

HOW TO ENHANCE THE UPTAKE ENERGY EFFICIENCY MEASURES IDENTIFIED IN THE AUDITS FOR INDUSTRIAL COMPANIES: THE AUDIT2MEASURE PROJECT

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ABSTRACT

The European decarbonisation objectives for 2050 assign a leading role to the industrial sector in the implementation of energy efficiency measures. Energy audits are, therefore, the key tool for guiding companies on the path to optimising their processes. However, although many companies are aware of both financial and non-financial benefits deriving from the adoption of the measures identified and proposed in the audits, the actual rate of implementation of the latter is, at present, relatively low. The main aim of the AUDIT2MEASURE (leading business towards climate neutrality by speeding up the uptake of energy efficiency measures from the energy audits) project is to support companies in the uptake energy efficiency measures identified in the audits. To this aim, AUDIT2MEASURE has developed a new engagement strategy (called 'Audit2Action') to put into action the opportunities emerging from energy audits, to overcome the obstacles for the implementation of the measures through the understanding of the decision-making processes in companies and the position of energy efficiency in them. Using this strategy, the project has started a capacity building program to motivate the professionals in the companies to increase their capacity to implement the energy audit outcomes, supporting the implementation of a series of selected energy efficiency measures in the field. This paper, after a short description of the 'Audit2Action' strategy, will present the result of stakeholder engagement using such a strategy in the first year of the project activities.

Keywords: energy efficiency, energy audit, energy saving measures.

1 INTRODUCTION

Industry is a key player in energy consumption and economic impact in the European Union (EU) and energy audits represent an important tool to improve energy efficiency in the sector [1]; despite both the spread of energy audits and the knowledge of their benefits, the actual implementation rate of the energy savings measures (ESM) proposed by energy audits is relatively low [2], [3]. The main aim of the AUDIT2MEASURE (leading businesses towards climate neutrality by speeding up the uptake of energy efficiency measures from the energy audits, <https://ieecp.org/projects/audit-to-measure/>) project is to support companies in the uptake of audits measures necessary to reduce the energy consumption supporting their energy transition. AUDIT2MEASURE will develop and implement a new engagement strategy (called 'Audit2Action') to put into action the opportunities emerging from energy audits.

2 THE AUDIT2MEASURE PROJECT AND THE 'AUDIT2ACTION' STRATEGY

The AUDIT2MEASURE (A2M) is a project funded under the EU LIFE program (project ID 101075785). It involved five countries: Spain, Italy, Greece, the Netherlands and the Czech Republic.

Its main goal is to boost the uptake of ESM contained in the energy audit in the industrial sector. The project will favour the adoption of the outcomes of energy audits thanks to a



developed strategy (called ‘Audit2Action’) aimed at the engagement of companies in the industrial sector and at their motivation towards the improvement of energy efficiency in their premises. The project has an approach to results based on concrete actions, thus both by developing a novel methodology for the adoption of the results stemming from energy audits (1st pillar) and for their application towards the improvement of energy efficiency with in-field pilot cases with companies to test the effectiveness of the strategy with real companies (2nd pillar). The ‘Audit2Action’ strategy (1st pillar) is based in four sequential steps which combine both theoretical and practical tools:

- 1) Assessment of the state of art of the implementation of energy efficiency in companies and the related policies on energy audits at national level.
- 2) Development of benchmarking system for the assessment of ESM, based on a series of key performance indicators (KPIs).
- 3) Set-up of a capacity building program for the involvement of stakeholders, which foresee a series of activities such as laboratories of ideas with company managers and other decision makers, training courses and workshops for operational staff and training workshops with industrial associations.
- 4) Creation of a knowledge exchange space (KES) which includes the main outputs of the project in a user-friendly structure.

