



## **D 4.2 Report on the framework for the development of national SMEs energy audit programmes and schemes**

December 2023

FINAL



DELIVERABLE 4.2		REPORT ON THE FRAMEWORK FOR THE DEVELOPMENT OF NATIONAL SMES ENERGY AUDIT PROGRAMMES AND SCHEMES	
Related Work Package	Work Package 4		
Deliverable Lead	ENEA		
Author(s)	Enrico Biele, Carlos Herce, Chiara Martini, Claudia Toro – ENEA Emma Bill, Liya Bensy Thomas, Adrianna Threpsiadi – EST (Chapter 5)		
Contact	<a href="mailto:enrico.biele@enea.it">enrico.biele@enea.it</a>		
Revised and approved	Enrico Biele, ENEA		
Grant Agreement Number/Funding body	893924 / Horizon 2020 Research and Innovation Programme		
Start date / Project Duration	1 SEP 2020 / 36 months		
Type of Deliverable <sup>1</sup>	R		
Dissemination Level <sup>2</sup>	PU		
Date of Last Update	22 December 2022		
Project Website	<a href="http://www.leap4sme.eu">www.leap4sme.eu</a>		

REVISION NO	DATE	DESCRIPTION	AUTHOR(S)
1.0	21.12.2023	Consolidated draft	ENEA
1.1	22.12.2023	Final version	ENEA

The content of this report reflects the views of the authors, who are responsible for the facts and accuracy of the information presented herein. The opinions expressed in this report are the author's own and do not reflect the views of the Agency or the European Commission

<sup>1</sup> R=Document, report; DEM=Demonstrator, pilot, prototype; DEC=website, patent fillings, videos, etc.; OTHER=other

<sup>2</sup> PU=Public, CO=Confidential, only for members of the consortium (including the Commission Services), CI=Classified



## Table of contents

<b>EXECUTIVE SUMMARY .....</b>	<b>4</b>
<b>1. INTRODUCTION .....</b>	<b>9</b>
<b>2. LITERATURE REVIEW ASSESSMENT OF EE POLICIES FOR SMES .....</b>	<b>10</b>
<b>2.1 Review of policies .....</b>	<b>10</b>
<b>2.2 Quantitative analysis.....</b>	<b>18</b>
<b>2.3 Literature review summary and conclusions.....</b>	<b>23</b>
<b>3. SURVEY RESULTS FROM NATIONAL AGENCIES AND MINISTRIES .....</b>	<b>25</b>
<b>4. POLICY INSIGHTS FOR EE IN SMES IN LEAP4SME COUNTRIES.....</b>	<b>37</b>
<b>4.1 Interviews with key experts from LEAP4SME national energy agencies .....</b>	<b>37</b>
4.1.1 WHAT DO YOU THINK IS THE MOST IMPORTANT BARRIER(S) TO SMES IN ADOPTING ENERGY AUDITS AND ENERGY EFFICIENCY MEASURES?.....	38
4.1.2 WHAT DO YOU THINK ARE LIKELY TO BE THE MOST IMPORTANT SUPPORT MECHANISMS FOR SMES IN ADOPTING ENERGY AUDITS AND ENERGY EFFICIENCY MEASURES? .....	42
4.1.3 WHAT WOULD YOUR KEY MESSAGE BE TO STAKEHOLDERS/MARKET PLAYERS WHO ARE WORKING WITH SMES ON ENERGY EFFICIENCY? .....	47
4.1.4 WHAT IS YOUR VIEW HOW THE LEAP4SME PROJECT CAN CONTRIBUTE TO PROGRESS IN THE SECTOR? .....	49
<b>4.2 Preferred practices for policy .....</b>	<b>53</b>
<b>4.3 Summary of previous results .....</b>	<b>55</b>
4.3.1 AVAILABILITY OF DATA FOR POLICY .....	55
4.3.2 RECOMMENDATIONS FROM CURRENT POLICIES ANALYSIS .....	61
<b>5. BEHAVIOURAL RESEARCH: ENERGY EFFICIENCY DECISION-MAKING AND INVESTMENT (ENERGY SAVING TRUST) .....</b>	<b>64</b>
<b>5.1 Introduction.....</b>	<b>64</b>
5.1.1 RESEARCH QUESTIONS.....	64
<b>5.2 Rapid Evidence Assessment.....</b>	<b>65</b>
5.2.1 RESULTS.....	65
<b>5.3 EXPERT INTERVIEWS .....</b>	<b>68</b>

5.3.1 FINDINGS .....	68
<b>5.4 Implications for SME policy and programme design .....</b>	<b>70</b>
<b>6. FRAMEWORK FOR DESIGN POLICY PROGRAMMES FOR ENERGY AUDITS IN SMES .....</b>	<b>72</b>
<b>6.1 Basic elements of an energy audit programme for SMEs.....</b>	<b>72</b>
6.1.1 PROGRAMME ADMINISTRATION .....	78
6.1.2 MONITORING AND EVALUATION OF THE PROGRAMME .....	80
<b>6.2 Examples of policy design for SMEs .....</b>	<b>82</b>
6.2.1 ENERGY INTENSIVE MEDIUM SIZED COMPANIES .....	82
6.2.1 SMALL SIZED COMPANIES IN SERVICES SECTOR .....	85
<b>6.3 Opportunities for improving existing schemes .....</b>	<b>88</b>
<b>7. SUMMARY AND CONCLUSIONS .....</b>	<b>89</b>
<b>APPENDIX A - EXPERT INTERVIEWEE TOPIC GUIDE .....</b>	<b>94</b>
<b>APPENDIX B – INFORMATION ABOUT CURRENT POLICIES IN LEAP4SME COUNTRIES .....</b>	<b>95</b>
<b>REFERENCES .....</b>	<b>113</b>

## Executive Summary

The aim of this report is to generate a framework for the development of national small and medium-sized enterprises (SMEs) Energy Audit programmes and schemes from four complementary sources: 1) literature review of worldwide policies, 2) surveys from 44 policymakers, 3) extensive information of nine LEAP4SME national agencies partners, and 4) behavioural research to identify decision-making and investment in SMEs. The findings presented in this deliverable provide key elements for policy makers, to develop more effective SMEs policies, and to policy evaluators and researchers, to better address the topic and methodology of future studies.

After an introductory section 1, the section 2 presents a structured literature review of the contributions analysing the main policies and measures related to energy efficiency in SMEs. A comprehensive overview of the policies developed for energy efficiency (EE) in SMEs, increasing the qualitative analysis of policies (64 policies from 21 countries), and deepen the quantitative analysis of the policies (14 policies from ten countries). Almost four hundred documents related to the topic have been analysed and at two assessment levels: 1) comprehensive analysis of contributions providing qualitative information on EE policies for SMEs; and 2) in-depth analysis of evaluation studies including quantitative information on EE policies for SMEs.

The energy efficiency taxonomy shows that usually the policy support to EE in SMEs is based on voluntary agreements, to limit the economic and administrative burden. Hence the SMEs are generally excluded from the prescriptive policies which are based on binding measures. Recent studies demonstrate that the most successful approaches are 1) the development of energy audits, 2) the balance of the economic and supportive policies, 3) the implementation of energy efficiency networks as cost-effective actions for industrial SMEs, and 4) targeting interventions through strategic segmentation (usually focusing on Energy Intensive Industrial SMEs).

Among the policy evaluation studies, it was possible to extrapolate quantitative results on 14 programmes from 10 countries: six stand-alone energy audit programmes, four mechanisms including the energy audits as part of more general schemes of energy efficiency in SMEs, two policies for energy intensive industries (including both SMEs and large companies), and

two energy efficiency networks. The in-depth analysis of evaluation studies has been developed referring to the number of SMEs, number of implemented Energy Performance Improvement Actions (EPIAs) per energy audit (EA), program cost, achieved and potential savings, public and EPIAs cost effectiveness, and payback period. The range of the analysed data depends on the type of policy and presents a high variability. The most successful mechanisms in terms of involvement of SMEs and public cost-effectiveness are the stand-alone EAs policies, confirming the crucial role of energy audits to encourage energy efficiency in SMEs.

From the literature review some common insights raised:

- To allow a better understanding of policy performance and to compare different policy mechanisms, a harmonized approach for the evaluation of EE policies for SMEs would be needed, in terms of specific methodologies and indicators.
- Quantitative studies on the topic are still scarce, in terms of the policies and countries analysed as well as the number of SME covered; moreover, an effective comparison among them is limited due to the high heterogeneity of adopted approaches and/or lack of information about them.
- All evaluation studies reporting quantitative information are focused on policies including the adoption of EA. In this sense, EA seem to be a pre-condition for developing a quantitative evaluation of savings and cost effectiveness of the program.
- According to some policy schemes, EA certification is mandatory. However, due to the complexity of the implementation of certified energy audits and energy management systems in non-energy intensive SMEs, the implementation of simplified forms should be taken under consideration by policymakers.
- Targeted policies and tools, tailored as function of the size, sector and energy intensity of the company, appear to be a successful approach to overcome barriers for EE in SMEs
- A more integrated approach combining different economic and supportive instruments may help SMEs in improving EPIAs implementation rate, starting from no-cost EE and low-risk interventions.
- The most successful strategies include the engagement of local or regional associations instead of national governments, due to the more common territorial connotation of SMEs activity.

- Capacity building programmes and learning networks (which are well received by SMEs) as part of a broader range of support, can help ensure the longevity of the policy, as SMEs develop their own skills that help them undertake energy audits and implement EPIAs

In section 3 has been analysed the answers from official representants from public organizations to a survey on energy efficiency on SMEs. A total number of 44 organizations from 23 countries provided feedback to the survey. Specifically:

- Six (6) countries (Austria, Croatia, Greece, Italy, Poland, and UK) were represented by the Ministry in charge of the EED transposition at national level.
- Twenty-three (24) National Energy Agencies, generally the Agencies are in charge of the implementation of mechanism of energy audits. Nine agencies are partner of the project, ten agencies are members of EnR (European Energy Network), and four are non-EU agencies from MEDENER (Mediterranean Association of National Agencies for Energy Management).
- Fourteen (14) Regional Energy Agencies from 6 countries (Austria, Greece, Italy, Poland, Portugal and UK), with competencies on energy programmes at local scale with particular importance for SMES in these countries.

The answers are strongly different considering three categories: Ministries, National Agencies and Regional agencies. At national level, both agencies and ministries consider that the general overview of the EE policies is sufficiently adequate. However, for ministries, policies for audits and implementation of EPIAs are insufficient. The perception of insufficient policies for EPIAs implementation is also shared by national agencies. It is important to note that the opinion about policies for energy audits, and the implementation of EPIAs is sensibly more negative at regional/local level than at national level. This result could reveal a problem in the implementation at local level of national policies, being the local scale crucial to engage SMEs.

The importance of incentives for the development of energy audits in SMEs is underlined by the response of the national agencies with 48% considering them of extremely high relevance and 39% of high relevance. Ministries also consider important the incentives have high relevance, but at the same level than training. For ministries, two aspects are more important than economic incentives: the qualification of the auditors (to ensure a high-quality audit) and the dedicated non-financial support to SMEs. The importance of incentives is particularly critical for the implementation of EPIAs that present an extremely high/high relevance for the

96% of the national agencies and 66% of the ministries. Policies for SMEs should be tailored. According to the agencies and ministries the policies must include the energy consumption and it is also recommended to include the sector (e.g. industry, tertiary) and the size of the enterprises (micro/small vs medium).

In section 4 some aspects related to the development of policies have been analysed internally to the consortium in the nine involved countries. Specifically, three aspects have been deepened. Firstly, interviews with key experts from LEAP4SME national energy agencies have been developed in four topics: 1) barriers to SMEs in adopting energy audits and energy efficiency measures; 2) support mechanisms for SMEs in adopting audits and implementing EPIAs; 3) key message to stakeholders/market players who are working with SMEs; and 4) contribution of LEAP4SME project to progress in the sector. Secondly, the national agencies have been explicitly asked about the best tailoring approach for the development of policies. The opinion of LEAP4SME partners is that the policies must include the energy consumption and also the sector (industry, tertiary...), and it is recommended to include the size of the enterprises (micro/small vs medium). And thirdly, a summary of previous results (partially unpublished) has been included: 1) detailed availability of data for policy; and 2) recommendations from current policies analysis.

In section 5, behavioural research has been developed in order to try to identify the energy efficiency decision-making and investment in SMEs. Two complementary analyses have been carried out. On the one hand, Rapid Evidence Assessment (REA) was undertaken to gain an overview of the evidence on SME energy efficiency decision-making, and to identify any knowledge gaps. On the other hand, five academic experts representing four countries (Australia, Italy, Sweden, UK) identified through the REA were invited to participate in an interview aimed to understand the role of behavioural factors in SME decisions to invest in energy efficiency, and identify approaches that drive SMEs to invest in energy efficiency, including the role of audits.

Based on the REA and expert interviews, recommendations for supporting SMEs to adopt and invest in energy efficiency and/or energy audits are:

- Engage SMEs, especially microbusinesses, in relation to their professional and personal priorities and values. External stakeholders and other intermediaries can use a values-led approach to engage and support SMEs, including early adopters.



- Event-driven interventions that involve local, historical, and/ or trusted stakeholders provide opportunities may be particularly effective. In practice this might be aligning energy efficiency advice and improvements with business milestones and changes, and requiring or incentivising other actors, such as tradesman, to support small businesses to become more energy efficient.
- Provide and require knowledge and awareness of energy efficiency issues as part of professional education, over and above production specific energy efficiency knowledge.
- Energy advisors and auditors need the expertise and tools to be able to identify and communicate potential improvement options, in addition to, an understanding of the investor and investing businesses priorities and values. Advisors and auditors should be clear on the technicalities and costs of energy efficiency measures for SMEs, and be able to translate the risks, alternatives, and if applicable, longer-term solutions.
- Distribute information on the availability of public and private funds through business networks, trade bodies and relevant government agencies. Providing instructions to managers and employees as to how to apply for certain funds may also help.

In section 6 a framework for design policy programmes for energy audits in SMEs has been developed. The general structure based on 12 basic elements (as proposed by Väisänen et al., 2002) has been adapted to the SMEs. The basic elements proposed were therefore specified for SMEs based on the know-how acquired during the LEAP4SME project through the analysis of existing policies, good practices, surveys and national and international observatories in nine European countries. Some good practices have been used to adjust the policy recommendations. Two examples have been fully developed and compared: a programme for EE in industrial SMEs (mainly medium), and a stand-alone programme for development of audits in services SMEs. This section has been completed with some suggestions to improve current policies in the LEAP4SME countries.

In section 7 a brief summary and conclusions are presented. The main results of this analysis are aligned with the results obtained in international and national observatories, involving policy makers, energy efficiency experts, academics, business associations and other relevant stakeholders.

# 1. Introduction

The aim of this report is to generate a framework for the development of national SMEs Energy Audit programmes and schemes from four complementary sources: 1) literature review of worldwide policies, 2) surveys from 44 policymakers, 3) extensive information of nine LEAP4SME national agencies partners, and 4) behavioural research to identify decision-making and investment in SMEs.

After an introductory section 1, the section 2 presents a structured literature review of the contributions analysing the main policies and measures related to energy efficiency in SMEs. A comprehensive overview of the policies developed for EE in SMEs, increasing the qualitative analysis of policies (64 policies from 21 countries), and deepen the quantitative analysis of the policies (14 policies from ten countries).

In section 3 has been analysed the answers from official representants from public organizations to a survey on energy efficiency on SMEs. A total number of 44 organizations from 23 countries provided feedback to the survey.

In section 4 some aspects related to the development of policies have been analysed internally to the consortium in the nine involved countries. Specifically, three aspects have been deepened. Firstly, interviews with key experts from LEAP4SME national energy agencies have been developed. Secondly, the national agencies have been explicitly asked about the best tailoring approach for the development of policies. And thirdly, a summary of previous results (partially unpublished) has been included.

In section 5, behavioural research has been developed in order to try to identify the energy efficiency decision-making and investment in SMEs. Two complimentary analysis have been carried out. On the one hand, Rapid Evidence Assessment (REA) was undertaken to gain an overview of the evidence on SME energy efficiency decision-making, and to identify any knowledge gaps. On the other hand, five academics experts were invited to participate in an interview aim to understand the role of behavioural factors in SME decisions to invest in energy efficiency, and identify approaches that drive SMEs to invest in energy efficiency, including the role of audits.

In section 6 a framework for design policy programmes for energy audits in SMEs has been developed. The general structure based on 12 basic elements (as proposed by Väisänen et al., 2002) has been adapted to the SMEs. The basic elements proposed were therefore specified for SMEs based on the know-how acquired during the LEAP4SME project. Two examples have been fully developed and compared: a programme for EE in industrial SMEs (mainly medium), and a stand-alone programme for development of audits in services SMEs. This section has been completed with some suggestions to improve current policies in the LEAP4SME countries. In section 7 a brief summary and conclusions are presented.

## 2. Literature review assessment of EE policies for SMEs

This section presents a structured literature review of the contributions analysing the main policies and measures related to energy efficiency in SMEs. Considering the relevance of SMEs and at the same time the difficulties in exploiting their energy efficiency potential, providing an updated and systematic literature review appears useful and of interest. Although the topic has been already addressed in the literature, SME-focused studies are still relative scarce, since literature contributions focus mainly on the impact of specific policies at national countries, or on policies for the productive sector as a whole (generally industrial SMEs).

