Efficiency services. Energy Transition Audit.
- Energy transitions and their impact on everyday life, at home, in business and in the local community.
- Approach to an Energy Transition Audit (decarbonisation).
- Grant funding available to companies in 2024 for EE projects.
- Integration of the multiple benefits of EE /decarbonisation measures in strategic decisions.
- Tools developed in international research projects for EM in companies.

The common agenda for these training events was the following:

- Presentation of the energy scan results and conclusions by the responsible person;
- Question & Answer session (Q&A)
- Training – Topics 1 followed by Q&A session;
- Training – Topics 2 followed by Q&A session;
- Next steps.

Overall, the companies valued the efforts made to organize individual training sessions and to address various staff categories. The topics covered were well-received, with particular interest in current legislation, available funding, the multiple benefit approach, and EM tools. At the end of the sessions, each company provided a list of participants.

5.4. Training in Spain

In **Spain,** EE courses are being customized for each organization based on their specific needs and the outcomes of analyses conducted. Engaging all levels of the company, including administrative, technical, and top management, is crucial to drive significant sustainability improvements. Before the training sessions, thorough assessments are conducted to identify areas where staff can benefit from additional knowledge and skills related to energy reduction. The training curriculum covers fundamental EE concepts and practical tools tailored to different staff groups. Technical staff receive training on best practices for machinery use and production line planning, while administrative staff focus on energy savings in office equipment usage. Top management is educated on EM systems, resource allocation for energy-saving measures, and regulatory compliance. Flexibility in session timings and formats is provided to accommodate participants' availability. In-house training sessions are aimed at members involved in energy scans and transition audits, with a focus on active participation and effective learning. Additionally, the timing of in-house training is adjusted based on the progress of ETAs, ensuring that results and decarbonization roadmaps can be presented to management beforehand. Despite the specific in-house training is planned for the completion of the

energy audits to present the results, preliminary positive feedback has been received from facility managers regarding the ETA concept.

Overall, the training events organised across the four countries were successful, and well-received by the companies. The total number of participants at this 1st round of training events was 161. The individual numbers per country together with explanations are showed in *Table 8.*

Table 8: Number of participants in the training events

Country	Number of participants in the 1st round of energy scans
Greece	40
Italy	51*
Romania	70
Spain	0**
TOTAL	**161**

**Estimated number of participants, as not all training events were concluded at the time of report writing.*

***Trainings were not organised at this stage; they are planned after the conclusion of the ETA implementation.*

6. Conclusion and next steps

The EnTRAINER project has successfully demonstrated a first step in shifting from conventional energy audits to "Energy Transition Audits" (ETA), providing a comprehensive approach to decarbonization for energy-intensive sites in Greece, Italy, Romania, and Spain. The initial implementation involving 41 sites highlighted the effectiveness of the ETA methodology in engaging companies and promoting energy efficiency through energy scans.

Key findings from the project show a high level of awareness and data management among the companies, with significant portions having dedicated budgets for energy efficiency projects and documented EE targets and action plans. However, the need to streamline administrative processes and ensure data availability remains crucial for smooth implementation.

The proposed energy efficiency measures, such as smart energy management, heat recovery, and renewable energy installations, not only promise substantial energy savings and emission reductions but also offer multiple non-energy benefits like improved operational efficiency and reduced maintenance costs. These measures are vital for achieving long-term sustainability and can be replicated across other EU Member States. Training events were concluded for each 41 company to raise awareness about several topics regarding energy transition.

Next steps will include the selection of companies for implementing the ETA, which contains valuable information about a potential long-term decarbonization action plan aligned with the companies' strategic objectives. The project activities include a second round of energy scans for at least 40 companies, applying the same methodology. This report will be updated in May 2025.

Overall, the EnTRAINER project provides a robust model for advancing decarbonization efforts, supporting a sustainable future for energy-intensive industries across Europe.

Appendix A. Letter of support

[Date]

[Recipient's Name]

[Recipient's Designation]

[Company Name]

[Company Address]

Subject: Expression of Interest in adopting an internal Decarbonization Action Plan

Dear [Recipient's Name],

We are writing to express our strong interest in adopting a decarbonization action plan within the next ten years. While we are not making any legal commitments at this stage, we are committed to taking substantial steps towards reducing our carbon footprint and contributing to a sustainable future.