3 RESULTS OF THE LABORATORY OF IDEAS IN A2M PROJECT COUNTRIES

3.1 Spain

In Spain, twelve companies were contacted for involvement into the laboratory of ideas, which were organised at the industries premises in the period from September to December 2023. The interviews with the companies in Spain led to some interesting results related to the role of the energy audit, barriers to the implementation of ESM and energy saving strategies of the companies. For the large companies, the energy audit was undertaken since it is compulsory by law. This is not the case for the small companies as they had never had an energy audit carried out before; nevertheless, they agreed to participate in the laboratory of ideas as they were interested to know how to reduce energy costs or identify improvements in energy efficiency and sometimes to undertake specific studies for it.

The larger companies, after the meetings, stated that it was useful to go through the recommendations of the energy audits and discuss some prioritisation criteria.

The main reason to implement ESM was to reduce energy costs. For a few companies, other benefits such as improving comfort were also important. Examples were reducing noise from machinery to reduce discomfort of the employees or improving temperature control in winter and summer as the HVAC system was old and not efficient.

In case ESM were not implemented, the main reason was the lack of sufficient budget allocated to this type of investment. In general, the main barriers for not implementing ESM could be summarised as follows: Most common was the economic/financial barrier, mainly the high investment costs and long payback periods for some proposed measures; in specific cases, there was a prioritisation from the company management board for other kind of measures than energy savings. Some specific barriers of a practical/technical nature were mentioned, such as the lack of room for new machinery or not enough surface area to install photovoltaic (PV) panels on the roofs of the company.



Only one of the companies had a specific ESM plan. In addition, most of the companies did not have a specific budget allocated for ESM implementation. Meaning that they had to ask their top management for each ESM separately when considering investments.

The decision-making process on ESM implementation differed between large companies and SMEs:

- For SMEs, after the ESM is analysed, it is the CEO who decides if it fits the company's budget plan and if it is implemented.
- For larger companies, the technicians propose the measures and it is a group of high-level managers from different areas (e.g. financial, technical departments, etc.) who decide whether or not to implement them.

Therefore, we can say that, for the companies with no energy audit, the meetings were useful to understand the role of energy efficiency in the reduction of energy costs through potential ESM which could be implemented in their premises. On the other hand, for large companies, it was useful to go through the recommended measures in order to establish some prioritisation criteria. Most of the companies also benefited from information provided about other topics related to quality or environmental impact.

The project team gained useful information about the main barriers (as viewed from the companies) and the decision-making process, which is crucial to the implementation process. Also, the insights given in the priorities that the companies have in choosing investments was useful.

3.2 Italy

The companies engaged in Italy started from a pre-existing network of contacts or through the dissemination of the project in conferences. Some of the companies were reached through intermediates. From the dialogue sessions with the management of the companies, it emerged that, for many of them, the role of energy audits is not considered of key importance for the decision about the implementation of energy saving measures. In practically, in all the engaged companies the energy audits were developed in order to comply with the existing legislative obligations.

Very few ESM deriving from energy audit in the interviewed companies have been implemented. Basically, two types of measures were implemented: those with low payback time like the replacement of lighting or those related to the necessary replacement of equipment at the end of their lifetime.

Some of the companies, however, implemented energy saving measures beyond the energy audits, often taking decision during the steep increase of energy prices in 2022.

Easiness in the implementation (i.e. equipment replacement) and absence of risks for product quality are other elements that have facilitated the approval of ESM.

Also, the more responsive and active companies have shown to be those having public commitment on environmental targets and/or those energy intensive or subjected to ETS obligation.

The barriers to the implementation of the energy saving initiatives are diverse, but the most perceived ones are low awareness (considering that, for some of them, the awareness has increased since the last energy audit), high payback time and competition with other priorities on a given investment budget.

The proposed solutions needed for most of the companies are technical support and information/support for the access to the incentives. Related to this, it could also be useful to

discuss topics like energy strategy planning, provide information on the valorisation of non-energy benefits (NEBs) and alternative financial mechanisms (EPC, PPA, etc.) to finance ESM.

The majority of the companies perceives the ESG obligations as a driver to improve. Only one company admitted that they are solely concentrated on its business and complies to the regulations superficially (as it is requested by authorities and clients), not caring much about energy efficiency and environmental issues themselves.