The main objectives of this section are to update previous studies providing a comprehensive overview of the policies developed for EE in SMEs, increasing the qualitative analysis of policies (64 policies from 21 countries), and deepen the quantitative analysis of the policies (14 policies from ten countries). Almost four hundred documents related to the topic have been analysed and at two assessment levels: 1) comprehensive analysis of contributions providing qualitative information on EE policies for SMEs; and 2) in-depth analysis of evaluation studies including quantitative information on EE policies for SMEs.

### 2.1 Review of policies

The information available regarding the implementation at national level of energy efficiency policies for SMEs is very variable. It is possible to find information about general policies on

SMEs (or general energy efficiency policies with partial focus on SMEs) in some countries such as Sweden, Japan, Portugal, Bulgaria, China, U.S., Germany, Netherlands, Lithuania, Vietnam and also at regional level. In addition, the analysis can be focused on macro-sectors (generally manufacturing SMEs in Italy, Slovenia, Belgium, Spain or Turkey) or on specific sectors from a comprehensive environmental perspective.

Due to the heterogeneity of the SMEs, the potential for the implementation of EPIAs is very variable. A common approach is to develop sector-specific policies according to the efficiency potential of the sector itself. The first step is to prioritize the sectors according to the potential in terms of number of SMEs, economic indicators, their size and energy consumption and the improvement potential, the energy intensity of the production, the cost of energy relatively to total production costs or other environmental issues. Hence, specific schemes must be tailored for each sector. Some examples of manufacturing sectoral analyses of energy efficiency in SMEs have been developed for textile, bakery, foundries, tourism, food and drink, wood, primary metals, plastics, ceramic, horticultural industries. However, existing contributions for energy efficiency in SMEs in services sectors are scarce.

Table 1 shows 45 references analysing 64 specific policies for EE in SMEs. References are shown by country and policy type and information is provided on topic and quantitative figures, namely numbers of SMEs involved, savings, program cost effectiveness (CE) and barriers/drivers assessed. The included studies analyse the policies of 16 European countries and 5 non-EU countries. Considering Tanaka's classification (Tanaka, 2011), 47% of the studies focus on the evaluation of a specific policy of which 18% economic, 22% prescriptive and 5% supportive. The remaining 53% of the studies analyse, evaluate, and review different types of policies in one or more countries. About half of the papers develop policy reviews, while 45% are policy evaluations and 5% of them present case studies on energy audits programmes in SMEs.

*Table 1 - Research on energy efficiency policies for SMEs in each country*

Country	Policy/Program	Type	Period	Ref	Topic	#SMEs	Savings	Sector	Public CE	Barriers/ Drivers
<b>Australia</b>	Queensland Climate Smart Business Cluster Program	S	2009-2011	(Meath et al., 2016)	PE	Y	N	All sectors	N	Y
	EEAP - Enterprise Energy Audit Program	E	1991-1997	(Andersson et al., 2017)	PR	Y	N	Industry	N	Y
	EEAP - Enterprise Energy Audit Program	E	1991-1997	(Harris et al., 2000)	PE	N	N	Industry	N	Y
	No specific policy	O	2012	(Redmond & Walker, 2016)	CS	Y	N <sup>a</sup>	Mainly services	N <sup>a</sup>	Y
<b>Austria</b>	Klimaaktiv	S	2008-2017	(Lackner & Kulterer, 2018)	PR	Y	Y	All sectors	N	N
<b>Belgium</b>	Different SMEs policies	V	2008-2015	(Thollander et al., 2014)	PE	N	Y	All sectors	N	N
	Policies to stimulate ESCO market	V	2001-2015	(Cornelis et al., 2015)	PR	N	N	Industry	N	N
	Various voluntary agreements	P	2002-2020	(Cornelis, 2019)	PR	N	Y	Industry	N	Y
<b>Bulgaria</b>	OPIC - SME support scheme in Bulgaria	E	2014-2020	(Nigohosyan et al., 2021)	PE	Y	Y	All sectors	Y	Y

**REPORT ON THE FRAMEWORK FOR THE  
DEVELOPMENT OF NATIONAL SMES ENERGY  
AUDIT PROGRAMMES AND SCHEMES**

	Policies to stimulate ESCO market	V	2001-2015	(Cornelis et al., 2015)	PR	N	N	Industry	N	N
<b>Denmark</b>	Several policies	V	2010-2014	(Bröckl et al., 2014)	PR	N	Y	All sectors	N	Y
	Agreement on Industrial Energy Efficiency	P	1993-2019	(Cornelis, 2019)	PR	N	Y	EII	N	Y
<b>Finland</b>	Several policies	V	1992-2011	(Bröckl et al., 2014)	PR	N	Y	All sectors	N	Y
	LEEN and Energy audit program for SMEs	S	2009-2014	(Wohlfarth et al., 2016)	PR	Y	N	Manufacturing	N	Y
	LEEN - Learning Energy Efficiency Networks	S	2009-2014	(Rohde et al., 2020)	PR	Y	Y	Manufacturing	N	Y
	Energy audit program for SMEs	E	2008-2016	(Fleiter, Schleich, et al., 2012)	CS	Y	N	All sectors	N	Y
<b>Germany</b>	Energy audit program for SMEs	E	2008-2017	(Andersson et al., 2017)	PR	Y	Y	All sectors	Y	Y
	Energy audit program for SMEs	E	2008-2012	(Fleiter, Gruber, et al., 2012)	PE	Y	Y	All sectors	Y	Y
	Energy audit program for SMEs	E	2008-2011	(Gruber et al., 2011)	PE	Y	Y	All sectors	Y	N
	Energy audit program for SMEs	E	2008-2012	(Schleich & Fleiter, 2019)	PE	Y	Y	All sectors	Y	N
<b>Ireland</b>	Energy Agreements Programme	P	2006-2019	(Cornelis, 2019)	PR	N	Y	EII	N	Y

**REPORT ON THE FRAMEWORK FOR THE  
DEVELOPMENT OF NATIONAL SMES ENERGY  
AUDIT PROGRAMMES AND SCHEMES**

<b>Italy</b>	National energy efficiency action plan 2017	V	2014-2020	(Malinauskaitė et al., 2019)	PR	N	Y	Mainly industry	Y	N
	EED Art 8 Mandatory EAs	P	2019	(Herce et al., 2021)	PE	Y	Y	All sectors	N	N
	Different SMEs policies	V	2005-2021	(Toro et al., 2022)	PR	N	N	All sectors	N	Y
	National energy efficiency campaign “Italy in Class A”	S	2015-2021	(Preziosi et al., 2022)	PE	N	N	All sectors	N	N
	White Certificates	E	2006-2015	(Stede, 2017)	PE	N	N	All sectors	N	N
<b>Japan</b>	Policies to stimulate ESCO market	V	2001-2015	(Cornelis et al., 2015)	PR	N	N	Industry	N	N
	Voluntary Agreement Program Climate	P	2001-2003	(Wakabayashi, 2013)	PR	Y	N	Industry	N	N
	VAP 114 Bussinees associations	P	1997-2012	(Wakabayashi & Arimura, 2016)	PR	Y	N	All sectors	N	N
	Several policies	V	1990-2014	(Thollander et al., 2015)	PR	N	Y	Mainly industry	Y	N
	Different SMEs policies	V	2005-2015	(Thollander et al., 2014)	PE	N	N	All sectors	Y	N
	EnMS regulation under the Energy Conservation Law (ECL)	P	2009-2010	(Kimura & Noda, 2014)	PE	Y	N	Mainly industry	N	Y
<b>Latvia</b>	Latvian Energy Efficiency Obligation Scheme (EEOS)	E	2017-2020	(Blumberga et al., 2021)	PE	N	N	All sectors	Y	N

<b>Lithuania</b>	Auditas pramonei LT	E	2015-2018	(Lisauskas et al., 2022)	CS	Y	Y	Manufacturing	N	N
<b>Mexico</b>	MSSP - Mexican Sustainable Supply Program	E + S	2005-2013	(van Hoof & Lyon, 2013)	PE	Y	Y	All sectors	Y	N
<b>Netherlands</b>	Dutch voluntary agreements on energy efficiency	P	2009-2012	(Abeelen et al., 2016)	PR	Y	N	All sectors	N	N
	MJAs - Dutch negotiated agreements on energy saving in industry	P	2002-2012	(Bressers et al., 2007)	PR	N	N	All sectors	Y	Y
	Various voluntary agreements	P	1991-2020	(Cornelis, 2019)	PR	N	Y	All sectors	N	Y
<b>Norway</b>	Several policies	V	2012	(Bröckl et al., 2014)	PR	N	Y	All sectors	N	Y
<b>Portugal</b>	EFINERG Project - EE in SMEs (250-500 toe)	O	2012	(Catarino et al., 2015)	PE	Y	N	Manufacturing	N	Y
<b>South Korea</b>	Voluntary Agreements	P	1999-2010	(Seok et al., 2021)	PR	N	N	Industry	N	N
	Target Management Scheme	V	2008-2013	(Suk et al., 2013)	PR	Y	N	Energy Intensive	N	N
<b>Spain</b>	Different SMEs policies	V	2008-2015	(Thollander et al., 2014)	PE	N	Y	All sectors	Y	N
	Policies to stimulate ESCO market	V	2001-2015	(Cornelis, 2019)	PR	N	N	Industry	N	N
<b>Sweden</b>	Several policies	V	1990-2014	(Thollander et al., 2015)	PE	Y	Y	Mainly industry	Y	N



**REPORT ON THE FRAMEWORK FOR THE  
DEVELOPMENT OF NATIONAL SMES ENERGY  
AUDIT PROGRAMMES AND SCHEMES**

Different SMEs policies	V	1990-2011	(Thollander et al., 2014)	PE	N	N	EII	N	N
Several policies	V	2004-2014	(Bröckl et al., 2014)	PR	N	Y	All sectors	Y	Y
Highland + PFE	E	2003-2008	(Thollander et al., 2007)	PE	Y	Y	Industry	Y	Y
SEAP - Swedish Energy Audit Program	E	2010-2014	(Paramonova & Thollander, 2016b)	PE	Y	Y	All sectors	Y	Y
Several policies	V	1990-2020	(Thollander et al., 2013)	PE	N	Y	Industry	Y	N
PFE - Program for Energy Efficiency in Energy-Intensive Industries	P	2005-2014	(Stenqvist & Nilsson, 2012)	PE	N	Y	All sectors	N	N
Regional EEN policy program - ENERGIG	S	2014-2019	(Jalo et al., 2021)	PR	Y	N	Industry	N	Y
Regional EEN policy program - ENERGIG	S	2015-2018	(Johansson et al., 2022)	PR	Y	Y	Industry	Y	Y
Regional EEN policy program - ENERGIG	S	2011-2016	(Paramonova & Thollander, 2016a)	PE	Y	N <sup>a</sup>	Industry	N	Y
Long term agreements for SMEs	P	-	(Thollander & Dotzauer, 2010)	PE	Y	Y	EII	Y	N
Policies to stimulate ESCO market	V	2001-2015	(Cornelis et al., 2015)	PR	N	N	Industry	N	N

	SEAP - Swedish Energy Audit Program	E	2010-2014	(Backlund & Thollander, 2015)	PE	Y	Y	All sectors	Y	N
	Highland + SEAP	E	2006-2014	(Andersson et al., 2017)	PR	Y	Y	Manufacturing	Y	Y
<b>United Kingdom</b>	National energy efficiency action plan 2017	V	2014-2020	(Malinauskaitė et al., 2019)	PR	N	N	Mainly industry	N	N
	Climate change agreements (CCAs) and climate change levy (CCL)	E + P	1999-2010 <sup>b</sup>	(Ekins & Etheridge, 2006)	PE	N	Y	All sectors	N	N
<b>United States</b>	IAC - Industrial Assessment Centers	E + S	1981 - 2000	(Andersson et al., 2017)	PR	Y	Y	Industry	N	N
	IAC + 30 US State and Regional Climate Policy actions of EPA	E + S	1984-2011	(Abadie et al., 2012)	PE	Y	N	Industry	N	Y
	Information program and support scheme	E + S	1976-2004	(Anderson & Newell, 2004)	CS	Y	Y	All sectors	N	Y
	IAC - Industrial Assessment Centers	E + S	1981-2009	(DOE, 2013)	PE	Y	Y	Industry	Y	N
	IAC - Industrial Assessment Centers	E + S	1981-2009	(Muthulingam et al., 2013)	PE	Y	Y	Industry	Y	Y

PE: Policy Evaluation, PR: Policy Review, CS: Case Study on EAs

E: Economic, O: Other, P: Prescriptive, S: Supportive; V: Various

<sup>a</sup> Available only at firm level <sup>b</sup> Scenario

## 2.2 Quantitative analysis

In Table 2 are presented the available quantitative information of public programmes which involve the implementation of energy audits in SMEs:

- Six stand-alone programmes from five countries (two from Sweden).
- Four programmes include the energy audits as part of more general schemes of energy efficiency in SMEs.
- Two policies are focused on tax levies for energy intensive industries (including both SMEs and large companies). The access to these programmes requires the development of energy audits.
- Finally, two energy efficiency networks are presented as examples of good practice for implementation of energy efficiency policies in SMEs. In these cases, the EAs are not mandatory (or at least not certified).

The most successful policies in terms of SMEs involved are the stand-alone US IAC (14,800 SMEs from 1981 to 2009) and the German energy audit programme (24,300 SMEs from 2008 to 2013).

The number of implemented measures by EA is very variable. Some programmes present the implementation of only 1 EPIA by audit and other more than 10 (Swedish PFE and ENERGIG). Usually, the number of EPIAs implemented is lower in the stand-alone schemes (from 1.0 to 9.2, mean 3.6) compared to other more comprehensive policies that include the partial funding of EPIAs implementation (from 1.0 to 14.0, mean 6.6). In most cases the implementation rate varies from 40% to 53%. Hence, of the policies evaluated about one half of the proposed measures are implemented. The implementation ratio value decreases with the maturity of the policies (for example the IAC programme presented an implementation rate of 60% in 1985 and 45% in 2008).

The cost of the mechanism is obviously lower in the stand-alone scheme (that only covers partially or fully the cost of the energy audits) than in other schemes that support the implementation of the EPIAs. The cost of the stand-alone programmes varies from 0.6 to 10 MEUR/year, supporting some thousands of companies. Moreover, the more comprehensive policies present budgets that cover tens of millions EUR by year, including only some

hundreds of companies. The cost of the energy audits is generally evaluated only in the stand-alone policies. The cost for each SME audit varies from 900 to 9000 EUR.

The saving reported are proportional to the number of companies involved. In the case of countries with strong industrial sectors (Germany, U.S. or Japan) the induced annual savings are higher than 1 TWh/year in the stand-alone EAs policies, corresponding to an induced saving of 0.66 GWh/y for each SME which carried out an energy audit. The averaged savings by SMEs increases up to 4.5 GWh/y (spreading from 0.46 GWh/y/SME in the Italian Energy-Intensive Industry programme, up to 14.3 GWh/y/SME in the Swedish PFE) in more comprehensive policies that include the implementation of EPIAs. In any case it is important to note the lack of information about the method for the estimation of energy savings, notably exception is (Paramonova & Thollander, 2016b).

The cost effectiveness of the implementation of the EPIAs is very variable (from 5 to 625 EUR/MWh) as well as the simple payback time (from 0.8 to 7.6 years) due to the intrinsic heterogeneity of technical solutions and SME sector, and the different industrial structure between countries. However, the cost-effectiveness of the EA stand-alone policies present an excellent ratio and a relative low dispersion (from 0.5 to 10 EUR/MWh, mean 3.4 EUR/MWh), confirming the energy audits as a key action to promote energy efficiency in SMEs.

