

Energy Efficiency Solutions for Small and Medium-Sized Enterprises [†]

Joanna Southernwood ^{1,*}, Grigoris K. Papagiannis ², Erudino Llano Güemes ³ and Luisa Sileni ⁴

¹ International Energy Research Centre, Tyndall National Institute, Cork, Ireland

² School of Electrical & Computer Engineering, Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece; gpapagia@ece.auth.gr

³ Fundación CIRCE—Centro de Investigación en Recursos y Consumos Energéticos, 50018 Zaragoza, Spain; ellano@fcirce.es

⁴ Istituto di Istruzione Professionale Lavoratori Edili, 40127 Bologna, Italy; luisasileni@edili.com

* Correspondence: jo.southernwood@ierc.ie

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Abstract: Few small and medium-sized enterprises (SMEs) have undertaken an energy audit to date and even fewer have taken action to implement energy-saving measures. Lack of time, knowledge, and finance, coupled with the low priority that SMEs give to energy management, are the most commonly cited barriers to effective energy management in SMEs. Four projects funded by Horizon 2020 (SPEEDIER, SMePower Efficiency, E2DRIVER, and Innoveas) have developed innovative capacity-building programmes designed to eliminate these barriers and encourage SMEs to undertake energy audits and implement the recommended energy efficiency measures. This paper presents an overview of the innovations being tested and suggests a series of policy recommendations that could help to drive uptake of energy audits in SMEs.

Keywords: energy efficiency; SME; energy audit; training; energy policy

1. Introduction

Article 8 of the Energy Efficiency Directive (EED) includes a requirement for Member States to develop programmes for small and medium-sized enterprises (SMEs) that encourage them to undertake energy audits and implement the identified energy efficiency measures [1]. It is estimated that SMEs make up over 99% of all businesses and account for approximately 13% of global final energy consumption [2]. If SMEs were a country, they would rank third in the world in terms of energy use, behind only China and the United States of America (calculated using data from the Global Energy Statistical Yearbook 2020 [3]). Engaging with SMEs and assisting them to improve their energy efficiency is, therefore, critical to achieving the European Union's energy efficiency targets of 32.5% by 2030. It is the distributed nature of this energy consumption, split between many thousands of individual businesses, that makes it so challenging to reach SMEs.

SPEEDIER, SMePower Efficiency, E2DRIVER, and Innoveas are Horizon 2020 projects aiming to improve the energy efficiency of European SMEs by helping them to undertake energy audits and implement the recommended energy efficiency measures. Each project is developing their own capacity-building activities and are targeting SMEs in a variety of countries and sectors with the aim of demonstrating the effectiveness of the different approaches. The innovative features and common findings from these four projects were presented in a workshop during the Sustainable Places 2020 conference and are summarized in this paper. The compiled presentation slides and a recording of the workshop are available as Supplementary Materials.

2. Barriers to Implementing Energy Audits and Energy Efficiency Recommendations in SMEs

In the roadmap towards achieving the EU 2030 energy targets, SMEs play an important role. Representing 99% of the EU businesses and employing approximately 100 million people, it is of high importance to reduce the energy footprint of SMEs, by improving their efficiency.

All the four projects worked on identifying the current situation and the existing barriers to the promotion of energy audit/energy management and the implementation of energy efficiency measures in SMEs. Proper surveys have been conducted both online and face-to-face, through questionnaires and interviews with SMEs' representatives and staff. The participating SMEs were from Cyprus, France, Germany, Greece, Ireland, Italy, Poland, Romania, Slovenia, Spain, and the UK, covering different sectors, such as construction, manufacturing, the food industry, services, chemicals and chemical products, hospitality, commercial and trade, heavy industry, education, energy, and the automotive industry. In the following section, the cumulative results from the surveys are presented, providing an insight into the obstacles which prevent SMEs from implementing actions to improve their energy efficiency.

From the results of the surveys, it can be concluded that energy efficiency is unfortunately not a high priority for SMEs. The current level of energy management within SMEs is low. This is a main reason why most SMEs have not carried out an energy audit, as shown in Figure 1. A positive outcome is that 72% of the companies who did conduct an energy audit continued to implement some energy efficiency improvements. The main motivation to implement energy efficiency actions is the reduction of cost, followed by the contribution to fighting climate change. The most common measures implemented are related to technical systems, i.e., lighting, ventilation, heating, cooling, and automation, which are lower risk and have quick payback, avoiding any risks to the production line or product quality. Less favoured measures are those related to the building envelop, along with Demand Response actions and energy management processes.