None of the interviewed companies has a periodical ESM planning; however, all the companies except one have shown commitment or positive attitude towards energy saving initiatives, but with no strict periodical planning target.

It emerged that, in all the cases, ESM are evaluated by the energy managers or by a dedicated board and then proposed to the top management that takes the final decision. This decision-making process can be quite agile in smaller companies, while the decision-making process becomes more structured and slower in bigger companies or in multinational groups where proposals originate inside single entities or departments but are sent to the corporate management for decision.

Therefore, we can say that, from the point of the companies, the most useful information was that on the normative updates or on incentives/financial hints; in other cases, technical advice was the most useful. Many of the companies have shown the interest in training courses and technical support.

We can say that companies are not against energy efficiency and carbon emissions regulations, but emphasise, at the same time, that simplification of authorising procedures is strongly needed; moreover, there are too many certifications and rules that sometimes conceal the real intentions of companies (green washing to look good towards the outside world).

In general, the impression from the meetings was positive. Most the companies have shown a good interest and commitment towards energy efficiency. At the same time, it was also interesting to hear the opinions of the management of a company not interested at all in energy saving or greenhouse gas emissions reduction measures. But this company has a lot of energy, sustainability and circular economy certifications exclusively for either legislative obligations or due to clients' requests. four out of the seven companies agreed to continue cooperation with the AUDIT2MEASURE project.

3.3 Greece

In Greece, companies in the aluminium industrial sector were engaged from October 2023 to January 2024 and, in this period, seven meetings (five online and two onsite) were held. From such meeting, it emerged that the main reasons for carrying out the energy audit were legal obligations, as all interviewed companies are large ones that are legally obliged to conduct energy audits in Greece. Furthermore, it became apparent that energy audits did not play a pivotal role in the implementation of energy saving measures, as businesses had already undertaken such initiatives independently on the energy audit.

The majority of the ESM implemented as a result of energy audits were lighting replacements or other ESM with comparatively short payback periods. In addition, the majority of companies that expressed a willingness to participate in the A2M project activities, cited their public commitment to environmental targets and their decarbonisation strategy and overarching objective as the primary motivations for implementing ESM.

The main challenges that businesses encountered with the adoption of ESM were inadequate financial resources for investment preparation and a lack of state funding. Each



implemented measure, irrespective of whether they emerged as energy audit results, was entirely financed by the companies themselves.

What was also mentioned by the companies was the complicated procedures for gaining financial support in the form of grants, for example. Even for businesses interested in designing a PV park or attempting to do so, the bureaucracy associated with the implementation impeded the process and presented a substantial barrier to adopting such ESM.

Providing informational support to enhance awareness regarding accessible funding and public incentives prioritising energy efficiency measures, especially those with extended payback periods, would constitute the primary solution. Furthermore, boosting the knowledge and providing additional information to company directors regarding the benefits of ESM may alleviate informational barriers about ESM.

During the interviews, it became also clear that, as all are large companies, ESM are reviewed by a dedicated technical team (either members of the energy management team or industrial plant managers) before being recommended to the heads of financial units, who make decisions alongside the management board.

3.4 The Netherlands

In the Netherlands, five companies were engaged; from the meeting with them, it emerged that most of the companies carried out an energy audit because of the legal obligations. Reasons for becoming part of the interview were different. One company mentioned that they were curious about the new legislation deriving from the EED (Energy Efficiency Directive). Joining the project could give them some insight. Another officer of a company was interested out of curiosity.

One of the companies implemented their ESM because of their ESG policies, while another company does the same for some of their processes. Smaller companies implemented energy savings measures as they were easy to implement. Two companies responded that they were too busy at the moment and they will consider implementing ESM later in 2024. One company did not want to spend money and time on energy efficiency, because it did not think that ESM would bring them competitive market advantage. Experienced barriers for not implementing ESM were mainly other priorities, lack of time and lack of ownership for energy and environmental issues outside the CSR department, the absence of ESG policy and having no idea where to start or who is responsible for implementing ESM.