Table 2 – Quantitative analysis of energy efficiency policies involving energy audits for SMEs in each country

Type of policy	Country	Policy	Reference years	#SMEs <sup>d</sup>	Impl. EPIAs per EA	Impl. rate (%)	Prog. Cost [M €]	Cost Energy Audit [€]	Savings [GWh/y]	Pot. Savings [GWh/y]	Public CE [€/MWh]	CE EPIAs [€/MWh]	PP <sup>j</sup> [y]	Ref
Energy Audits for SMEs	AU	EEAP	1991-1997	1200 (100)	4.7	81%			4166				1.3	(Andersson et al., 2017; Fleiter, Gruber, et al., 2012; Paramonova & Thollander, 2016b)
			2008-2010	542	1.4	40%						225-625		(Fleiter, Schleich, et al., 2012)
	DE	German energy audit programme for SMEs <sup>c</sup>	2008-2010	9292	1.6	43%	17.7		953	1653	1-1.3		6.1	(Andersson et al., 2017; Fleiter, Gruber, et al., 2012; Paramonova & Thollander, 2016b)
			2008-2010	10,400 (542)	2.8	53%	18.9	900-4000	1921	38,000	0.5-0.7	5-23	6.1	(Gruber et al., 2011)
			2008-2013	24,300 (1471)				1200-4800		10-20% <sup>i</sup>			6	(Schleich & Fleiter, 2019)
	JP	ECCJ audit program	2004-2007	2409			7.7		2380		3.2			(Thollander et al., 2015)

**REPORT ON THE FRAMEWORK FOR THE  
DEVELOPMENT OF NATIONAL SMES ENERGY  
AUDIT PROGRAMMES AND SCHEMES**

	Highland Project	2003-2008	139 (47)	1.0	22%		7	16			(Andersson et al., 2017; Fleiter, Gruber, et al., 2012; Paramonova & Thollander, 2016b)	
SE		2003-2008	340	3.0	50%	0.6	2000	40	75	5-10	(Thollander et al., 2007)	
		Ex-ante	900			3.5			700-1400	2.5-5.0	(Thollander & Dotzauer, 2010)	
	SEAP	2010-2013	241	9.2	53%	1.5	9160	110-160	207-306	0.7-1.3	125-265	(Backlund & Thollander, 2015)
		2010-2014	713	4.5	53%	3.5	4540	340	589	7	7.6	(Paramonova & Thollander, 2016b)
US	IAC	1981-2009	14,800	3.8	50% <sup>e</sup>	7-10/y <sup>f</sup>	7000	18,833				(Anderson & Newell, 2004; Andersson et al., 2017; Fleiter, Gruber, et al., 2012; Paramonova & Thollander, 2016b)
BE	Flanders –Audit Covenant	2005-2013	229					1166				(Thollander et al., 2014)

Energy Efficiency for SMEs <sup>a</sup>	BG	OPIC	2014-2020	426	1.0		154 <sup>g</sup>		356		434	5.9	(Nigohosyan et al., 2021)
	MX	MSSP	2005-2012	972	2		156 <sup>g</sup>					0.8	(van Hoof & Lyon, 2013)
	ES	PAE4+	2008-2012	260			2,85	14,600	2360		1.2	115	(Thollander et al., 2014)
Energy Intensive Industries <sup>a,b</sup>	IT	EII "Energivori"	2014-2018	2546					1186		119		(Malinauskaite et al., 2019; Toro et al., 2022)
	SE	PFE	2005-2007	98			70 <sup>h</sup>						(Thollander et al., 2007)
			2005-2012	101	12.5	43%	88 <sup>h</sup>		1450		6.5	9.3-16	1.5
EE Networks <sup>a</sup>	DE	LEEN	2009-2014	948	3.7				6208				(Rohde et al., 2020; Wohlfarth et al., 2016)
	SE	ENERGIG	2015-2018	44 (15)	14.0	50%				5,5	5.8		(Johansson et al., 2022)

<sup>a</sup> Programmes including Energy Audits. Both SMEs and large enterprises participate

<sup>b</sup> Tax levies programmes

<sup>c</sup> 'Sonderfonds Energieeffizienz in KMU' 2008-2010, 'Energieberatung Mittelstand' 2010-2012

<sup>d</sup> In parenthesis, number of evaluated companies

<sup>e</sup> The implementation rate decreased from 60% (1985) to 45% (2008)

<sup>f</sup> Out of the program's current federal outlay of about US\$ 7 million per year, each school receives about US\$ 180,000 annually, or about US\$ 7000 per assessment

<sup>g</sup> Include not only the Audit Programme but the incentives to implementation EPIAs

<sup>h</sup> Include the tax deductions associated to the programme

<sup>i</sup> Include only four types of EPIAs: Lighting, Insulation, Heating, Operations. Savings related to these specific processes.

<sup>j</sup> Mean simple payback period of implemented EPIAs

## 2.3 Literature review summary and conclusions

The energy efficiency taxonomy shows that usually the policy support to EE in SMEs is based on voluntary agreements, to limit the economic and administrative burden. Hence the SMEs are generally excluded from the prescriptive policies which are based on binding measures. Recent studies demonstrate that the most successful approaches are 1) the development of energy audits, 2) the balance of the economic and supportive policies, 3) the implementation of energy efficiency networks as cost-effective actions for industrial SMEs, and 4) targeting interventions through strategic segmentation (usually focusing on Energy Intensive Industrial SMEs).

64 literature contributions on specific policies for EE in SMEs in 21 European and non-European countries have been analysed. Distinguishing by country and policy type, an assessment of the quantitative figures included is presented, in terms of number of SMEs involved, savings, program cost effectiveness and barriers/drivers. About half of the papers develop policy reviews, while 45% are policy evaluations and 5% of them present case studies on energy audits programmes in SMEs.

Among the policy evaluation studies, it was possible to extrapolate quantitative results on 14 programmes from 10 countries: six stand-alone energy audit programmes, four mechanisms including the energy audits as part of more general schemes of energy efficiency in SMEs, two policies for energy intensive industries (including both SMEs and large companies), and two energy efficiency networks. The in-depth analysis of evaluation studies has been developed referring to the number of SMEs, number of implemented EPIAs per EA, program cost, achieved and potential savings, public and EPIAs cost effectiveness, and payback period. The range of the analysed data depends on the type of policy and presents a high variability. The most successful mechanisms in terms of involvement of SMEs and public cost-effectiveness are the stand-alone EAs policies, confirming the crucial role of energy audits to encourage energy efficiency in SMEs.

From the literature review some common insights raised:



- To allow a better understanding of policy performance and to compare different policy mechanisms, a harmonized approach for the evaluation of EE policies for SMEs would be needed, in terms of specific methodologies and indicators.
- Quantitative studies on the topic are still scarce, in terms of the policies and countries analysed as well as the number of SME covered; moreover, an effective comparison among them is limited due to the high heterogeneity of adopted approaches and/or lack of information about them.
- All evaluation studies reporting quantitative information (Table 3) are focused on policies including the adoption of EA. In this sense, EA seem to be a pre-condition for developing a quantitative evaluation of savings and cost effectiveness of the program.
- According to some policy schemes, EA certification is mandatory. However, due to the complexity of the implementation of certified energy audits and energy management systems in non-energy intensive SMEs, the implementation of simplified forms should be taken under consideration by policymakers.
- Targeted policies and tools, tailored as function of the size, sector and energy intensity of the company, appear to be a successful approach to overcome barriers for EE in SMEs
- A more integrated approach combining different economic and supportive instruments may help SMEs in improving EPIAs implementation rate, starting from no-cost EE and low-risk interventions.
- The most successful strategies include the engagement of local or regional associations instead of national governments, due to the more common territorial connotation of SMEs activity.
- Capacity building programmes and learning networks (which are well received by SMEs) as part of a broader range of support, can help ensure the longevity of the policy, as SMEs develop their own skills that help them undertake energy audits and implement EPIAs.

### 3. Survey results from national agencies and ministries

On October 2021 a survey on energy efficiency on SMEs was released ([https://ec.europa.eu/eusurvey/runner/LEAP4SME\\_Survey\\_Organizations](https://ec.europa.eu/eusurvey/runner/LEAP4SME_Survey_Organizations)) with several objectives:

- To examine the point of view of organizations (national agencies and business associations, ministries, NGOs and industrial associations) and companies on policy barriers and needs in SMEs
- To identify the most relevant energy audits needs for SMEs
- To understand how to increase the implementation of the recommended energy efficiency measures for SMEs
- To define more effective tailored policy schemes for SMEs

A total number of 177 answers were collected from public institutions, private organisations (i.e. financing institutions, ESCOs), private associations (i.e. business associations) and other organisations (including academia and NGOs). The main results of the analysis were previously published on D3.2 “Report on SMEs characterization to address an effective policy development” (December 2021).

In this work are analysed only the answers from official representants from public organizations received from October 2021 to June 2023. A total number of 44 organizations from 23 countries provided feedback to the survey. Specifically:

- Six (6) countries (Austria, Croatia, Greece, Italy, Poland, and UK) were represented by the Ministry in charge of the EED transposition at national level.
- Twenty-three (24) National Energy Agencies, generally the Agencies are in charge of the implementation of mechanism of energy audits. Nine agencies are partner of the project, ten agencies are members of EnR (European Energy Network), and four are non-EU agencies from MEDENER (Mediterranean Association of National Agencies for Energy Management).

- Fourteen (14) Regional Energy Agencies from 6 countries (Austria, Greece, Italy, Poland, Portugal and UK), with competencies on energy programmes at local scale with particular importance for SMES in these countries.

The full list of respondents is presented in Table 3 and 4 and in Figure 1.

*Table 3 – Official national agencies respondents to the survey*

Country		National Energy Agency
<b>Austria</b>	LEAP4SME	AEA
<b>Croatia</b>	LEAP4SME	EIHP
<b>Greece</b>	LEAP4SME	CRES
<b>Italy</b>	LEAP4SME	ENEA
<b>Malta</b>	LEAP4SME	EWA
<b>Poland</b>	LEAP4SME	KAPE
<b>Portugal</b>	LEAP4SME	ADENE
<b>Slovakia</b>	LEAP4SME	SIEA
<b>United Kingdom</b>	LEAP4SME	EST
<b>Bulgaria</b>	EU Country	SEDA
<b>Estonia</b>	EU Country	CPTRA
<b>Finland</b>	EU Country	Motiva Oy
<b>France</b>	EU Country	ADEME
<b>Germany</b>	EU Country	DENA
<b>Hungary</b>	EU Country	MEKH
<b>Ireland</b>	EU Country	SEAI
<b>Lithuania</b>	EU Country	LEA
<b>Luxembourg</b>	EU Country	myenergy
<b>Sweden</b>	EU Country	SEA

<b>Jordan</b>	Non-EU Country	NERC
<b>Morocco</b>	Non-EU Country	AMEE
<b>Lebanon</b>	Non-EU Country	ALMEE
<b>Palestine</b>	Non-EU Country	PENRA
<b>Tunisia</b>	Non-EU Country	ANME

*Table 4 – Official respondents to the survey by country: ministries and regional authorities*

<b>Country</b>	<b>National Ministry</b>	<b>Regional Authorities</b>
<b>Austria</b>	BMK	1
<b>Croatia</b>	MINGOR	
<b>Greece</b>	YPEN	4
<b>Italy</b>	MASE	4
<b>Poland</b>	MCE	1
<b>Portugal</b>		3
<b>United Kingdom</b>	BEIS	1

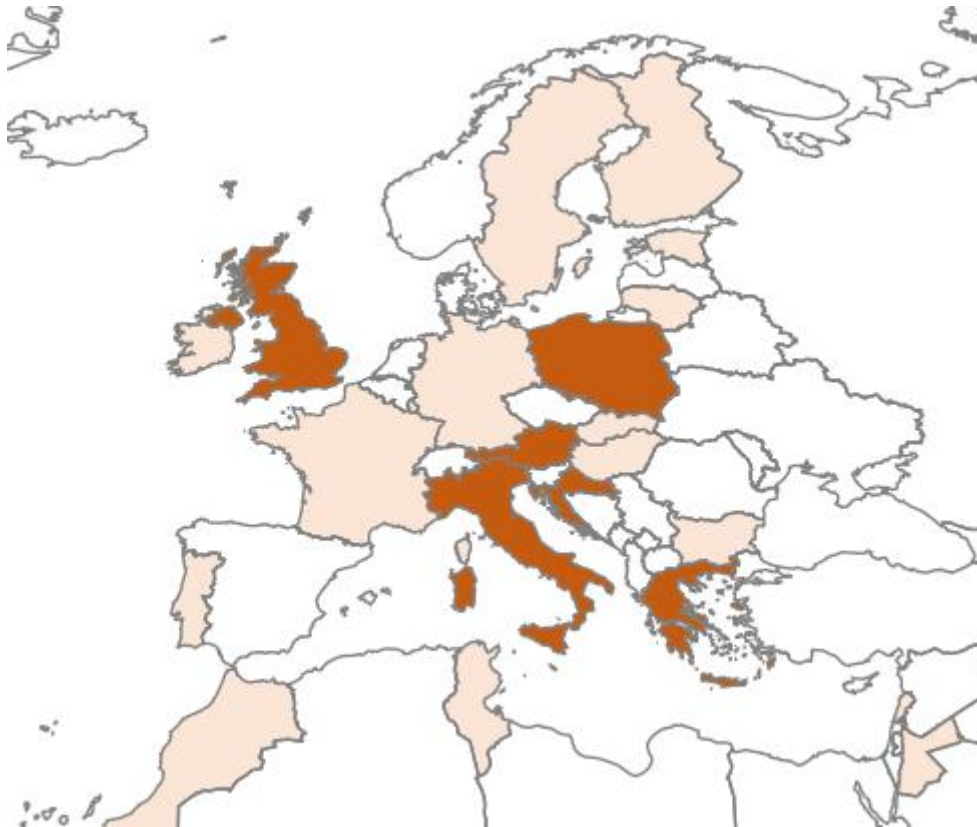


Figure 1 National Energy Agencies respondents to the Organizations survey (Only answer from agencies in pink. In Red response from Ministry+National Agency)

The first three questions analysed in the survey concern the opinion on the overview of energy efficiency policies for SMEs. Specifically, the three questions were:

- 1.- General overview of the energy efficiency incentives for SMEs in your country
- 2.- General overview of energy audit policies for SMEs in your countries
- 8.- Overall support policy framework is adequate to support the implementation and conservation of energy efficiency measures (EPIAs) recommended in energy audits for SMEs?

The rating scale ranges from 0 (not adequate) to 5 (completely adequate). The mean response values were 2.7 for energy efficiency incentives for SMEs, 3 for energy audit policies for SMEs and 2.6 for implementation of EE measures. Therefore, the general opinion about the policies

is similar and can be considered sufficiently adequate (over 2.5), with high room for improvement .

The answers are strongly different considering three categories: Ministries, National Agencies and Regional agencies (Figure 2). At national level, both agencies and ministries consider that the general overview of the EE policies is sufficiently adequate (2.6 and 2.7 respectively). However, for ministries, policies for audits and implementation of EPIAs are insufficient (2.3). The perception of insufficient policies for EPIAs implementation is also shared by national agencies. It is important to note that the opinion about policies for energy audits, and the implementation of EPIAs is sensibly more negative at regional/local level (1.9 and 2.1 respectively) than at national level (2.6 and 2.4). This result could reveal a problem in the implementation at local level of national policies, being the local scale crucial to engage SMEs.

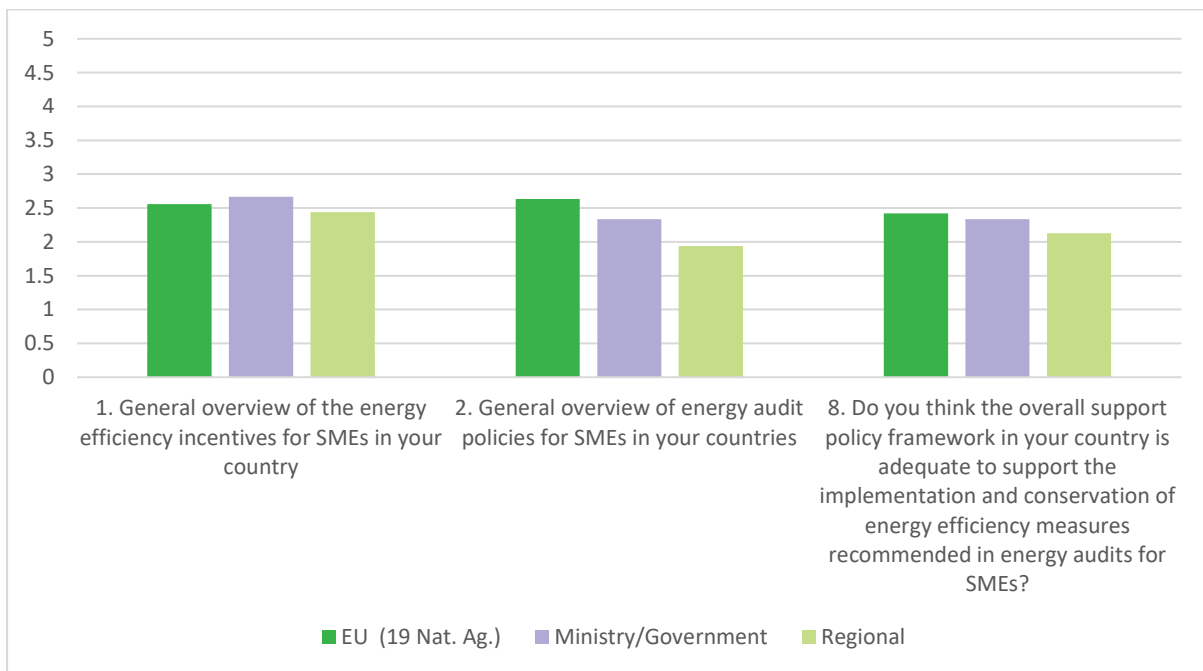


Figure 2 General opinion on EE, EA and implementation of EPIAs policies by type of organisation

The opinion is different among national energy agencies (Figure 3). The Agencies involved in the project present a better perception of their national policies than the other EU agencies (2.7 vs 2.4 general EE in SMEs, 2.8 vs 2.5 energy audits for SMEs, and 2.7 vs 2.2 on implementation of EPIAs). In general, the LEAP4SME agencies consider their policies adequate, while other EU agencies do not find them sufficiently adequate (particularly the support to implement the EPIAs contained in the audits). In both cases, the room for

improvement is high and the reason for this perception could be a better knowledge about the different available schemes for energy audits in SMEs, deepened by LEAP4SME agencies in the project. Contrary to the opinion of the European agencies, the other MEDENER agencies consider that the policies for SMES, for audits in SMEs and the implementation of EPIAs are highly adequate (valuation from 3.25 to 3.4 in all the questions).