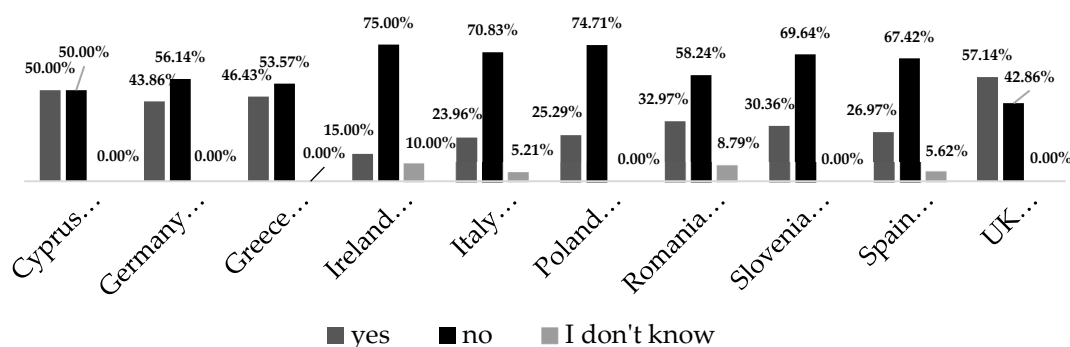


Figure 1. Implementation of an energy audit in small and medium-sized enterprises (SMEs) in the participating countries.

Fewer than 50% of the companies surveyed use a complete energy-monitoring system. The others declare not having enough resources, having other priorities, or even a belief that such a monitoring system is not necessary. The most common consumption-monitoring methods are based on energy bills and energy meters, while there are only few companies who simultaneously compare real consumption data to set targets.

Regarding the financing of energy efficiency measures, the surveys' results show that many SMEs do not have the necessary budget for investments in energy efficiency. Own funding is the most common case, while there is a lack of awareness regarding funding opportunities at the local or EU level, including grants, loans, national support schemes, etc. This becomes more crucial by the absence of effective support schemes, the lack of understanding of energy efficiency financing by banks and other sources, and the bureaucracy, resulting in a lack of motivation.

In a nutshell, the most common barriers for energy efficiency improvement investments in SMEs are related to economic reasons, the lack of time resources, and the low awareness about the multiple

benefits. Moreover, SME decision-makers consider energy efficiency improvements to have low priority compared to other investments. Additionally, there is a lack of SME staff with proper skills and expertise to monitor and access the energy footprint. Finally, in the COVID-19 pandemic, most of the SMEs are struggling to survive, and therefore investing in energy efficiency measures is out of the question.

To mitigate all these barriers, it is necessary to provide proper support and training courses for all stakeholders at all levels to facilitate access to information regarding policies, energy efficiency solutions, funding schemes, and good practices already implemented.

3. Innovative Approaches to Training

The objective of the four projects is to increase the energy efficiency in SMEs around Europe. To do so, they each designed different training strategies and pedagogical approaches that will enable them to achieve the desired goals. Furthermore, from the mobile app of SPEEDIER and the virtual reality of E2DRIVER to the high-quality videos of INNOVEAS and the certification scheme of SMEmPower, each project has implemented several innovative approaches that could impact future projects enabling ever-more effective schemes of energy efficiency improvement in SMEs.

3.1. SPEEDIER—Outsourced Energy Management

The aim of the SPEEDIER project is to provide a one-stop-shop solution to support SMEs in managing their energy consumption. Each SME is assigned to a SPEEDIER Expert: an energy auditor or energy consultant who takes on the role of outsourced energy manager, advises the business on the most suitable package of energy efficiency measures, and then supports them through the implementation process. The support of a SPEEDIER Expert removes the hassle of managing energy from the SME, thus overcoming the most commonly cited barriers of lack of time, knowledge, and resources.

To overcome financial barriers, the SPEEDIER Expert begins with the implementation of no-cost measures (e.g., adjusting timer controls), and encourages the SME to ring-fence the resulting savings and re-invest them in other energy efficiency actions (e.g., upgrading lighting systems). This cycle of ring-fencing and re-investing the savings can be repeated as many times as necessary to achieve the desired level of energy savings. The SPEEDIER Expert can also be paid from the savings, which removes the perceived risk from the SME and ensures that the Expert always acts in the best interests of their client.