It is worth to note that some officers mentioned that they implemented an ESM, but it was not recorded in company's records. This was in the case of replacing (only) some of the office lighting with LED lighting.

In several talks it appeared that it was not the unwillingness to implement ESM, but the monitoring and the disclosure of the data were seen as hurdles in cooperation with the A2M team. The larger companies did not know where to start or which department was responsible. Another barrier that was mentioned is of technical nature. In some parts of the Netherlands, congestion in the electricity grid is a serious hurdle for implementing ESM, at least when they are based on electricity. This could limit the number of PV plants that can be installed on roofs, or the number of charging stations installed on companies premises due to delays in obtaining an electric connection to the grid.

A specific example was mentioned by a company operating an electric crane and having several electric vehicles, for which they have limited charging capacity on-site.

ESM obligation or an obligation to share some data would create more awareness in the companies and among management and operational managers. Larger companies can easily



imbed the new rules in their audit department or with the CSR department or officer. Smaller companies will spend time and invest in it. Willingness to share data will, of course, depend on whether the competitor companies do the same.

With two larger companies, the energy management system was discussed. In both cases it became clear that they were very knowledgeable about the energy savings obligation for their business. It became also clear that the A2M project could not bring more expertise than they already had. It will, however, help one company in their training about parts of legislative framework they are interested in implementing to ensure ESM and learn of their experience and expertise, if they want.

One company with a CSR policy had problems to disclose the data and, thus, they were more reluctant to participate than would be expected. In the beginning of the project, the required data was too difficult to ask the companies without having something in return for them (e.g. kg CO₂ reduction per product line).

In conclusion, a distinction can be made between large companies with a ESG or CSR policy in place and smaller businesses that would like to be more sustainable but did not take the steps. Firstly, large companies expressed their interest to know what other companies within the EU do to become more ESG-compliant and, secondly, they expressed their interest in learning about the new EU-level legislation.

The smaller companies expressed their interest in information about ESM, but they were more reluctant to share the data. The reasons for their reluctance were the confidentiality or the time it took to disclose the data to the project team. In two cases, the company did not give any reason but did not respond to the email or telephone reach out.

It would be more interesting if the training courses could be adapted for the type of companies. First the size of the company, secondly the distinction between a process industry, tools manufacturer, energy business or small enterprises and pitch them for their group of business with a professional video or tailor-made folder. A video that explains quickly what they can expect from the different training could be useful too, as such a promotional video would help a company decide the group of trainings they are interested in.

3.5 Czech Republic

In total, seven meetings were organised in the Czech Republic with five companies in the period from November 2023 to February 2024. The companies were from the ceramics sector, construction materials, plastics and foundry.

The main reasons for carrying out the energy audit were legal obligations, as all interviewed companies are large ones that are legally obliged to conduct energy audits in the Czech Republic.

Whether the energy audit obligation plays an important role in the decision of investing in energy saving measures is difficult to say. The obligation does exist in the Czech Republic since the year 2000 for large energy consumers: this means that large companies have gone through multiple rounds of energy audits already, which may have created increased awareness over the years. This statement would be supported by the fact that, according to some of the companies, businesses had already undertaken energy saving measures. Although in some cases that may have been independently on the last audit.

The majority of the ESM implemented as a result of energy audits were lighting replacements or other ESM with comparatively short payback periods. Most audits included such measures as lighting replacement or insulation of buildings, while some also included process-related measures (e.g. use of waste heat from a production process in other places in the company).



One of the companies handed over its last energy audit and technical experts from which ENVIROS partners saw that some more interesting measures such as use of waste heat (that would potentially have the largest impact on energy consumption) were not addressed in detail. This suggests that there may be a difference in quality among the audits. A reason for this could also be that, as the audits are mandatory, companies are usually motivated to acquire an audit at the lowest possible costs, without looking too much at its quality.