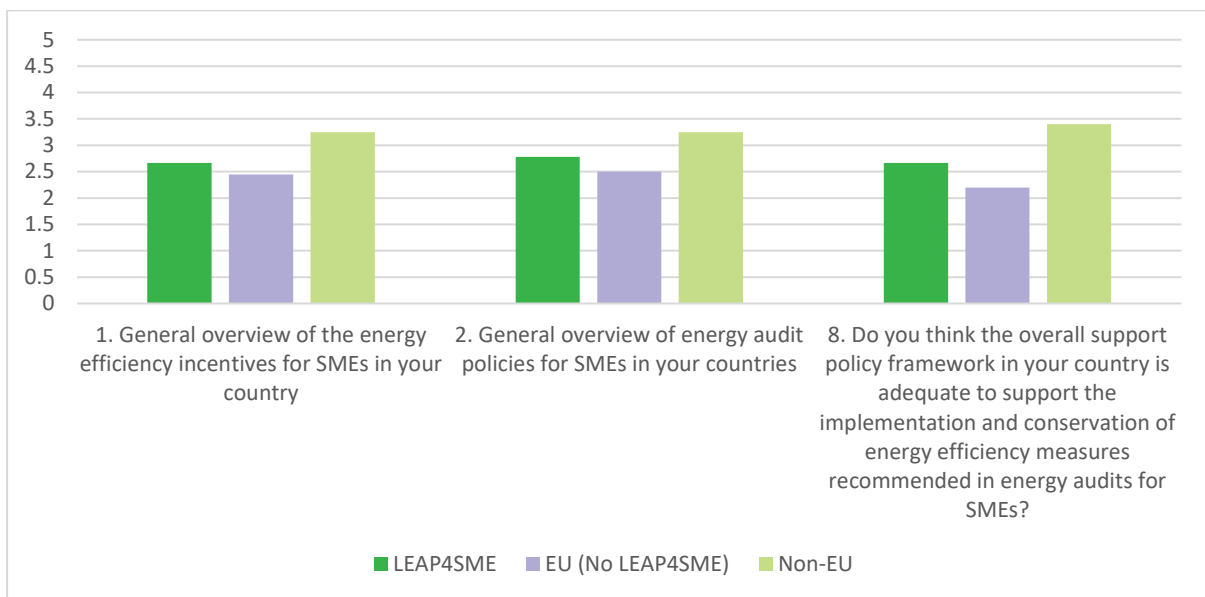


Figure 3 General opinion on EE, EA and implementation of EPIAs policies by National Energy Agencies

The importance of incentives for the development of energy audits in SMEs (Figure 4) is underlined by the response of the national agencies with 48% considering them of extremely high relevance and 39% of high relevance. Ministries also consider important the incentives (66% high relevance, but no extremely high relevance), but at the same level than training. For ministries, two aspects are more important than economic incentives: the qualification of the auditors (to ensure a high-quality audit, 87% extremely high/high relevance) and the dedicated support to SMEs (66% extremely high/high relevance). The importance of training and qualification of auditors are also very relevant for the national agencies; however, the support activities seem to be less important (55% consider average or low relevance). The importance of the qualification of auditors can be due to the transposition of the EED that explicitly include that audits must be “carried out in an independent manner by qualified and/or accredited experts”. Training and support activities are typically promoted and/or developed by national bodies. However, the incentives for developing audits in SMEs usually are not

directly funded but national government, but by regional/federal governments. Surprisingly, half of the respondents consider that information policies present an average/low relevance.

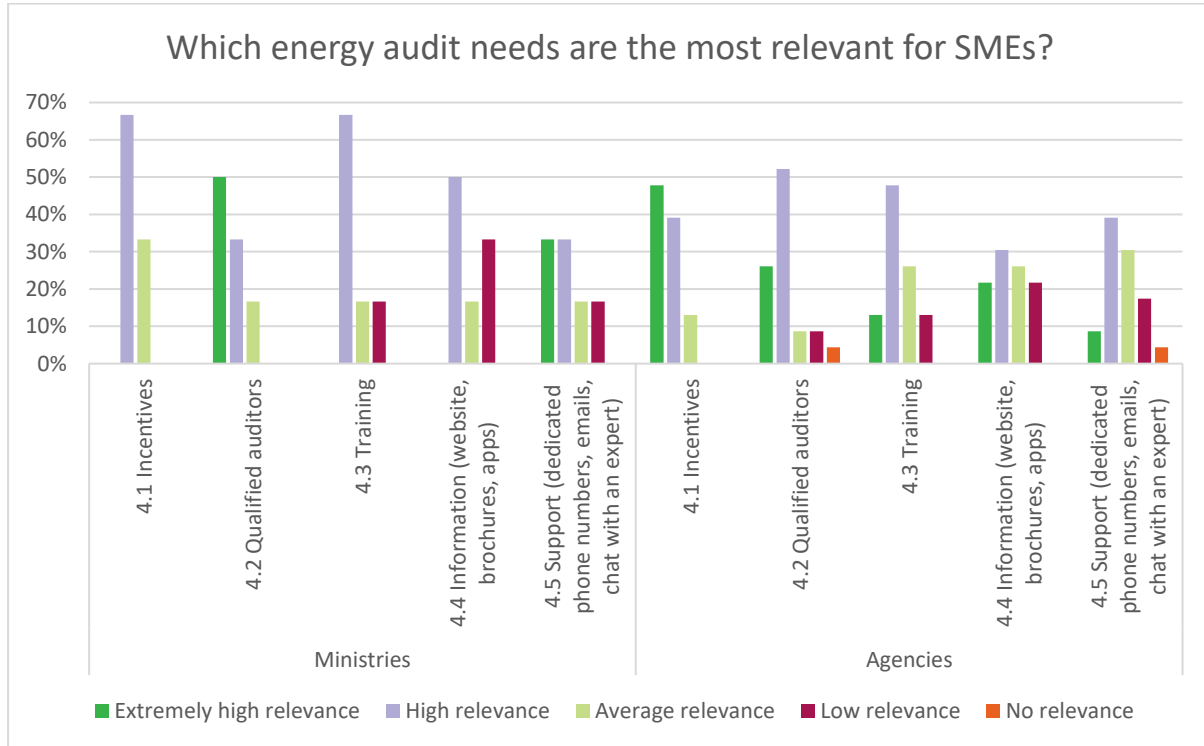


Figure 4 Question. According to your Organisation experience, which energy audit needs are the most relevant for SMEs? Answers from ministries and national energy agencies

The importance of incentives is particularly critical for the implementation of Energy Performance Improvement Actions (EPIAs) (figure 5) that present an extremely high/high relevance for the 96% of the national agencies and 66% of the ministries. The nature of the incentives is not described but they could be grants, loans and tax levies, and they can be linked to energy efficiency programmes (that generally include the development of energy audits) or stand-alone-programmes. The implementation obligations are not generally considered for SMEs, that are generally supported by voluntary agreements. For this reason, the main answer is “average relevance” and the number of respondents that consider high and low relevance is similar. The other actions are generally considered of high relevance (with a number of answer of extremely high/high relevance that spreads from 50% to 70%) with this prioritization: active support in information and capacity building, combination of energy efficiency with resources efficiency and multiple benefits, one-stop shops, and standardization support.



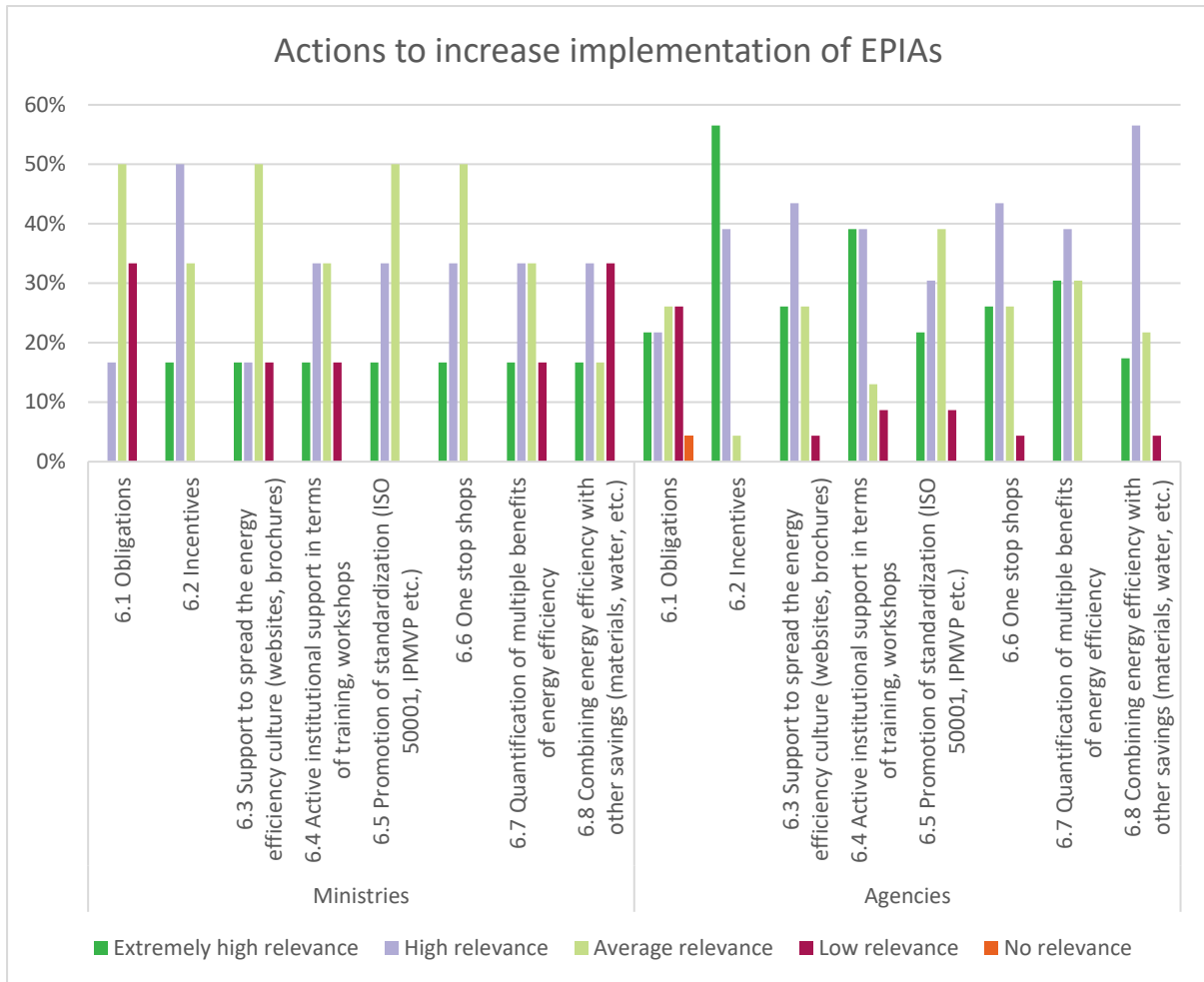


Figure 5 Question. To increase the implementation of the recommended measures for SMEs do you think it is better to concentrate the efforts on? Answers from ministries and national energy agencies

Tailoring the policies for SMEs is an effective way to increase the effectiveness of the mechanisms. Most of the respondents believe that consider the SMEs as a whole or only their size is an incorrect strategy (Figure 6). It is important to include the energy consumption of the SMEs (as included in the Art. 11 of the recast of the EED where the obligated companies are defined according to their energy consumption rather than non-SMEs status) and their economic sector. According to the agencies and ministries the policies must include the energy consumption and it is also recommended to include the sector (e.g. industry, tertiary) and the size of the enterprises (micro/small vs medium).

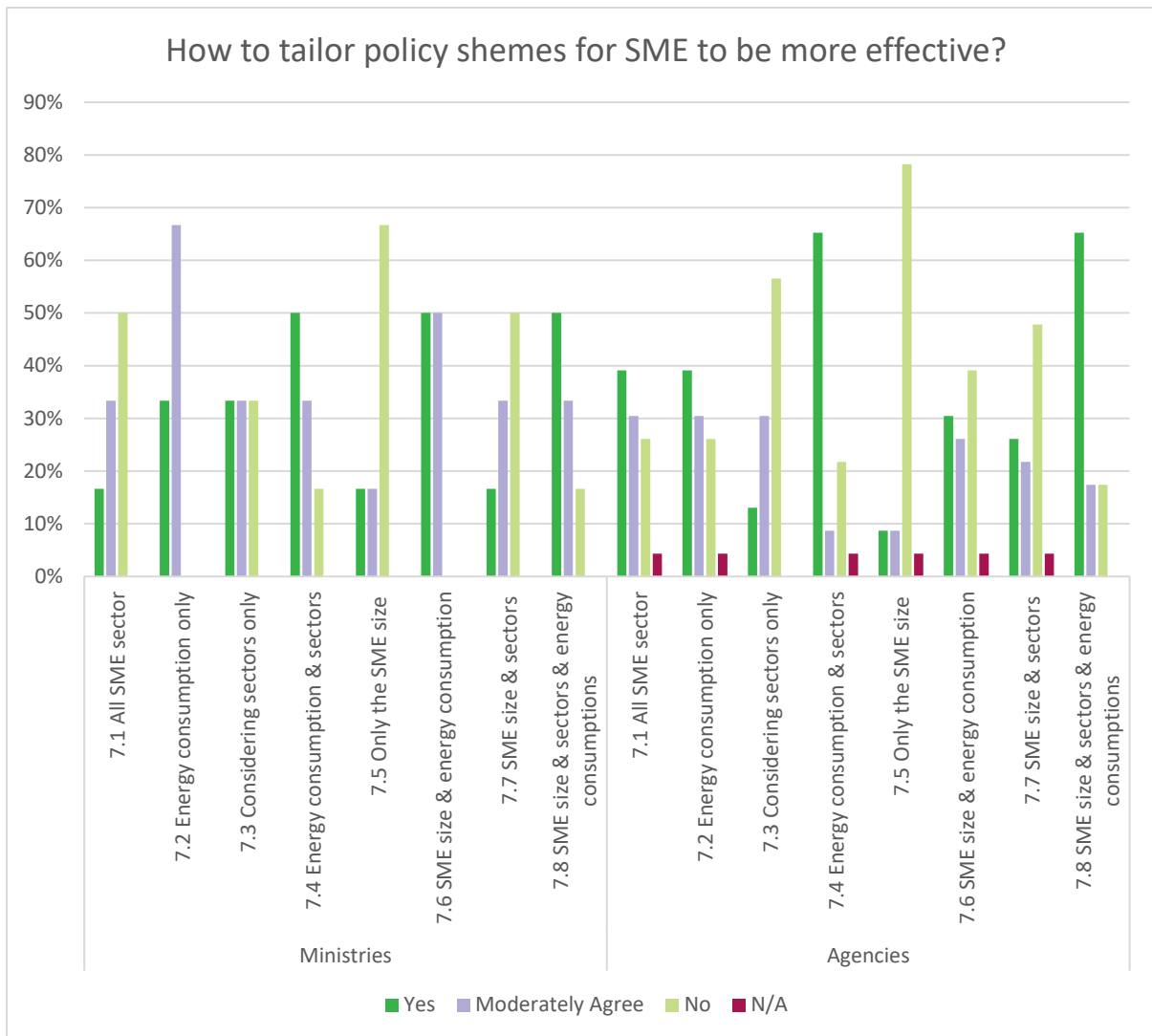


Figure 6 Question. How would you tailor policy schemes for SME in order for them to be more effective? Answers from ministries and national energy agencies

The question 9 was “Do you think that a support measure for energy audits, especially when giving financial support, should include an obligation to implement one or more energy efficiency measures?”. Hence, the aim is to understand the opinion on the link between the incentive for energy audits and the obligation of implementation of the EPIAs. On the one hand, for the ministries (Figure 7), the support to carry out an energy audit should be uncoupled from the obligation of implementation (except if there is an additional incentive for implementation), being only 33% of respondents favourable to the obligation. On the other hand, for the national agencies this opinion rises to 52%, with an additional 22% considering an additional incentive for implementation. Therefore, there is a different perception between

the obligation coupled with energy audits, being the tendency of the ministries to support only with voluntary tools but including more binding measures according to the national agencies.

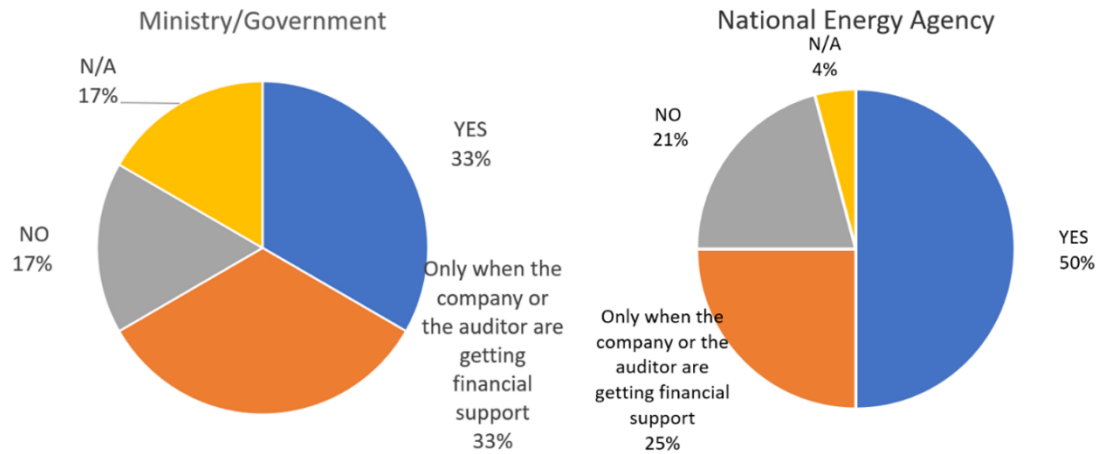


Figure 7 Question. Do you think that a support measure for energy audits, especially when giving financial support, should include an obligation to implement one or more energy efficiency measures? Answers from ministries and national energy agencies

A focus on the industrial SMEs has been analysed (Figure 8). Both national agencies and ministries consider that industrial SMEs should be obligated to carry out energy audits and to implement also EPIAs. It is plausible to suppose that these obligations should be considered only to the enterprises with certain energy consumption (as proposed in the recast of the EED). Moreover, most of the respondents consider the tax levies as a good option to fund the energy efficiency actions. The last question was related to extend the concept of energy poverty not only to families but also to micro-SMEs. This idea seems to be of interest to the ministries (67% of respondents agree) but to a less extent to the agencies (only 30%), maybe due to a different perception of measurement issues.