At [Your Company Name], we firmly believe in the urgent need to address climate change and its impact on our planet. We are actively exploring innovative technologies, energy-efficient solutions, and renewable energy sources to reduce greenhouse gas emissions. We also aim to implement measures that promote energy conservation, waste reduction, and sustainable transportation within our organization.

In line with our commitment to this initiative, we are thrilled to announce that a dedicated group of our staff is eager to actively participate in a short training program as part of the energy transition audit implementation. This training initiative aligns seamlessly with our endeavor to enhance our understanding of decarbonization strategies and contribute effectively to a more sustainable company and environment through awareness.

We are ambitious to collaborate with the EnTRAINER consortium and external experts to address the challenges posed by climate change collectively. Working together can amplify our impact and accelerate the transition to a greener, more sustainable future.

While we are not making a legal commitment, we are determined to set ambitious goals and develop a comprehensive decarbonization action plan. This plan will outline specific targets, milestones, and strategies for reducing carbon emissions over the next decade.

We kindly request your support and guidance as we embark on this transformational path. We would greatly appreciate any insights, best practices, or resources you could share with us to help us achieve our decarbonization goals. We are open to collaborating on joint initiatives and engaging in discussions that promote sustainable practices.

Thank you for considering our expression of interest.

Yours sincerely,

[Name]

[Designation]

[Company Name]

[Contact Information: Phone number, email address]

Appendix B. Emission factors

1	Natural gas	0.202	kgCO2/kWh
2	Liquid gas - Liquefied Petroleum Gases	0.23	kgCO2/kWh
3	Liquid Gas - Natural Gas Liquids	0.23	kgCO2/kWh
4	Diesel	0.268	kgCO2/kWh
5	Gasoline	0.25	kgCO2/kWh
6	Lignite	0.365	kgCO2/kWh
7	Coal - Anthracite	0.356	kgCO2/kWh
8	Biogas	0.197	kgCO2/kWh
9	Biomass (wood)	0.4	kgCO2/kWh
10	Solar thermal	0	kgCO2/kWh
11	Geothermal	0	kgCO2/kWh
12	Electricity renewable - wind	0	kgCO2/kWh
13	Electricity renewable - Photovoltaics		kgCO2/kWh
14	Electricity	as per table below	kgCO2/kWh
15	District heating	depends on each country if applicable	kgCO2/kWh

Electricity		
Greece	0.416	kgCO2/kWh
Italy	0.252	kgCO2/kWh
Romania	0.247	kgCO2/kWh
Spain	0.205	kgCO2/kWh
Source: Link		

Appendix C. Energy scan template

EnTRAINER
Energy Scan Report

Company name

Co-funded by the European Union

EnTRAINER-LIFE21-CET-AUDITS - 101076424

EnTRAINER Energy Scan

EnTRAINER-LIFE21-CET-AUDITS - 101076424

EnTRAINER Energy Scan

Introduction

The energy scan, as part of the EnTRAINER project funded by the LIFE Programme, is focused on identifying and addressing specific obstacles in the implementation of energy efficiency measures.
This assessment analyzes the current energy consumption levels and associated costs with the aim of establishing an initial energy efficiency plan. Additionally, it offers valuable energy management recommendations tailored to the analyzed site, while also highlighting the various benefits associated with the proposed energy efficiency measures.

1. General information

Site name:	
NACE code:	
Date of Evaluation:	
Auditor's Name:	
Auditor's Signiture:	
Date:	

LIFE21-CET-AUDITS - 101076424

2. Site overview

A description of the main operations and processes, including main energy carriers of the site is presented above.

To complete

3. Energy management

☐	Is there a budget allocated for energy saving or energy efficiency projects?
☐	Is energy consumption (oil, gas, electricity) recorded monthly?
☐	Are energy costs known and are energy bills also available to the energy manager?
☐	Are the bills critically analysed? (e.g. compared with the
☐	Is the company aware of the specific consumptions in its sector? (e.g. benchmarks communicated by your trade association)
☐	Is there a person responsible for energy-related regulations and laws, e.g. an energy manager?
☐	Are there written targets and action plans for energy efficiency (better performing systems) and energy saving (elimination of waste)?
☐	Are there written procedures for the efficient use of machines? (Work, process or company procedures)