The main challenges businesses encountered with the adoption of ESM were of economic/financial nature. Companies had either inadequate financial resources available or other business priorities that usually have a higher return on investments. What was also mentioned by the companies was the complicated procedures for gaining financial support in the form of grants for example. Grant applications usually require some technical/economic assessment of the proposed investment which requires some input from external advisors. Although, when a company thought that a measure would make sense and that a grant would reduce the upfront investment costs, then the choice was usually made to apply for the grant for the implementation of the measure.

From discussions with companies, it became clear that the availability of grant funding could be the motivation for companies to implement a certain measure. What also played a role during the last few years were the increasing (or fluctuating) energy prices. The massive increase in energy costs in 2022 after the Russian invasion of Ukraine caused a lot of companies to reconsider some of the measures that were proposed in earlier energy audits (although the stabilisation of energy costs in 2023 caused that some of these measures were not carried out in the end).

Large companies have a good overview of the technical possibilities; what it is actually missing a bit is the link to the availability of grant funding: thus, providing this information could help companies in realising some measures.

As we understood from the companies, when an incentive scheme is available that would improve the financial parameters of an ESM (e.g. pay-back time), the company management is more eager to approve the investment. Technical experts also mentioned that they would like to continue cooperation in A2M if they could get help with grant application.

One of the companies involved is a part of a multinational company for which has sustainability as high priority. Therefore, there is a pressure from the top management to implement all kinds of sustainability measures and, in general, to decrease the carbon footprint of the company.

In conclusion, we can say that the majority of the companies emphasised the need of financial incentives in realising energy saving measures. Technical advice would be helpful as well to select the most suitable measure for grant funding. All of the companies are aware of the need to reduce their energy costs. The energy audit provides only a minor role in that. Some of the audits also do not provide that much practical information about certain measures that would help companies to make a sound decision on implementation. A more detailed feasibility study would be helpful in order to convince top managers to agree with the investment. The main barriers were lack of time of the technical experts in the company to assess the impacts of ESM and to search for suitable grant programmes. Assistance in selecting most suitable grant programme for ESM would be helpful as well as assistance in preparing grant applications.

4 SUMMARY OF THE RESULTS OF STAKEHOLDER ENGAGEMENT USING THE 'AUDIT2ACTION' STRATEGY

This paper has presented the results of stakeholders' engagement using the 'Audit2Action' strategy in the first year of project activities reporting the main findings from the company



visits in the framework of the 'laboratory of ideas' for five countries (Spain, Italy, Greece, the Netherlands and the Czech Republic).

Laboratory of ideas were aimed at getting input from company management on why they invest or don't invest in ESM in their companies (even if such measures are proposed in energy audits) and what conditions should be met so that companies will invest in ESM.

The overall goal of the capacity building and know-how sharing program is to increase knowledge and capacity of both managerial and operational level professionals from companies as well as industry associations and energy experts with the aim of accelerating the uptake of energy audits outcomes with the aim to enable a higher uptake of ESM in the industrial sectors addressed by the project. The main target groups include companies' top-management and decision makers as well as their operational staff, industry associations and energy experts such as energy auditors and energy managers.

The companies chosen for the laboratory of ideas are partly chosen from those already contacted in the first stages of the project, and partly from new companies (based on partners own contacts or gained through intermediaries).

After developing a comprehensive overview and comparison of national audit systems in the related legislative framework of the six countries involved in the A2M project (the Czech Republic, Greece, Germany, Italy, the Netherlands and Spain) (first step) and the development of a benchmarking system for the assessment of ESM, based on a series of KPIs, including non-energy and of non-financial benefits (second step), partners have started the capacity building program, in particular the 'laboratories of ideas' (third step).