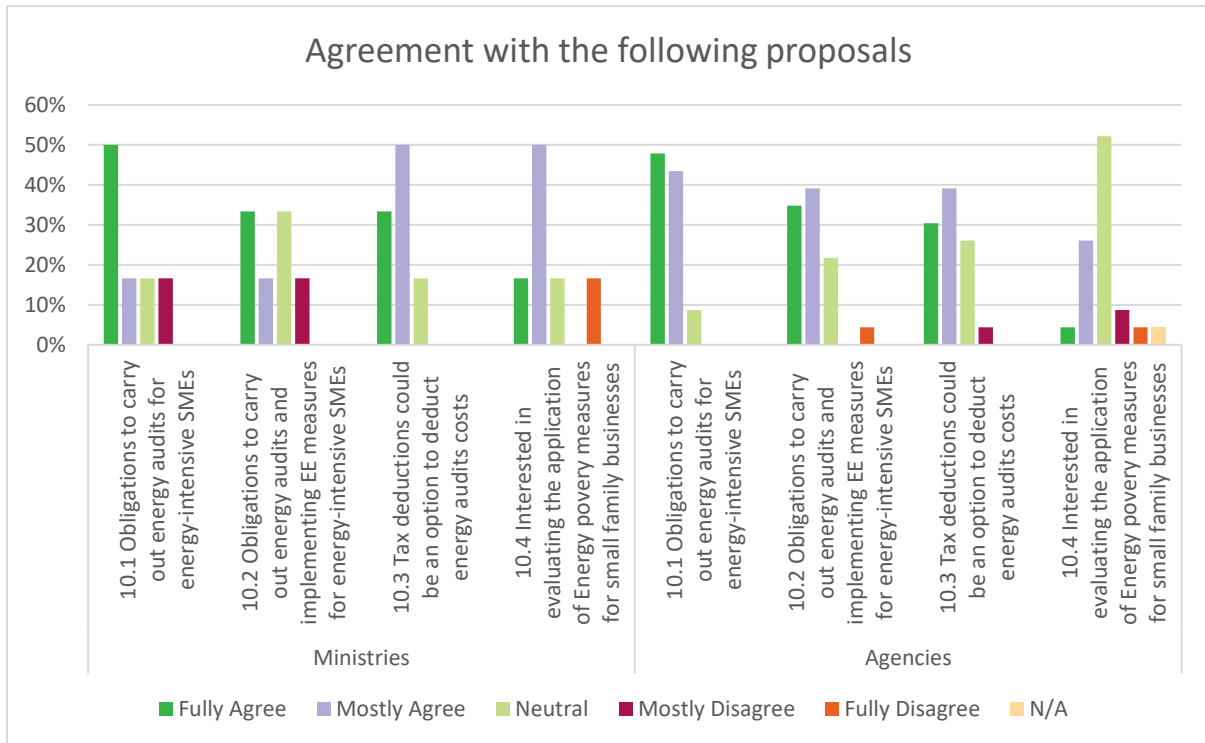


Figure 8 Question. Please express your agreement with the following proposals [list of proposals follows, 10.1 to 10.4 in figure] Answers from ministries and national energy agencies

Finally, the importance of multiple benefits of the energy efficiency has been evaluated on twelve different aspects (Figure 9). Three categories of interest have been characterized. The “high priority class” (where the importance of the multiple benefits is considered of Extremely high relevance/high relevance for more than 80% of the answers) is formed by four categories: 1) reducing energy costs; 2) reducing greenhouse gas emissions; 3) increasing the process overall efficiency; and 4) including renewable energy sources. The second class “important class” (extremely/high importance, 50-75% of the answers) include other four aspects: 5) increasing technological competitiveness; 6) improving the company's image; 7) reducing maintenance and operational costs; and 8) reducing raw materials consumption. Finally, the “low priority class” (<50% of the answer consider extremely/high importance) is formed by 9) increasing product quality; 10) implementation of innovative solutions; 11) improving air quality; and 12) improving water quality. It is possible to observe that “high priority class” is formed by the factors that impact on GHG emissions and reduction of costs, the “important class” is focused on economic aspects at company scale, and the “low priority class” with other environmental and product issues. These results should be compared with the opinion of the

SMEs in order to understand the alignment with policymakers. In a preliminary analysis<sup>3</sup>, some differences have been observed, mainly linked to aspects related to company's image and air quality that are considered priority by the enterprises (with low awareness on overall efficiency improvements).

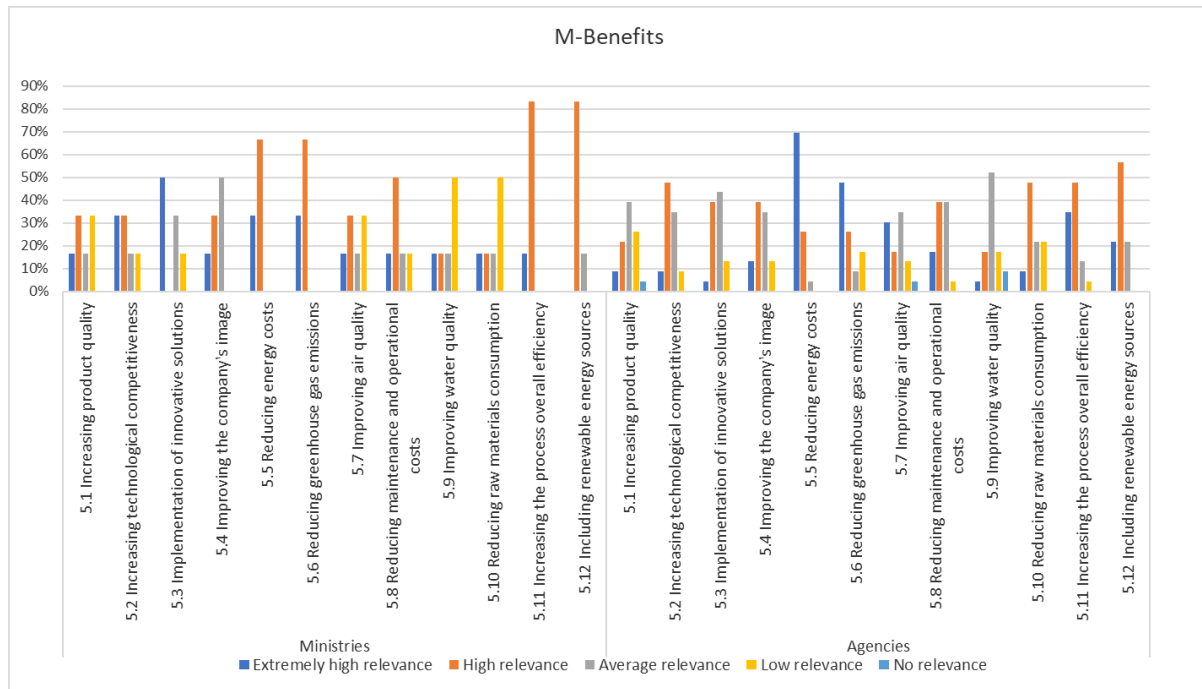


Figure 9 Question. Which co-benefits in your opinion can reasonably emerge from energy efficiency implementation measures in SMEs? Answers from ministries and national energy agencies

<sup>3</sup> Linking between multiple benefits and energy audits in SMEs. European Energy Efficiency Conference - World Sustainable Energy Days 2023 (WSED), Wels (Austria) 2-3 March 2023 <https://leap4sme.eu/wp-content/uploads/2023/07/LEAP4SME-Academic-Poster-Linking-multiple-benefits-and-energy-v3.pdf>

## 4. Policy insights for EE in SMEs in LEAP4SME countries

In this section some aspects related to the development of policies have been analysed internally to the consortium in the nine involved countries. Specifically, three aspects have been deepened. Firstly, interviews with key experts from LEAP4SME national energy agencies have been developed and the transcription is reported. Secondly, the national agencies have been explicitly asked about the best tailoring approach for the development of policies. And finally, a summary of previous results (partially unpublished) has been included: 1) detailed availability of data for policy; and 2) recommendations from current policies analysis.

### 4.1 Interviews with key experts from LEAP4SME national energy agencies

The project aims to disseminate the knowledge gained to a range of policymaker and non-policymaker stakeholders and to develop a set of policy recommendations which will be disseminated through capacity building exercises with key stakeholders.

Thus, some key topics have been discussed by conducting a short interview with senior leaders of the partners' energy agencies to gather their opinions on LEAP4SME. The interviews have been collected from the partners, lasted about 30 minutes and four questions were discussed:

1. What do you think is the most important barrier(s) to SMEs in adopting energy audits and energy efficiency measures?
2. What do you think are likely to be the most important support mechanisms for SMEs in adopting energy audits and energy efficiency measures?
3. What would your key message be to stakeholders/market players who are working with SMEs on energy efficiency?
4. What is your view how the LEAP4SME project can contribute to progress in the sector?

The senior leaders that provide feedback are:

- AEA (Austria) – Petra Lackner, Head of Center, and Konstantin Kulterer, Senior Expert, Center Commerce & Industry
- EIHP (Croatia) – Vesna Bukarica, Head of Energy Efficiency department
- CRES (Greece) – Spyridon Economou, President at Center for Renewable Energy Sources and Savings
- ENEA (Italy) – Ilaria Bertini, Head of the Italian National Energy Efficiency Agency and Director of the Energy Efficiency Department
- EWA (Malta) – Therese Galea, Senior Energy Analyst
- KAPE (Poland) – Dariusz Koc, Senior Leader in energy efficiency in enterprises and Managing Director
- ADENE (Portugal) – Manuel Casquiço, Head of Department of Programs and Initiatives
- SIEA (Slovakia) – Artur Bobovnický, Director of Innovations and International cooperation
- EST (UK) – Mike Thornton, Chief Executive

#### 4.1.1 What do you think is the most important barrier(s) to SMEs in adopting energy audits and energy efficiency measures?

AEA – The implementation of energy audits and energy efficiency measures do not completely present the same barriers. For implementing energy efficiency measures there can be a long path from awareness to financing and implementation. During this path many barriers can arise, e.g. lack of interest, lack of knowledge on the energy efficiency possibilities, lack of technology or providers, lack of knowledge of own process concerning energy consumption details, low energy prices, other priorities (e.g. other measures to increase turnover are more important, other costs are more important).

In micro and small enterprises, the energy consumption and energy costs could be quite low, e.g. in comparison to personnel costs. Especially in small and micro businesses, the owner is responsible for almost all aspects related to the main activity. There is no time and often not even the awareness to worry about energy efficiency.

The barriers to the adoption of energy audits are 1) Perception of uselessness due to lack of operational problems (only if you have a problem e.g. with energy supply or equipment use an audit will be initiated, or if there are plans to expand the facility); 2) Energy is not considered as a priority (energy saving, energy efficiency, CO2 reduction are not the main target of the company, but the achievement of quantitative and qualitative business targets); 3) Lack of awareness about the existence of possible improvements; 4) bad experience with energy auditors (price, report); 5) difficulty in finding a good consultant; 6) confidentiality issues, company strategy of not working with external auditors; 7) lack of knowledge of how to conduct an audit with internal resources; 8) lack of time to conduct energy audit internally or even externally; and 9) the energy auditor doesn't fully convey the potential benefits of an audit.

The barriers to the implementation of energy efficiency measures proposed by energy audit are 1) not fully understanding business needs; 2) no interest in the whole report (was done due to regulation); 3) high payback time; 4) irrelevant energy and monetary savings (too small); 5) too complex report; 6) other investment priorities; and 7) responsibility for implementation not clarified.

EIHP - There are various reasons for SMEs not investing in energy audits and EE measures. One of the most universal barriers, relevant also for Croatia, is lack of information and knowledge about costs and benefits of such activities. Depending on the type of SME, the reasons may lie in the low share of energy in overall business costs, lack of ownership of facilities in which business activity is performed (e.g. renting the building) and general lack of capacities to deal with issues that are not strictly related or legally binding on the business activity.

CRES - The most important barrier in adopting energy audits and energy efficiency measures is that the SME owners and/or managers are unable to recognize or quantify the clear benefit, which is not only financial but also environmental, improvement of the working environment and their social responsibility.

Since the impact of energy audits in SMEs is expected to be significant, due to the energy consumed in their operations, these audits should be enforced by the state, be mandatory so



that Europe can meet its energy efficiency and air emissions targets and achieve climate neutrality by 2050.

ENEA - We identify two main barriers to SMEs in adopting energy audits and energy efficiency measures: a “knowledge” barrier and an economic barrier. SMEs commonly lack in capacity, time and resources to work systematically with energy efficiency. They may need support to raise awareness about energy, to find a qualified expert for carrying out an energy audit and applying for audit financial incentives, to interpret the result of the audit itself. Support is also needed in implementing energy-efficient solutions, including how to finance them. These difficulties constitute all together a relevant barrier for implementing energy efficiency and renewable energy measures. Therefore, there is still a large potential for cost-effective efficiency improvements in SMEs.

There is also an economic barrier to be considered, because often SMEs find it difficult to access incentive mechanisms and therefore to invest in energy efficiency.

EWA - As an Agency we think that the lack of financial capital is the main barrier for SMEs in adopting energy audits and energy efficiency measures, which is why most of the schemes available aim to offer financial assistance. Another barrier faced by SMEs is the lack of available technical resources and the ever-increasing difficulty to find these. However, we believe that there are other barriers that we may not be aware of, which require a better understanding to be tackled appropriately.

KAPE - Several barriers exist. From the lack of awareness of the saving potential size, to the knowledge on the energy efficiency measures that can be applied, to low awareness of the share of energy costs in the costs of business activities. This has a clear negative effect on the demand for energy audits. SME owners generally see no reason to perform audits.

Another reason is the way in which the Energy Efficiency Directive has been implemented in Poland and the approach to audit as a mandatory document, but without any relevant significant additional value.

The lack of funding for energy efficiency investment from EU or national environmental funds where mandatory audit would be the prerequisite to achieve this kind of funding, also does not

encourage to undertake energy audits. There are also opinions that there is no point in carrying out an energy audit if there is no possibility of getting a grant for identified energy efficiency improvement measure on its basis.

ADENE - We believe that there are three relevant barriers that may be preventing SMEs from proceeding with the performance of energy audits and consequent implementation of energy efficiency measures.

The first is financial, since there is a need for an initial investment to perform the energy audit, as well as to implement the energy efficiency measures, that often these companies are not able to do.

The second is related to technical issues and the human resources that make it possible to carry out the necessary technical analysis, specialization, or financial feasibility that all projects must have.

Finally, we consider that there is some energy illiteracy, with lack of knowledge of the companies' managing directors, who do not know where to turn to evaluate what can be done, what measures they can implement, and also the direct and indirect benefits that result from their implementation.

SIEA - Lack of motivation to carry out energy audits. Energy audits are not mandatory for SMEs. They are motivated to carry out energy audits only in case they apply for governmental/European funding (structural funds etc.) and energy audit is a prerequisite. However, the application procedures are used to be rather too complicated, and this fact leads to high rate of errors in applications making the process very lengthy and painful. Negative experience leads many companies and mainly SMEs thinking the whole process is not worth it and energy audit is just another administrative burden. Therefore, the understanding of energy audit benefits and its importance is the most needed change among SMEs. Another barrier is the lack of internal competencies at SMEs in the whole process of energy management resulting in neglecting the energy audits.

EST – SMEs are viewed as non-core, non-essential businesses. They have limited administrative and management resource, with their main focus being on sales and survival.

Often without the resources to adopt energy audits and energy efficiency measures, instead these are seen as “nice to haves”.

It's important that accessibility and ease of use are front and centre of any support programmes. Any contact that I have with SMEs, they say that they don't really understand how their businesses work so they can't use support programmes. Sometimes this is a default position rather than reflecting reality. Sometimes need to go the extra mile to show that support programmes are accessible and can be useful.

The administrative hoops that they have to go through to access the support are a limitation. There is an issue with the support being “one-size-fits-all” and therefore is not that useful because the SMEs' sector is so varied – this needs to be considered carefully.

#### 4.1.2 What do you think are likely to be the most important support mechanisms for SMEs in adopting energy audits and energy efficiency measures?

AEA - There are two main drivers to promote the adoption of energy audits and energy efficiency measures. On the one hand regulatory obligations that induce the conduction of energy audits or meeting certain CO<sub>2</sub> or energy saving target. On the other hand, the economic driver can be the energy prices or the CO<sub>2</sub> tax for energy intensive sectors.

The tools to promote the implementation of energy efficiency can be the training of craftsmen like electricians and plumbers to make SME aware of their possibilities and advantages in energy efficiency improvements, the creation of energy (efficiency) networks, the simplification to handle investment subsidies, and the use of simple and appealing benchmarking tools.