Main conclusions

4.1 Energy analysis - Yearly consumption, cost and CO2 emissions

Energy carrier 1	EC1	Last year of data	2022
Energy carrier 2	EC2		
Energy carrier 3	EC3		

Year	EC1 indicators				
	Quantity	Cost	Specific cost	CO2 emission	Coeficient
	[MWh]	[Euro]	[Euro/MWh]	[Tons]	[g/kWh]
2020			#DIV/0!	0.00	
2021			#DIV/0!	0.00	
2022			#DIV/0!	0.00	

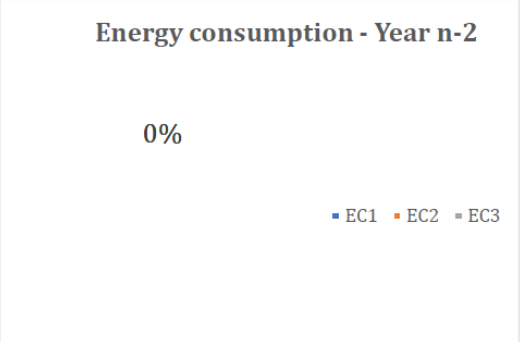
Year	EC2 indicators				
	Quantity	Cost	Specific cost	CO2 emission	Coeficient
	[MWh]	[Euro]	[Euro/MWh]	[Tons]	[g/kWh]
2020			#DIV/0!	0.00	
2021			#DIV/0!	0.00	
2022			#DIV/0!	0.00	

Year	EC3 indicators				
	Quantity	Cost	Specific cost	CO2 emission	Coeficient
	[MWh]	[Euro]	[Euro/MWh]	[Tons]	[g/kWh]
2020			#DIV/0!	0.00	
2021			#DIV/0!	0.00	
2022			#DIV/0!	0.00	

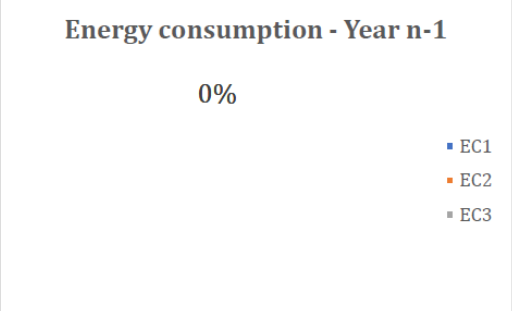
Year	TOTAL			
	Quantity	Cost	Specific cost	CO2 emission
	[MWh]	[Euro]	[Euro/MWh]	[Tons]
2020	0	0	#DIV/0!	0
2021	0	0	#DIV/0!	0
2022	0	0	#DIV/0!	0

4.2 Energy analysis - Share of energy consumption

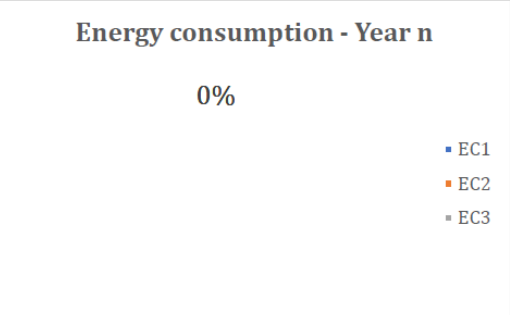
2020	MWh/ year	%
EC1	0	#####
EC2	0	#####
EC3	0	#####
TOTAL	0	#####