To assist the SPEEDIER Expert in their role, two innovative software tools are being developed:

1. The SPEEDIER Tool for Experts. This tool will streamline the process of carrying out the energy audit, identifying energy conservation opportunities, and measuring the resulting energy savings. The tool will also use gamification to encourage SMEs to take action. SMEs will be able to see how they are performing compared to other similar businesses and the SPEEDIER Expert can assist them to take action to improve their ranking.
2. The SPEEDIER Mobile Application. Intended for use by SME staff members, this application encourages the development of an energy culture through gamification. Staff members can score points and earn awards by using the application to give feedback on their level of comfort in the working environment, make suggestions for saving energy, access the available learning material, or take an energy quiz. Simple charts showing energy consumption over time also help to develop a culture of energy awareness among staff members.

3.2. SMEmPower—Internal Capacity Building

The objective of the SMEmPower Efficiency project is to empower SMEs to undergo energy audits and implement energy-saving measures for increasing their energy efficiency. This will be achieved by connecting professionals, promoting intelligent energy tools, promoting traditional and innovative technologies, and providing decision support for various stakeholders.

In this framework, accredited Educational and Training (E & T) programs will be offered simultaneously and with a common curriculum in all the project partner countries, i.e., Cyprus, Germany, Greece, Italy, Romania, Slovenia, Spain, and the UK. The courses are certified by the participating or associated universities as life-long learning programs with 5 European Credit Transfer and Accumulation System (ECTS) credits (of European Qualification Framework level 6). (The European Credit Transfer and Accumulation System (ECTS) is used to control the quality of EU courses at all academic levels as well as to facilitate the mobility of students in Europe.) The courses will be based on an in-depth multidisciplinary harmonized approach, including lectures, practice, and self-study hours, being delivered using a hybrid system of distance-learning methods and face-to-face work, where possible, due to COVID-19.

The strategic target of the E & T program is to train key SME staff members to use intelligent energy management solutions; to design, propose, and successfully find pathways to implement affordable energy efficiency investments; to facilitate changes in SME energy consumption; and to obtain the support of decision-makers. The training will go beyond an energy consumption survey, to effectively implement energy management techniques, instruments, and solutions. The courses consist of five learning units: (i) European and national policies and legislation for energy efficiency; (ii) energy efficiency systems, measures, and solutions; (iii) basics of energy surveys and standards; (iv) tools for monitoring and managing energy; and (v) financing energy efficiency measures, tools, and evaluation.

A training handbook containing the course training material will be available for attendees and all interested professionals as an open access document on the SMemPower portal (smempower.com). Moreover, the project platform will offer two built-in tools for uploading energy data, accompanied by a Monitoring and Targeting (M&T) tool for energy analytics and a Measurement and Verification (M & V) tool. Finally, the E & T courses will also include a practical action project with the collaboration of engaged SMEs.

3.3. E2DRIVER—Sector-Specific Approach

E2DRIVER is developing a collaborative-cooperative training platform and a methodology in order to boost the automotive sector's collective intelligence on energy efficiency around Europe. The methodology and the platform will be able to generate customized capacity-building programmes in order to make SMEs fully aware of the multiple benefits resulting from energy audits, while also providing them with the required skills and information to implement their recommendations.

This project has several differences compared to the other projects. One of the most remarkable of these is the single-sector approach. This project is totally focused on the automotive sector, aiming to deeply understand the reality of this activity in order to offer training that is adapted to the specific features of this economic sector.

Regarding the training approach, the E2DRIVER capacity-building programmes will be composed of three main parts. Once the design of the whole customized programme for the company is performed, the first event in the context of the capacity-building programme will be the E2DRIVER Adjustment Session where experts from the project will meet with the company in order to present the training proposal and perform the finishing touches and modifications. After this session, the core of the training can begin. It will be composed of different E2DRIVER training depending on the professional profile: E2DRIVER Training for Managers; E2DRIVER Training for Scientific and Engineering Professionals; E2DRIVER Training for Technical Managers; E2DRIVER Training for Technicians; and E2DRIVER Training for Change Agents. (A change agent is a selected professional in the company that will be in charge of ensuring that the company internalizes the knowledge provided by the E2DRIVER project and that the professionals take advantage of the training.) These trainings will follow the Ontological Flip Teaching [4] as pedagogical approach with a blended learning format (on-site and online, if possible) plus a third part where it is anticipated that trainees will generate additional training materials. Finally, the closing session of the E2DRIVER capacity-building programme will consist of an E2DRIVER Virtual Reality session where trainees will learn more about energy measuring thanks to virtual reality.