EIHP – For sure, higher promotion of energy audits and EE measures among SMEs to raise their awareness on the benefits could help significantly. Sharing of the best practices and achieved results from the peers in the same branch would be, in my opinion, the best way to achieve this. Energy audits may reveal low hanging fruit in a company, that may bring reductions of energy bills from 5 to 15%, just by implementing some organisational and low-cost measures. These experiences should be shared in order to prove that energy audits are not just another piece of service, resulting in the document that has no other purpose. It also needs to be stressed that energy audits are the starting point in any analysis of EE and RES

use potentials, hence are likely needed for applying to available funds that provide financial support for such activities. This was, actually, the way funds were used in Croatia – energy audits needed to be performed prior to application for the funds and the funding could be obtained for measures identified in energy audit reports.

CRES - Support mechanisms for SMEs in adopting energy audits and energy efficiency measures should include, at least, rewards with tax benefits for the best performing SMEs.

In addition, governments should build energy consumption data bases for SMEs to justify that the “green” promoted projects or services are indeed produced with lean and green methods. Based on the data base SME classification, the EU member state governments should award the most energy efficient SMEs with a Seal of Energy Efficiency Excellence (SEEE).

The SMEs that adopt a social and environmental responsible approach of operations and receive the SEEE should be further rewarded by the EU member-states with extended publicity, but also, a preferential status which will allow the “green” SMEs, for example, to participate in various financial support measures with increased percentages of state funding.

Note: The SMEs’ energy efficiency performance reports should be issued by third independent and certified bodies.

ENEA - There are several policy instruments and measures to implement energy savings and/or efficiency in SMEs: White Certificates Mechanism, Thermal Account 2.0, National Energy Efficiency Fund (to finance interventions), Industry 4.0 Plan. In addition, some further resources for the enterprises may be deployed by the forthcoming recovery plan. The most important support we can offer to the enterprises will probably be to correctly guide enterprises and professionals in accessing the available funds. According to the Italian NECP (National Integrated Energy and Climate Plan) the saving objective for 2030 is 1 Mtoe for the industrial sector (that is the difference between the estimates of industrial final energy consumption in the reference scenario and in the policy scenario). The development described in the Italian NECP – under review at the end of April 2021- shows that the final energy savings from new measures promoted with the White Certificates scheme could reach 1.3 Mtep in 2030.

EWA - We believe that there are two very important support mechanisms that can help SMEs adopt energy audits and energy efficiency measures, firstly financial aid (i.e., the provision of grants and subsidies) to undertake energy audits and implement energy efficiency measures. We believe that financial assistance helps with alleviating some of the costs of energy auditing and energy efficiency investments, thus making the investment more attractive to SMEs.

Secondly, information and awareness raising campaigns targeted specifically towards SMEs. SMEs may not be fully aware of the energy and non-energy benefits of energy auditing and energy efficiency measures in the long term. Hence, SMEs may view such investments as unprofitable. For this reason, we believe that tailored information campaigns are key to influence the perspective of the corporate management.

KAPE - I suppose that a good solution would be to actively engage SMEs in the planned process of decarbonisation the economy in the perspective of 2050, by creating a system to reward SMEs for their activity in reaching this goal. As an example, could be various types of bonuses and refunds of partial investments costs (specified at the investment planning phase) for investments made or planned in a system generating low transaction costs, operating efficiently (the entire process takes no more than one month) and on transparent terms.

Another example could be a system, which would be similar to the Energy Efficiency Certificates – White Certificates (currently operating system in Poland), but without waiting several years for the decision of the Energy Regulatory Office and without complications in the form of having to trade securities on the Polish Power Exchange. The transactions should be based on a simple and clear valuation of the amount of support (depending on the type of investment) for a specific catalogue of measures, the audit should take the form of a check list, and the formalities should be manageable in a "one stop shop" model. This could apply to investments generating up to 50 toe of energy savings per year, perhaps even up to 100 toe. Experience shows that for large investments, above 100 toe savings per year, it is always worth doing a full energy audit. Such a scheme could be of interest to SMEs.

Also the subsidies to the costs of carrying out audits could help, but under the condition that the investment identified and analysed in the energy audit would be implemented. Otherwise, the SMEs would have to pay back the grant amount. This would support efficient planning and spending money for different investments in energy efficiency.

ADENE - The mechanisms to be adopted must help to overcome the previously identified barriers. From a financial point of view, companies can use banking directly, Energy Services Companies (ESCOs) that are available to make investments, and other more innovative mechanisms, such as crowdfunding platforms that charge reduced commissions to raise the money needed to implement the energy efficiency measures.

More recently, with the availability of community support lines due to the COVID-19 pandemic, many European countries provide support and financing lines for the implementation of these measures.

At a technical level, there are several options that can be used, the first one is related to the training of human resources, with the possibility for the company's technicians to obtain specific training on energy efficiency. Alternatively, it will be possible to use outside consulting companies, which can provide this service by paying a certain amount. It is also possible that the ESCOs themselves provide this support, but in this case the know-how will always be on the side of the external service provider.

In terms of energy literacy, it is our understanding that national entities, as is the case with energy agencies, can play an important role in the dissemination of best practices in these matters, and thus reach out to the SMEs' top management elements.

SIEA - Currently the most important mechanisms are Operational programme quality of environment and programme SloVSEFF III<sup>4</sup>. For the future development of energy audits in SMEs an important tool should be easy access for competent support in preparing application/projects for funding as well as motivation through various incentive options, e.g. tax reduction or deduction in case they invest in energy saving measures.

EST - Energy audits need to be supplied to SMEs by people that have business understanding and can talk their language. Avoiding the upfront costs is important for SMEs because they don't want to take on additional debt burden even if there is good payback (not entirely true interest free loans are an example in Scotland). If SMEs are to receive support for measures, they don't want to have to pay for it and then get the money back, they want the support

---

<sup>4</sup> [The Slovak Energy Efficiency and Renewable Energy Finance Facility \(SLOVSEFF III\) – Policies - IEA](#)

programme to pay the invoices direct on the agreed basis of the support measures, so they don't have to increase their overdraft to manage the initial capital spend for example. There is a psychological element to it, if SMEs have a back-to-back loan agreement with their banks, they could ask for additional financing for a month to pay to install equipment for instance, but in practice they aren't going to do that because would require the bank to require all of the financial materials in order to agree the adjustment. There is a lot of "stickiness" in these mechanisms.

Simplifying the support mechanism – financial support is key, reducing the hoops.

Need to keep the lowest possible balance between due diligence and bureaucracy. There's an important point. The difficulty is that public money is needed for these schemes, which requires necessary diligence, however at the same time, you cannot eliminate every risk. The public body governing the programme needs to agree in advance the level of risk comfortable with taking and then adapt the cheques and balances within the programme to match the level of risk. The Scottish and Welsh governments have done this in some of their schemes.

The temptation is to include a mechanism to eliminate all risks, but at 3% risk requires additional administrative burden on the recipient in order to address that risk. Sometimes must accept appetite for risk so that the scheme is still accessible. There needs to be a risk management approach to the support i.e. price the risks at the beginning into the interest rates. The difficulty with public bodies, is that government doesn't have the opportunity to do that in the same way but can still take a risk based system and trade off between the amount of risk for accessibility and ease of use because. Very often they don't do that, and instead they provide a list of all the risks and mitigation measures that the businesses need to do which creates too much burden on the SMEs and reduces the overall uptake of the scheme.

It's important that you shouldn't have just financial support without the energy audit at the beginning. We need to recognise that SMEs generally don't have any idea what the best options are for sustainable energy and energy efficiency, and at the same time having various people trying to sell them "energy saving" products and systems with payback of X years. From a public body point of view, want to invest in the products with the best payback, but the SMEs need to have support to identify these.



### 4.1.3 What would your key message be to stakeholders/market players who are working with SMEs on energy efficiency?

AEA - It is relevant to give the message that it is important to start (or to continue) to improve your business and processes, incl. energy efficiency as a competitiveness driver.

Other important aspect is to offer regional and sector specific support programmes. In order to be more effective, it is crucial to find out 1) which actors SMEs listen to the most, namely those that are on site and can convince or advise the entrepreneurs (they could be electricians, plumbers, chimney sweepers but also e.g. tax consultants); and 2) which trainings different actors would need to support SMEs in becoming more energy efficient.

EIHP - Provide SMEs clear guidance of cost and benefits of EE measures to enable them to make informed decisions on their implementation.

CRES - Services and products provided by all SMEs should be compliant to the social and environmental goals of the UN, the Paris Agreement, and the EU Green Deal.

Therefore, the key message to stakeholders and market players who are part of the value chain, within the cyclic economy, the energy, and industrial transitions framework, should be “think green and responsibly”.

All stakeholders should be accountable for energy efficiency measures and provide further, within the SME value chain, energy efficient services and products (“green supplies”).

ENEA - Surely the key message is to underline the importance of carrying out a quality energy audit to obtain significant savings in energy efficiency in SMEs both in the industrial and tertiary sectors. In Italy a new operational plan (2021-2030) has been developed to encourage SMEs to carry out energy audits in their production sites. The plan includes training activities, extensive collaboration with business associations to develop sectoral guidelines and tools for a first self-assessment of energy consumptions. We strongly encourage market stakeholders and local Authorities to get involved in these initiatives and be in touch to overcome together some of the barriers to energy efficiency in enterprises.



EWA - Our key message to stakeholders would be to have an open dialogue with SMEs in order to gain a better understanding of their needs, vis a vis their respective economic activities and the challenges they face with regards to energy auditing and energy efficiency projects.

KAPE - SMEs in Poland is a sector that has limited capacity for independent analysis, preparation and implementation of investments in improving energy efficiency (there are no dedicated departments, employees or specialised organisational units). Also, the share of energy costs is lower than in more energy-intensive heavy industries, so identifying potential projects, analysing them and assessing their efficiency in the SME sector is relatively more difficult.

It will therefore be crucial to provide SMEs with easy-to-use and easy-to-understand tools for at least a preliminary identification of energy efficiency potential and identification of projects, indicating which projects are worth pursuing as well as which of the identified investments would require the support of external experts (specialised auditors). Such tools could be complemented by a "one stop shop" platform, where one could apply for financial support for the implementation of measures. If it was possible to build such a system, it would be of key importance for it to be durable and stable in operation over a few years as it will take quite a long time for SMEs to be interested in such a proposal and to build their trust.

ADENE - This is a job that cannot be done in a short period of time, it is a continuous work, with a constant effort to communicate and try to transmit the added value of promoting energy efficiency. If there is anything that can be passed on to stakeholders, it is innovation. Innovation can break with the current paradigm, the advantages of energy efficiency are obvious with the reduction of energy bill costs, it is therefore important to communicate in another way, to innovate, in order to be able to transmit ideas in a better way to the stakeholders.

SIEA - Be empathic and patient. The awareness building needs stick and carrot approach, but carrots must dominate. SMEs have to get clear picture of benefits that energy audits will bring them and to their business performance.

EST - Stakeholders, including governments, have to offer a very simple proposition which doesn't overburden the SMEs and gives them a credible return on their investment. Most of the financial support programmes is not that different from the proposition of an energy service provider, i.e. come and do this thing, it's worth doing because it will save you money. The government can offer individual measures instead of a holistic approach, because it is offering support rather than a wrap around service. The underlying proposition of an energy service provider and government are quite similar and have similar barriers – an energy services stakeholder wants to have a very simple offering to guarantee savings (they can't afford a more sophisticated approach to speak to energy managers). Complicated programmes will put off SMEs if they can't assess the risks.

COVID – a lot of business support available at the moment that could be given green parameters, so there is more leverage than useful e.g. you need to have an energy audit to receive the support to access some financial instrument.

At the moment a lot of businesses aren't trading as they useful would, therefore a good time for someone to undertake an energy audit because the businesses aren't operating a typical capacity.

#### 4.1.4 What is your view how the LEAP4SME project can contribute to progress in the sector?

AEA - There are three topics that should be deepened. Firstly, to analyse which programmes went well and why, which pitfalls should be avoided, which Improvements of current energy audit programmes. Secondly, to identify main stakeholders who can act as “energy efficiency messenger”. And, thirdly, to establish specific trainings for the messengers and regional / local policy makers.

EIHP - The project partners should seek for partnerships with associations that are gathering SMEs (like chambers of economy, or associations of employers, or entrepreneurs) and through these networks communicate the benefits from energy audits and EE measures. However, this promotion should not be based on the theoretical “this is good and you should

do it” messages, but on real-life best practices and achieved results from the peer SMEs in same or similar branches. Based on strong communication with SMEs and investigation of their needs and barriers, the LEAP4SME project could prepare a policy paper with recommendations for policy makers to establish appropriate support measures for EE in SMEs. Establishment of energy management system should also be promoted.

CRES - The LEAP4SME project should support policy makers so they can build specific, measurable, and realistic measures, covering all economic activities in EU member-states.

This can be achieved, with an innovative training and capacity building programme for policy makers which will be designed, created and implemented within the LEAP4SME project, taking into account SMEs operating in every market sector, for SMEs that manufacture products or offer services.

ENEA - LEAP4SME can truly represent a turning point for the development of energy efficiency policies and practices in SMEs. Mapping the characteristics of the various SMEs, sharing best practices at European level, comparing the various support mechanisms, allows the various Member States to have a broader and more precise global vision on the European (and national) context of SMEs, going to identify the most correct methodologies and solutions to increase energy efficiency. The first technical project outcomes are already being used as a reliable knowledge base for ENEA’s activities in art. 8 policy implementation.

EWA - We believe that the LEAP4SME project will play a key role in understanding and working towards how to increase energy auditing and energy efficiency projects among SMEs as it will help The Energy and Water Agency identify the challenges faced by SMEs and build capacity on other knowledge gaps with regards to current policies and support mechanisms. This information and knowledge shall then be used to improve already established schemes and policies, possibly even contributing to the development of new ones.

KAPE - The LEAP4SME project aimed at supporting the policy development of energy audits in enterprises may be an extension of the activities so far carried out by KAPE together with the Ministry of Climate and Environment under the project "Energy in SMEs" funded by the

SRSS programme. This project has prepared a toolkit<sup>5</sup> to support energy efficiency improvements in SMEs, including online training, good practice manuals and those on energy audits and self-audits, as well as a calculator for optimising energy consumption in an enterprise, etc.

The LEAP4SME project will also show good practices from all over Europe to both SMEs and regulatory bodies in Poland. Cooperation with LEAP4SME stakeholders will help to develop the optimal financial support system for detailed audits for SMEs and the financial support system for investment implementation.

ADENE - It is important to work on the barriers identified and in this sense the project contains the necessary activities, both from the main energy efficiency measures' point of view, considering the companies' size, as well as the development of a set of communication and training actions to communicate the added values.

The proximity policy proposed by the project seems to us to be one of the main measures envisaged here, that is, it is necessary not only to communicate these advantages, but also to ensure its implementation and monitor as far as possible their evolution.

We also consider relevant the proposal of recommendations at the policy level, that can effectively lead to legislative changes if they occur to streamline the process necessary to implement energy efficiency measures.

Finally, we consider it is important to exchange experiences at a European level, since there are different panoramas and this exchange of ideas can be extremely positive, so that the best practices can be replicated in other Member States.

SIEA - It has good chance to become a game changer when done properly. In order to be done properly we need experience from our partners who already performed various campaigns for uptake of energy audits. We need to have a chance to share these best practices among the target group and we will join the forces with our other programmes to deliver the messages effectively.

---

<sup>5</sup> [Home page - Efficiency of energy use in small and medium sized enterprises - Gov.pl website \(www.gov.pl\)](http://www.gov.pl)

EST - It seems reasonably clear that there isn't much knowledge of what is done elsewhere, so sharing of good practice at European level is quite powerful in this sector. The context which SMEs operate in is different in different countries, but there are many similarities so therefore should be a lot of read across. Policy makers don't like to be first movers – can use case studies from other countries as motivation for innovation, even if not at European level. This is a nut that is not cracked. Looking at the Scottish example, offers up to £100k interest free money, including energy audit, done by people with SME business background, has a low take up. If looking at the number of SMEs that have taken up the scheme versus the number of SMEs in Scotland, it's insignificant. Most SMEs are not engaged with this agenda. Most SMEs programmes have been ticking along. There is provision of support for SMEs, but the uptake is relatively low. From a policy perspective, this is fine but from a Net Zero perspective, it isn't enough to meet the targets.

There will have to be a lot more support in this area in order to get the various EU and national carbon emissions under control. The sector needs more government support, because without it the sector will be off the net zero pathway. Which means that either net zero targets are missed or the businesses will have a really hard time because they are running a high carbon operation in a low carbon economy, they are doing things in the wrong way which is bound to have an economic impact on them.

What are member states government's net zero pathways for these sectors? Once you have the pathway you need to look at the support, and then cost it and be prepared to provide the necessary investments from the private sector.

Government isn't going to pay the investment costs of 100,000s of SMEs. So ultimately it isn't going to be direct support in the end that will transform the sector because the costs are too great. Net Zero should be driving an approach that is regulatory that is aimed at releasing private sector funds into these businesses rather than the government providing direct. It needs to start with consideration of the net zero pathway, who is going to pay for it, and how it is going to be implemented.

Governments reluctant to provide funding because the SMEs are commercial enterprises that should have access to private capital, so there is direct financial support, but it is known that the take up won't be very high. The service is there but isn't used, therefore the government can pay for it but as soon as all SMEs are accessing the support then it's unaffordable.

Governments could guarantee loans or pay the interest instead of the capital, which would make the funds go further although the upfront cost of conducting energy audits at scale would be large. If energy service companies saw this as a market, then governments wouldn't have to deal with this at all, however difficult to make the market appealing because SMEs various, fragmented and numerous, which doesn't make a good market for financial services.

Hence the key points are the knowledge sharing across partner countries – learning from innovative policies, and to encourage more uptake of existing schemes.