Within this activity, meetings took place with high-level managers and decision makers from involved industrial companies with the aim to understand decision processes within the companies and assess barriers to the implementation of ESM, in order to identify the most appropriate solutions to overcome such barriers. The capacity building activities in the 'laboratory of ideas' might also be preparatory to gain decision makers' commitment to the implementation of viable energy savings measures into companies' strategies to improve their energy efficiency and sustainability. Apart from the highest-level management, the partners also attempted to involve financing, legal (and CSR) management representatives to address the aspects of finance, regulation and communication.

Five to ten companies in Spain, Italy, Greece, the Netherlands and the Czech Republic were involved in the 'laboratory of ideas', that took place in a format of bilateral meetings between the respective project partner and the company with approximate duration of 2–3 hours. The main findings from the laboratory of ideas could be summarised as follows:

- The main reason for companies to implement energy saving measures is the reduction of energy costs. The input received from companies was that with increasing energy costs as experienced during the last two years, the interest for implementing energy saving measures was rapidly increasing.
- The energy audit only to a very limited extent motivates companies to implement energy saving measures and, if so, the ones implemented are usually those with the lowest payback time, such as lighting replacement.
- Decisions about energy saving measures are taken by top management in the company and there are usually competing interests/investment priorities. Energy saving measures are usually only one investment priority among many.

Partners also understood that the implementation of energy saving measures is hindered by a number of barriers, the main ones named by the companies were:



- Cost issues (high payback time of some ESM) and competition with other priorities on a given investment cost budget;
- Low awareness among company management, sometimes combined with lack of detailed information provided in the energy audit about more complex ESM;
- No clear responsibilities for ESM implementation exist in some companies;
- Complexity of application procedures for grant programmes for energy and climate mitigation measures.

Based on the discussion between companies and A2M partners, it is suggested that the following assistance to companies could be provided in follow-up activities of A2M:

- Providing additional information about specific ESM and link these to possible financial instruments. This would especially be welcomed by the smaller companies.
- ‘Translate’ the somewhat technical descriptions in energy audit reports to a feasibility study, addressing all pros and cons of the proposed energy saving measure.
- Prioritisation of the ESM mentioned in the energy audits. This would also help technical staff to clearly and simply state the arguments for ESM implementation towards company management.

Recommendations from the laboratory of ideas will be taken into account in the assistance to companies in the implementation of ESMs as part of next steps of the ‘Audit2Action’ strategy.

5 CONCLUSIONS AND NEXT STEPS

This paper has described the ‘Audit2Action’ strategy and presented the results of stakeholders’ engagement using such a strategy in the first year of project activities: in particular, the results of the ‘laboratory of ideas’ developed and carried out by AUDIT2MEASURE partners within the Capacity building program of the project.

One thing that emerged is that, although the knowledge of energy saving measures is there among companies, at least with the technical staff, the decision for implementing them is usually taken by company management which, on the other hand, has either less technical knowledge or needs to decide between different (competing) investment decisions. The technical specialists at the company, therefore, need to come with convincing arguments to get an ESM investment approved.

Another thing that emerged, is that companies today need to commit to many regulations and standards: apart from national and European regulations related to audits for example, there are, for example, ISO standards (14001 and 50001) and CSR strategies. Although the latter are not mandatory, there is often a push from either foreign parent companies or large (corporate) clients to commit to these standards and strategies. Therefore, for companies, it is often difficult to evaluate which standards and strategies are the most beneficial for them.

The results from ‘laboratory of ideas’ will be taken into account in the assistance to companies in the implementation of ESM as part of the next steps of the ‘Audit2Action’ strategy.

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REFERENCES

- [1] Deloitte, Energy efficiency in Europe: The levers to deliver the potential, 2016. <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/energy-efficiency-in-europe.pdf>. Accessed on: 6 Jun. 2023.
- [2] Thollander, P. & Palm, J., *Improving Energy Efficiency in Industrial Systems*, Springer-Verlag: London, 2013.
- [3] Cagno, E., Worrel, E., Trianni, A. & Pugliese, G., A novel approach for barriers to industrial energy efficiency. *Renewable and Sustainable Energy Reviews*, **19**, pp. 290–308, 2013.