2021	MWh/ year	%
EC1	0	#####
EC2	0	#####
EC3	0	#####
TOTAL	0	#####

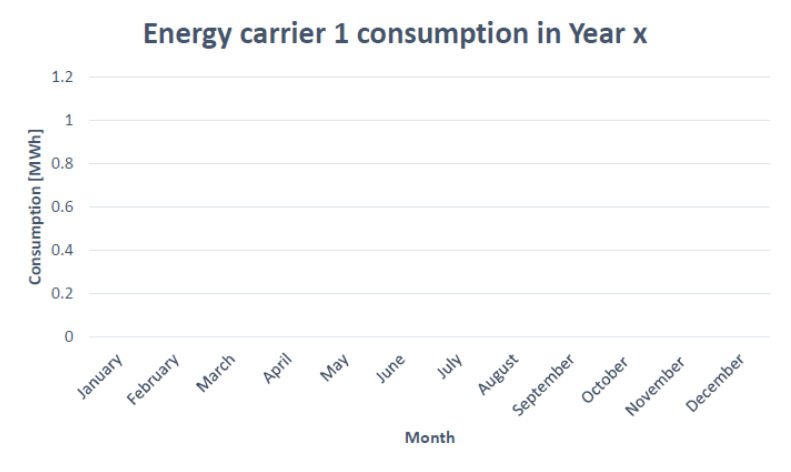


2022	MWh/ year	%
EC1	0	#####
EC2	0	#####
EC3	0	#####
TOTAL	0	#####



4.3 Energy analysis - Montly consumption & cost

EC1 Consumption - Year 2022			
Month	Quantity	Cost	Specific cost
	MWh	[Euro]	Euro/MWh
January			#DIV/0!
February			#DIV/0!
March			#DIV/0!
April			#DIV/0!
May			#DIV/0!
June			#DIV/0!
July			#DIV/0!
August			#DIV/0!
September			#DIV/0!
October			#DIV/0!
November			#DIV/0!
December			#DIV/0!
TOTAL	0	0	



Insert any note, conclusion

5.1 Barriers Assessment

Identify specific barriers hindering energy efficiency improvements and/or decarbonization actions at the site, including sector-specific challenges.

75%	**75%**	Lack of awareness about energy-saving opportunities.
50%	**50%**	Insufficient budget allocation for energy upgrades.
25%	**25%**	Complex regulatory environment.
50%	**50%**	Resistance to change from operational staff.
50%	**50%**	Limited access to technical expertise.
25%	**25%**	Lack of clear energy efficiency goals.
75%	**75%**	Difficulty in obtaining management buy-in.
100%	**100%**	Lack of monitoring of energy consumption.
25%	**25%**	Over-reliance on outdated equipment.
50%	**50%**	Other, specify:

Note	
0%	Total disagreement
25%	Disagree
50%	Neutral
75%	Agree
100%	Total agreement

5.2 Energy efficiency

Describe if there are already implemented energy efficiecny measures or renewable energy sources. List all the measures and, if avaialble, the assiciated impact. Note if measure was implemented with own fund, grants or other sources.

Renewable energy sources

RES available:		
Year of implementation:		
Yearly production:		MWh/year

RES available:	Choose	
Year of implementation:		
Yearly production:		MWh/year

6. Energy Efficiency Action Plan - Measure 1

Briefly describe the proposed measure

To complete

The impact of the proposed measure:

X	Energy saving
	Energy cost
	CO2 emission reduction
	Other emission reduction
	Renewable energy generation

Highlight the multiple benefits of the proposed energy efficiency measures.

	Reduced malfunction or breakdown of machinery and equipment
	Improved equipment performance
	Longer equipment life (due to reduced wear and tear)
	Reduced waste heat and associated operational costs
	Reduced water consumption and associated operational costs
	Reduced CO, CO2, NOx, SOx emissions
	Reduced maintenance cost
	Reduced noise
	Air quality improvement of ambient air
	Reduced CO2 and energy price risks
	Reduced disruption of energy supply risk and energy price changes
	Contribution to company's vision or strategy
	Increased knowledge of production/auxiliary processes
	Increased assets value
	Increased customers or staff satisfaction
	Other, specify:

7. Energy Management Tips & Tricks

Provide brief energy management tips and tricks that could help improve energy efficiency on-site. Some examples are provided below.

X	Set thermostats at optimal temperatures to reduce energy use.
	Turn off equipment when not in use to conserve energy.
	Conduct regular energy audits to identify wastage and emission sources.
	Encourage employees to adopt energy-saving habits to reduce overall consumption.
	Implement a preventive maintenance schedule to keep systems efficient.
	Other, specify:
	Other, specify:
	Other, specify:

8. Conclusions

Present the main conclusions drawn from the energy scan and walkthrough audit. Include a summary of the energy efficiency action plan.

To complete *E.g. Conclusions: The site has significant potential for energy savings through lighting and HVAC upgrades.* *Action Plan: Prioritize x, optimize y, and implement z measures.*

Key conclusions of the energy scan

Some questions which are useful for the you, as auditor to quide the discussions with the company's representative:

EnTRAINER references

entrainer-project.eu

@EnTrainer_Project

@EnTRAINER_EU

@EnTRAINER_Project

EnTRAINER partners

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