## 4.2 Preferred practices for policy

The partner agencies of the project have been enquired about their preference for tailored policies. Explicitly, the question was “For energy efficiency in enterprises policy purposes (specifically for energy audits/energy efficiency programmes) it may be useful to consider different subsectors in-depth analysis or split when dealing with the SME sector. Please express your opinion on a possible split of the SME sector/definition to be then put in consultation with relevant Stakeholders in LEAP4SME next steps” the options provided were:

- Option 1) Three sub-categories: energy intensive SMEs, medium consumption SMEs, low consumption SMEs;
- Option 2) Four sub-categories: energy intensive SMEs, medium consumption SMEs, low consumption SMEs, very low consumption SMEs (e.g. small family businesses in the food and beverage sector, small offices);
- Option 3) Three-four categories according to the most relevant sectors (industry, tertiary, transports...);
- Option 4) a further in-depth analysis per sector and dimension;
- Option 5) a different solution (please write it in the white box "comments")

The preferred option was the option 3 (Figure 10): tailor the policies as function of economic activity sector. Two agencies suggested to base the policies as function of energy consumption in three levels. The other three agencies suggested combined approaches:

- ADENE: Considering the purpose “energy audits”, and from a practical point of view, the most appropriate is option 3 (sector approach). The NACE macro sectors could inspire a “per sector” classification of SME. If the purpose is also to develop “energy

efficiency programmes”, with SME prioritization and goals, the option 4 (sector + dimension) may be the most appropriate for an in-depth and most complete approach.

- ENEA: Both options 1/2 (Energy consumption category) and 3 (Economic Activities) should be considered and merged. The threshold for the definition of different energy-intensive SMEs could be different in various sectors, and then also shared with some relevant stakeholders for further development in the policy WP. For the Italian industrial context a reasonable threshold of 1 GWh/year of electricity consumption for energy intensive SMEs, a threshold between 1 and 0,5 GWh/year for medium consumption, under 0,5 GWh/year for low/very low consumption. For the tertiary sector and transport threshold would be different (i.e. the overall consumption of a tertiary high consumption SME will be probably similar to a medium/low energy consumption industrial SMEs).
- EST: Dividing by sector and energy consumption are both important. Suggestion is to have three to four sector categories, each sector divides SMEs into significant and non-significant energy users (for example over or under 500 toe per year). This would result in six to eight categories in total.

Hence, the opinion of LEAP4SME partners is that the policies must include the energy consumption and also the sector (industry, tertiary...), and it is recommended to include the size of the enterprises (micro/small vs medium).

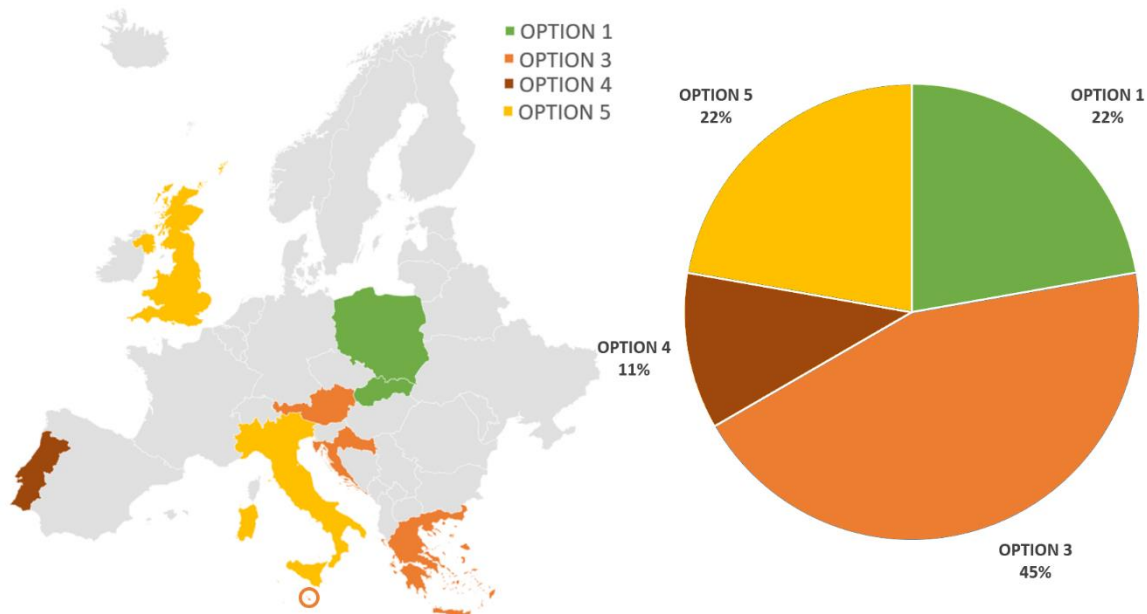


Figure 10 Preferred options to tailor EE policies in SMEs for LEAP4SME partners



## 4.3 Summary of previous results

### 4.3.1 Availability of data for policy

In order to provide scientific evidence for policymaker, it is important to provide the more detailed data and statistics as possible. A more detailed analysis of the work carried out in “D2.1 Mapping SMEs in Europe: Data collection, analysis and methodologies for estimating energy consumptions at Country levels” have been developed and extended to other countries in EU<sup>6</sup>.

A detailed analysis of different energy data KPI importance and availability has been carried out in “D3.1 Guideline document on SMEs selection criteria and stakeholders engagement”.

On the basis of the results from the internal consultation to the 9 National Energy Agencies involved in the project, relevant information has been gathered on the level of availability of KPIs, the impact of each proposed KPI on the policy development/implementation and the Agencies’ expert opinion on the difficulties in implementing the indicator itself.

Proposed KPIs were divided into 3 groups:

- General sector KPIs – referred to all enterprises, both large and SMEs.
- General SMEs sector KPIs – referred only to SMEs
- Sectorial KPIs – referred only to SMEs.

KPIs relate to the general characteristic of the sector, energy consumption, energy production, energy sources, energy intensity, cost of energy, CO<sub>2</sub> emissions, energy audit, energy efficiency and energy saving (potential and implemented).

General sector KPIs are mostly available or partially available in partner countries. However, the energy-related KPIs are usually not available or available only for limited sample of SMEs or specific SMEs sub-sectors.

The data availability and importance of the KPIs are codified as presented in Tab 5









---

<sup>6</sup> Herce C., Biele E., Martini C., Salvio M., Toro C., Brandl G., Lackner P., Reuter S. A methodology to characterize energy consumption in small and medium-sized enterprises at national level in European countries (2023) Clean Technologies and Environmental Policy, In press.

<https://doi.org/10.1007/s10098-023-02606-z>



Table 5 – Key of data availability and importance of energy information

DATA AVAILABILITY	
Available and accessible	
Available and partially accessible	
Available but not accessible	
Partially available	
Not Available	
DATA IMPORTANCE	
High	
Medium	
Low	

The high level KPIs (general sectors) for each country is relatively available when associated to national statistics and Eurostat databases (Table 6 and 7). Particularly, the energy information is reduced compared to economic data, and it is difficult to analyse the link between energy costs and its impact in economy of the different sectors.

However, when the data are referred specifically to SMEs, the availability is dramatically reduced (Tables 8, 9, 10 and 11). This information is generally excluded from official statistics and mainly contained in projects and studies related to specific sectors and the impact of specific tools (for example the impact of incentives for energy audits in energy intensive industries including SMEs, or implementation of environmental management systems in SMEs).

Table 6 – Data availability of sectoral KPIs (SMEs and non-SMEs) energy statistics by country

	Type	KPI	Austria	Croatia	Greece	Italy	Malta	Poland	Portugal	Slovakia	UK
1. GENERAL SECTOR KPIs	General	Number of enterprises by sector	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Number of enterprises in EU-ETS	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Mean size of enterprise in the sector	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Sector included in EU-ETS	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Share of micro companies (0-9 employees)	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Share of small companies (10-49 employees)	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Share of medium companies (50-249 employees)	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Share of large companies (+250 employees)	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Energy Consumption	Final energy consumption in total / Net energy consumption	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Thermal final energy consumption	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Share of heating, cooling and heat consuming industrial processes on net energy consumption	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Electrical final energy consumption in enterprises in total	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Share of electricity consuming	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Transportation fuel final energy consumption	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Share of transport energy/fuel net energy consumption	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Other final energy consumption	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Share of other	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	CO2 emmissions	CO2 emissions per energy consumption in enterprises	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Energy Intensity	(Final/Net) Energy consumption per unit of value added/turnover in enterprises	✓	✓	✓	✓	✓	✓	✓	✓	✓
		(Final/Net) Energy consumption per unit of product	✓	✓	✓	✓	✓	✓	✓	✓	✓
		(Final) Energy consumption per employee in enterprises	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Cost of energy	Share of energy costs in the total costs incurred by enterprises	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Share of energy costs in the turnover incurred by enterprises	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Share of energy costs in the total GVA by enterprises	✓	✓	✓	✓	✓	✓	✓	✓	✓
		GVA per energy consumption in enterprises	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Potential Sector	Potential to develop/implement EE mesures/actions	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Share of overall savings potential compared to net energy consumption.	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 7 - Data importance of sectoral KPIs (SMEs and non-SMEs) energy statistics by country

	Type	KPI	Austria	Croatia	Greece	Italy	Malta	Poland	Portugal	Slovakia	UK
1. GENERAL SECTOR KPIs	General	Number of enterprises by sector	●	●	●	●	●	●	●	●	●
		Number of enterprises in EU-ETS	●	●	●	●	●	●	●	●	●
		Mean size of enterprise in the sector	●	●	●	●	●	●	●	●	●
		Sector included in EU-ETS	●	●	●	●	●	●	●	●	●
		Share of micro companies (0-9 employees)	●	●	●	●	●	●	●	●	●
		Share of small companies (10-49 employees)	●	●	●	●	●	●	●	●	●
		Share of medium companies (50-249 employees)	●	●	●	●	●	●	●	●	●
	Share of large companies (+250 employees)	●	●	●	●	●	●	●	●	●	
	Energy Consumption	Final energy consumption in total / Net energy consumption	●	●	●	●	●	●	●	●	●
		Thermal final energy consumption	●	●	●	●	●	●	●	●	●
		Share of heating, cooling and heat consuming industrial processes on net energy consumption	●	●	●	●	●	●	●	●	●
		Electrical final energy consumption in enterprises in total	●	●	●	●	●	●	●	●	●
		Share of electricity consuming	●	●	●	●	●	●	●	●	●
		Transportation fuel final energy consumption	●	●	●	●	●	●	●	●	●
		Share of transport energy/fuel net energy consumption	●	●	●	●	●	●	●	●	●
		Other final energy consumption	●	●	●	●	●	●	●	●	●
	Share of other	●	●	●	●	●	●	●	●	●	
	CO2 emmissions	CO2 emissions per energy consumption in enterprises	●	●	●	●	●	●	●	●	●
	Energy Intensity	(Final/Net) Energy consumption per unit of value added/turnover in enterprises	●	●	●	●	●	●	●	●	●
		(Final/Net) Energy consumption per unit of product	●	●	●	●	●	●	●	●	●
		(Final) Energy consumption per employee in enterprises	●	●	●	●	●	●	●	●	●
	Cost of energy	Share of energy costs in the total costs incurred by enterprises	●	●	●	●	●	●	●	●	●
		Share of energy costs in the turnover incurred by enterprises	●	●	●	●	●	●	●	●	●
		Share of energy costs in the total GVA by enterprises	●	●	●	●	●	●	●	●	●
		GVA per energy consumption in enterprises	●	●	●	●	●	●	●	●	●
	Potential Sector	Potential to develop/implement EE mesures/actions	●	●	●	●	●	●	●	●	●
		Share of overall savings potential compared to net energy consumption.	●	●	●	●	●	●	●	●	●

Table 8 - Data availability of sectoral KPIs (only SMEs) energy statistics by country

	Type	KPI	Austria	Croatia	Greece	Italy	Malta	Poland	Portugal	Slovakia	UK	
1. GENERAL SMES	General	Number of SMEs by sector	✓	✓	✓	▲	▼	✓	✓	▲	✓	
		Mean size of enterprise (SME) in the sector	✓	▼	✓	▲	▼	✓	✓	▲	✓	
	Energy Consumption	Final energy consumption in total / Net energy consumption	▼	✗	✓	▼	✓	▼	▼	▲	✓	
		Thermal final energy consumption	✗	✗	✓	▼	✗	✗	✗	▼	✗	
		Share of heating, cooling and heat industrial processes	✗	✗	✓	▼	✗	✗	✗	✗	✗	
		Electrical final energy consumption	✗	✗	✓	▼	✗	▼	✗	▼	✗	
		Share of electricity consuming	✗	✗	✗	▼	✗	✗	✗	✗	✗	
		Transportation fuel final energy consumption	✗	✗	✓	▼	✗	✗	▬	✗	✗	
		Share of transport energy/fuel consumption	✗	✗	✓	▼	✗	✗	▬	✗	✗	
		Other final energy consumption	✗	✗	✓	▼	✗	✗	▼	✗	✗	
		Share of other	✗	✗	✓	▼	✗	✗	▼	✗	✗	
		SECTOR KPIs	CO2 emmissions	CO2 emissions per energy consumption in enterprises	▼	✗	✓	▼	✗	▼	▼	✗
	Energy Intensity		Energy consumption per unit of value added/turnover in enterprises	▼	✗	✓	▼	✗	▼	▲	✗	✗
		Energy consumption per unit of product	✗	✗	✗	▼	✗	✗	▲	✗	✗	
		Energy consumption per employee in enterprises	✗	✗	✓	▼	✗	✗	▲	✗	✗	
		Fleet Management - Energy consumption per passenger.km	✗	✗	✗	✗	✗	✗	▬	▲	✗	
		Fleet Management - Energy consumption per ton.km	✗	✗	✗	✗	✗	✗	▬	▲	✗	
	Cost of energy	Fleet Management - Energy consumption per vehicle.km	✗	✗	✗	✗	✗	✗	▬	▼	✗	
		Share of energy costs in the total costs incurred by enterprises	✗	✗	▼	▼	✗	✗	✗	✗	✗	
		Share of energy costs in the total GVA by enterprises	✗	✗	✗	▲	✗	✗	✗	✗	✗	
Potential Sector	GVA per energy consumption in enterprises	▼	✗	✗	▲	✗	▼	✗	✗	✗		
	Potential to develop/implement EE mesures/actions	✗	✗	✗	✗	✗	▲	▼	▲	✗		
		Share of overall savings potential compared to net energy consumption.	✗	✗	✗	✗	✗	▼	▼	▲	✗	

Table 9 - Data importance of sectoral KPIs (only SMEs) energy statistics by country

	Type	KPI	Austria	Croatia	Greece	Italy	Malta	Poland	Portugal	Slovakia	UK	
1. GENERAL SMES	General	Number of SMEs by sector	●	●	●	●	●	●	●	●	●	
		Mean size of enterprise (SME) in the sector	●	●	●	●	●	●	●	●	●	●
	Energy Consumption	Final energy consumption in total / Net energy consumption	●	●	●	●	●	●	●	●	●	●
		Thermal final energy consumption	●	●	●	●	●	●	●	●	●	●
		Share of heating, cooling and heat industrial processes	●	●	●	●	●	●	●	●	●	●
		Electrical final energy consumption	●	●	●	●	●	●	●	●	●	●
		Share of electricity consuming	●	●	●	●	●	●	●	●	●	●
		Transportation fuel final energy consumption	●	●	●	●	●	●	●	●	●	●
		Share of transport energy/fuel consumption	●	●	●	●	●	●	●	●	●	●
		Other final energy consumption	●	●	●	●	●	●	●	●	●	●
		Share of other	●	●	●	●	●	●	●	●	●	●
		SECTOR KPIs	CO2 emmissions	CO2 emissions per energy consumption in enterprises	●	●	●	●	●	●	●	●
	Energy Intensity		Energy consumption per unit of value added/turnover in enterprises	●	●	●	●	●	●	●	●	●
		Energy consumption per unit of product	●	●	●	●	●	●	●	●	●	
		Energy consumption per employee in enterprises	●	●	●	●	●	●	●	●	●	
		Fleet Management - Energy consumption per passenger.km	●	●	●	●	●	●	●	●	●	
		Fleet Management - Energy consumption per ton.km	●	●	●	●	●	●	●	●	●	
	Cost of energy	Fleet Management - Energy consumption per vehicle.km	●	●	●	●	●	●	●	●	●	
		Share of energy costs in the total costs incurred by enterprises	●	●	●	●	●	●	●	●	●	
		Share of energy costs in the total GVA by enterprises	●	●	●	●	●	●	●	●	●	
Potential Sector	GVA per energy consumption in enterprises	●	●	●	●	●	●	●	●	●		
	Potential to develop/implement EE mesures/actions	●	●	●	●	●	●	●	●	●		
		Share of overall savings potential compared to net energy consumption.	●	●	●	●	●	●	●	●		

Table 10 - Data availability of energy efficiency sectoral KPIs (only SMEs) by country