The most notable results of the project are expected to be: 40 automotive SMEs trained; the E2DRIVER e-learning platform as a knowledge-sharing space and platform for carrying out online training; and the E2DRIVER methodology that will be materialized as a guide for trainers in order to ensure a high-quality implementation of the training and in order to facilitate the spread of the E2DRIVER way of work.

3.4. INNOVEAS—Building Lasting Expertise in SMEs

INNOVEAS is an initiative promoted by 10 partners from six EU countries with the purpose of creating a capacity-building program that removes the main non-technical barriers (psychological and behavioural) that often hinder the adoption of energy audits by SMEs. The objective of the project is to consolidate a structured, permanent, and expandable training offer that will contribute to the development of self-sustainable services and awareness raising, and build capacity in the field of energy auditing and related energy efficiency measures in SMEs.

The project aims to define and implement training programs for SME staff that will strengthen company policy in the field of energy efficiency and build initiatives for the involvement of the entire supply chain; the creation of a network and an international alliance is an important step to reach the target and the final outcome. The training activities are structured as follows:

- Web-based modules developed by each partner involved in trainings.
- In situ training for groups of companies.
- In-company trainings at the premises of few selected SMEs.
- Training videos and webinars.

Moreover, the trainings are not only targeted to SMEs but also to another type of actors: the intermediaries, meaning the trainers, who will be responsible for the dissemination and sustainability of the project outputs after the conclusion of the activities.

4. Policy Recommendations

Despite the requirements of Article 8 of the EED, the research carried out by the four projects shows that few SMEs are undertaking energy audits and most need further assistance to implement anything other than simple energy efficiency measures. This indicates that the programmes developed by Member States to support SMEs are not well known, are not working, or do not yet exist. Each of the projects takes a different approach to overcoming the obstacles to energy management in SMEs and are examples of possible support mechanisms that could be adopted by Member States in future:

- SPEEDIER outsources the role of energy manager to a SPEEDIER Expert thus eliminating the often-cited barriers of lack of time and lack of knowledge. Moreover, the ring-fence and re-invest mechanism removes the financial barriers to implementation of measures.
- SMEmpower Efficiency builds internal capacity within SMEs to allow them to better manage their own energy consumption, removing the barrier of lack of knowledge and highlighting the multiple benefits of energy efficiency through formal training and qualifications.
- E2DRIVER takes a sector-specific approach and shows the benefits of providing tailored support in the automotive sector. The project focuses on making sure that the training results in lasting change within the supported SMEs by improving organisational energy culture.
- INNOVEAS helps SMEs to build their internal capacity for energy management and builds a network of training providers that can enhance delivery in the long term. This approach ensures that a range of SMEs of different types, sizes, and sectors can be reached.

Our research shows that no single approach will eliminate all the barriers in every SME, so Member States should consider offering a range of solutions. Together, the projects have identified the following policy recommendations to increase uptake of energy audits and implementation of the resulting energy efficiency measures:

1. Consider mandatory energy audits for SMEs. Businesses that undertake an energy audit are more likely to implement energy efficiency measures, therefore ensuring that SMEs undertake audits by making them mandatory is an important first step towards realising the energy-saving potential of SMEs.
2. Encourage a range of support mechanisms. Providing information alone is not enough to drive uptake of energy efficiency. SMEs need additional support through the implementation phase in order to remove the perceived risk, therefore Member States should offer a range of services that cover information, training, external support, and finance.
3. Promote the multiple benefits of energy efficiency. Cost is not the only factor that drives investment decisions in SMEs. The wider benefits such as improving staff comfort and well-being and enhancing brand image should be used to show how energy efficiency projects align with the strategic objectives of the business.
4. Develop suitable financial mechanisms. Lack of finance has been identified as one of the main barriers to energy efficiency in SMEs. Less bureaucratic access to tax incentives, grants, revolving loan funds, and energy tariff structures could all incentivise investment in energy efficiency.
5. Train stakeholders at all levels. It is important for SMEs and their staff to understand the importance of energy management, but it is equally important for energy experts, finance providers, industry associations, and other multiplier organisations to recognise their role in supporting SMEs through the energy transition. Where necessary, these stakeholders should be open to changing their approach to meet the specific needs of SMEs.

Supplementary Materials: The compiled presentation slides and a recording of the workshop are available online at <https://www.sustainableplaces.eu/home/sp20-workshops-events/energy-smes/>.

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