Type	KPI	Austria	Croatia	Greece	Italy	Malta	Poland	Portugal	Slovakia	UK
Energy Production	Self-production of energy in total (in local sources)	X	▼	▼	▼	X	X	X	X	X
	Self-production of electricity (in cogeneration, pv etc.)	X	▼	▼	▼	X	X	X	X	X
	Self-production of heating	X	▼	▼	▼	X	X	X	X	X
	Share of energy self-consumed / energy self-produced	X	▼	▼	▼	X	X	X	X	X
	Share of self-produced fossil energy/net energy consumption	X	X	▼	▼	X	X	X	X	X
	Share of renewable energy / total energy consumption	X	▼	▼	▼	X	X	X	X	X
	Share of enterprises that uses fossil fuels	X	▼	▼	▼	X	X	X	X	X
Energy sources	Share of enterprises that use renewable energy sources	X	X	▼	▼	X	X	X	X	X
	Distribution of energy sources in final uses	X	▼	▲	▼	X	▼	X	X	X
CO2 emmissions	CO2 emmissions per energy consumption by SMEs	▼	▼	▲	▼	X	▼	X	X	X
Cost of energy	Share of energy costs in the total costs incurred by SMEs	X	▼	▼	▼	X	X	X	X	X
	Share of energy costs in the total GVA by SMEs	X	X	▼	▼	X	X	X	X	X
	GVA per energy consumption in SMEs	▲	X	▼	▼	X	X	X	X	X
Final uses	Average share of main activities on total energy consumption	X	X	X	▼	X	X	X	X	X
	Average share of auxiliary services on total energy consumption	X	X	X	▼	X	X	X	X	X
	Average share of general services on total energy consumption	▲	X	X	▼	X	X	X	X	X
Complexity	Complexity of energy consumption structure	▲	X	X	X	X	▼	X	X	X
	Share or Number of SMEs that made energy audit or self-audit in	▼	X	X	▲	▲	X	X	▲	▲
Energy audit	Share or Number of SMEs that regularly undertake energy audit or self-audit or with an energy management strategy	▼	X	X	▼	X	X	X	▲	X
	Share or Number of SMEs that plan to undertake energy audit or self-audit in next 4 years	X	X	X	X	X	X	X	X	X
	Share or Number of SMEs that will not undertake energy audit or self-audit in next 4 years without external funding	X	X	X	X	X	X	X	X	X
	Share or Number of SMEs that will not undertake energy audit or self-audit in next 4 years without external funding	X	X	X	X	X	X	X	X	X
Savings from EPIAs	Total achieved savings by EPIAs	X	X	X	▼	X	X	X	▼	X
	Achieved savings of electricity from declared interventions addressed in energy audits	▼	X	X	▼	X	X	X	X	X
	Achieved savings of thermal energy from declared interventions addressed in energy audits	▼	X	X	▼	X	X	X	X	X
	Achieved savings on transport fuels from declared interventions addressed in energy audits	▼	X	X	▼	X	X	X	X	X
	Other achieved savings from declared interventions addressed in energy audits	▼	X	X	▼	X	X	X	X	X
	Total potential savings by EPIAs	▼	X	X	▼	X	X	X	▼	X
	Potential savings of electricity from identified interventions addressed in energy audits	▼	X	X	▼	▼	X	X	X	X
	Potential savings of thermal energy from identified interventions addressed in energy audits	▼	X	X	▼	▼	X	X	X	X
	Potential savings on transport fuels from identified interventions addressed in energy audits	▼	X	X	▼	▼	X	X	X	X
	Other potential savings from declared interventions addressed in energy audits	▼	X	X	▼	▼	X	X	X	X
	Most important intervention area	▼	X	X	▼	X	▲	X	▲	X
Existence of incentives to support the project cost of most important intervention area	▲	X	▼	▲	▲	▲	X	▲	▲	
Implemented EPIAs	Annual average (or total) number of energy efficiency interventions introduced in last 4 years	X	▼	X	▼	▼	X	X	X	X
	Annual average (or total) energy savings of interventions introduced in last 4 years	X	X	X	▼	▼	X	X	▼	X
	Annual average (or total) energy savings of interventions introduced in last 4 years compared to total/net consumption	X	X	X	▼	▼	X	X	▼	X
	Annual average (or total) energy investments associated to interventions introduced in last 4 years	X	▼	X	▼	▼	X	X	X	X
	Average cost of energy saving (cost effectiveness)	X	X	X	▼	▼	▲	X	X	X
Energy efficiency and energy savings	Share of SMEs that have an energy management system	X	X	▼	▼	X	X	X	X	▲
	Share of SMEs that have an environmental management system	X	X	▲	▼	X	X	X	X	▲
	Share of SMEs that made an energy efficiency investment during last 5 years	X	▼	X	▼	X	X	X	X	▲
	Share of SMEs that made RES investment during last 5 years	X	▼	X	▼	X	X	X	X	X
	Share of SMEs that plan to make an energy efficiency investment in next 5 years	X	X	X	▼	X	X	X	X	X
Investments	Share of SMEs that plan to RES investment in next 5 years	X	X	X	▼	X	X	X	X	X
	Share of SMEs that will not make an energy efficiency or RES investment in next 5 years without external funding	X	X	X	X	X	X	X	X	X
	Share of SMEs that choose to make an energy efficiency investment with SPBT < 1 year	X	X	X	▼	X	X	X	X	X
	Share of SMEs that choose to make an energy efficiency investment with SPBT(1 year, 3 years)	X	X	X	▼	X	X	X	X	X
	Share of SMEs that choose to make an energy efficiency investment with SPBT(3 year, 5 years)	X	X	X	▼	X	X	X	X	X
	Share of SMEs that choose to make an energy efficiency investment with SPBT > 5 years	X	X	X	▼	X	X	X	X	X
	Share of SMEs that would choose to invest in RES (if SPBT > 5 years)	X	X	X	▼	X	X	X	X	X
	Share of SMEs that would choose to carry out thermal modernisation (if SPBT > 5 years)	X	X	X	▼	X	X	X	X	X
	Share of SMEs that would choose to replace production equipment (if SPBT > 5 years)	X	X	X	▼	X	X	X	X	X
	Potential to develop/implement EE mesures/actions	X	X	X	X	X	X	X	▲	X
Share of overall savings potential compared to net energy consumption.	X	X	X	▼	X	X	X	X	X	

Table 11 - Data importance of energy efficiency sectoral KPIs (only SMEs) by country

Type	KPI	Austria	Croatia	Greece	Italy	Malta	Poland	Portugal	Slovakia	UK
Energy Production	Self-production of energy in total (in local sources)	●	●	●	●	●	●	●	●	●
	Self-production of electricity (in cogeneration, pv etc.)	●	●	●	●	●	●	●	●	●
	Self-production of heating	●	●	●	●	●	●	●	●	●
	Share of energy self-consumed / energy self-produced	●	●	●	●	●	●	●	●	●
	Share of self-produced fossil energy/net energy consumption	●	●	●	●	●	●	●	●	●
	Share of renewable energy / total energy consumption	●	●	●	●	●	●	●	●	●
	Share of enterprises that uses fossil fuels	●	●	●	●	●	●	●	●	●
	Share of enterprises that use renewable energy sources	●	●	●	●	●	●	●	●	●
	Energy sources	●	●	●	●	●	●	●	●	●
	CO2 emmissions	●	●	●	●	●	●	●	●	●
Cost of energy	Share of energy costs in the total costs incurred by SMEs	●	●	●	●	●	●	●	●	●
	Share of energy costs in the total GVA by SMEs	●	●	●	●	●	●	●	●	●
	GVA per energy consumption in SMEs	●	●	●	●	●	●	●	●	●
Final uses	Average share of main activities on total energy consumption	●	●	●	●	●	●	●	●	●
	Average share of auxiliary services on total energy consumption	●	●	●	●	●	●	●	●	●
	Average share of general services on total energy consumption	●	●	●	●	●	●	●	●	●
Complexity	Complexity of energy consumption structure	●	●	●	●	●	●	●	●	●
Energy audit	Share or Number of SMEs that made energy audit or self-audit in	●	●	●	●	●	●	●	●	●
	Share or Number of SMEs that regularly undertake energy audit or self-audit or with an energy management strategy	●	●	●	●	●	●	●	●	●
	Share or Number of SMEs that plan to undertake energy audit or self-audit in next 4 years	●	●	●	●	●	●	●	●	●
	Share or Number of SMEs that will not undertake energy audit or self-audit in next 4 years without external funding	●	●	●	●	●	●	●	●	●
Savings from EPIAs	Total achieved savings by EPIAs	●	●	●	●	●	●	●	●	●
	Achieved savings of electricity from declared interventions addressed in energy audits	●	●	●	●	●	●	●	●	●
	Achieved savings of thermal energy from declared interventions addressed in energy audits	●	●	●	●	●	●	●	●	●
	Achieved savings on transport fuels from declared interventions addressed in energy audits	●	●	●	●	●	●	●	●	●
	Other achieved savings from declared interventions addressed in energy audits	●	●	●	●	●	●	●	●	●
	Total potential savings by EPIAs	●	●	●	●	●	●	●	●	●
	Potential savings of electricity from identified interventions addressed in energy audits	●	●	●	●	●	●	●	●	●
	Potential savings of thermal energy from identified interventions addressed in energy audits	●	●	●	●	●	●	●	●	●
	Potential savings on transport fuels from identified interventions addressed in energy audits	●	●	●	●	●	●	●	●	●
	Other potential savings from declared interventions addressed in energy audits	●	●	●	●	●	●	●	●	●
Implemented EPIAs	Most important intervention area	●	●	●	●	●	●	●	●	●
	Existence of incentives to support the project cost of most important intervention area	●	●	●	●	●	●	●	●	●
	Annual average (or total) number of energy efficiency interventions introduced in last 4 years	●	●	●	●	●	●	●	●	●
	Annual average (or total) energy savings of interventions introduced in last 4 years	●	●	●	●	●	●	●	●	●
	Annual average (or total) energy savings of interventions introduced in last 4 years compared to total/net consumption	●	●	●	●	●	●	●	●	●
	Annual average (or total) energy investments associated to interventions introduced in last 4 years	●	●	●	●	●	●	●	●	●
Energy efficiency and energy savings	Average cost of energy saving (cost effectiveness)	●	●	●	●	●	●	●	●	●
	Share of SMEs that have an energy management system	●	●	●	●	●	●	●	●	●
	Share of SMEs that have an environmental management system	●	●	●	●	●	●	●	●	●
	Share of SMEs that made an energy efficiency investment during last 5 years	●	●	●	●	●	●	●	●	●
	Share of SMEs that made RES investment during last 5 years	●	●	●	●	●	●	●	●	●
	Share of SMEs that plan to make an energy efficiency investment in next 5 years	●	●	●	●	●	●	●	●	●
	Share of SMEs that plan to RES investment in next 5 years	●	●	●	●	●	●	●	●	●
Investments	Share of SMEs that will not make an energy efficiency or RES investment in next 5 years without external funding	●	●	●	●	●	●	●	●	●
	Share of SMEs that choose to make an energy efficiency investment with SPBT < 1 year	●	●	●	●	●	●	●	●	●
	Share of SMEs that choose to make an energy efficiency investment with SPBT(1 year, 3 years)	●	●	●	●	●	●	●	●	●
	Share of SMEs that choose to make an energy efficiency investment with SPBT(3 year, 5 years)	●	●	●	●	●	●	●	●	●
	Share of SMEs that choose to make an energy efficiency investment with SPBT > 5 years	●	●	●	●	●	●	●	●	●
	Share of SMEs that would choose to invest in RES (if SPBT > 5 years)	●	●	●	●	●	●	●	●	●
	Share of SMEs that would choose to carry out thermal modernisation (if SPBT > 5 years)	●	●	●	●	●	●	●	●	●
	Share of SMEs that would choose to replace production equipment (if SPBT > 5 years)	●	●	●	●	●	●	●	●	●
Overall	Potential to develop/implement EE measures/actions	●	●	●	●	●	●	●	●	●
	Share of overall savings potential compared to net energy consumption.	●	●	●	●	●	●	●	●	●

2. SECTORIAL KPIs  
Referred only to SMEs

### 4.3.2 Recommendations from current policies analysis

In “D2.2 Existing support measures for energy audits and energy efficiency in SMEs”, a total of 173 policy instruments were identified through a literature review conducted by the LEAP4SME partners, researching the policies and support programmes available in their countries.

The policy instruments identified have been categorised as either financial support, information/advice, regulations, and national plans and strategies, with further sub-categorisation for each type.

The majority of policy instruments identified (66) were specifically targeted at SMEs across all sectors, others were targeted at all business types and sizes (44), or a combination of different stakeholders, including SMEs, large businesses, householder and public bodies. Eight policies were identified which were targeted at SMEs in specific sectors, such as agro-food processing, tourism, and industry.

Information was gathered for each of the policies identified on the successes, challenges and lessons learned, and the barriers to SMEs in taking up the support mechanisms. Some of the key successes include significant energy, financial and CO2 savings, large numbers of people trained or consultations given, and the creation of jobs in the energy sector. Challenges and lessons learned included (amongst others), low uptake of project applicants and being under the targeted amount of spending for financial support, a lack of appropriate training and information provision specifically targeted at SMEs, insufficient clarity of application processes for programmes, and long time periods for organisations to wait to receive funding/support.

Throughout the review of the various policy instruments and through discussions with LEAP4SME team members, several key recommendations have been discussed which policy makers should consider when designing and implementing SME energy audit and energy efficiency support:

- Best practice examples show that a mix of different instruments can be successful to engage and assist smaller companies.
- Obligations to conduct energy audits in SMEs and to meet certain CO2 or energy saving targets could support the implementation of energy efficient measures.

- Well qualified external energy consultants as a one-stop-shop for smaller companies could play an important role in delivering good energy audits and advice.
- Investments by SMEs in energy efficiency and renewable energy are needed and subsidies are well-implemented policy instruments.
- Awareness raising to motivate SMEs to take action can be a challenge. Sufficient time and resources to communicating the policy instrument must be committed from the outset.
- Avoid complex applications processes with overly strict qualification criteria in order to drive uptake by SMEs.
- Plan for an appropriate level of support for SMEs during the application process, programme implementation and following programme delivery to ensure SMEs stay engaged.
- Sector specific policy instruments might be more appropriate for harder to reach SMEs.
- The use of capacity building and development of learning as part of a wider range of support, can help to ensure longevity of the policy to provide scientific evidence for policymakers.

In “D2.3 Energy audits market overview and main barriers to SMEs” after identifying the set of key barriers and reviewing the learnings from best practices examples of when SMEs have been supported to overcome barriers, the report concludes with some key recommendations, which should be considered when designing and implementing policies to support SMEs with accessing audits and energy efficiency improvements:

- Develop strategies to meaningfully engage with SMEs to raise awareness of energy audits, by emphasizing both the energy-related and non-energy related benefits to the business.
- Encourage strong networks of local government representatives, SMEs and auditors which can strengthen programmes by identifying barriers and providing place-specific solutions.
- Require stronger standards for auditors working with SMEs and set minimum quality standards for the audit and its outputs, which use clear language, present data in a visually engaging way and contain actionable recommendations.

- Link audits to holistic support programmes, which guide SMEs through the entire journey from understanding what energy improvements can be made to accessing financing and completing the installations.
- Provide long-term policies and support programmes that ensure stability and give SMEs the confidence to invest in measures that may have long payback periods.

In “D3.3 Compilation of good practices” a total number of 43 good practices have been selected. From the first analysis of the collected policies and programmes of the nine LEAP4SME partner Agencies it is possible to observe some interesting trends, such as:

- The implementation of Energy efficiency measures appears to be sensibly dependent of the territorial scale of the mechanism (national or local), being the more frequently mandatory in national than in regional programmes.
- The obligation of implementation EPIAs is generally correlated with more stringent requirements of the energy audits (use of international standard, obligation of certified auditors, etc.).
- It is also possible to observe as the policies based on EED art.8 present a lower degree of obligation of implementation of energy efficiency measures compared to the policies not-based on the EED. However, the policies based on art.8 are more restrictive in terms of the quality of the audits, mostly due to the specific requirements of EED (Annex VI - Minimum criteria for energy audits including those carried out as part of energy management systems).

In “D6.1 Report on the literature review analysis of multiple benefits” and “D6.2 Report on impact scenarios framework and strategies to boost energy audits and energy efficiency implementation” were analysed main benefits (mainly non-energy benefits) from resource audits, analysing its pertinence and proposing a quantitative methodology. Nevertheless, firstly energy audits and energy efficiency measures were studied, to better understand their role within SMEs, as they have the capacity to influence the decision of SMEs to proceed with energy efficiency investments, the path to achieve the aimed reduction of energy consumed.



## 5. Behavioural Research: Energy efficiency decision-making and investment (Energy Saving Trust)

### 5.1 Introduction

Research has identified different factors that can work to prevent and motivate SMEs to invest in energy efficiency (EE). These factors include perceived and real barriers and drivers for energy efficiency and vary widely among SMEs, beyond characteristics such as firm size and sector.

When it comes to policy and other solutions to improve energy efficiency investment and adoption by SMEs, it is useful to consider factors at the macro (external environment), meso (organisation/ firm) and micro (individual/ employee) levels, as each can be associated with specific barriers and drivers that need to be overcome.

While all levels should be considered by SME decision-makers and practitioners, our research focuses on barriers and drivers at the individual employee level and aims to achieve a thorough understanding of the range of behavioural influences on SME energy efficiency, and in what contexts such factors have been studied.

#### 5.1.1 Research questions

While we know that there are multiple factors that can influence energy efficiency decision-making in SMEs, to the best of our knowledge, less attention has been paid to the role of different stakeholders – that is, the individual employees that comprises an SME – in the decision-making process.

- **What is known about how different stakeholders<sup>7</sup> influence SME decision-making and investment in EE?**

---

<sup>7</sup> Internal stakeholders include, for example, owner-managers and CEOs, frontline workers, dedicated energy manager(s). External stakeholders include, for example, intermediaries, suppliers and/ or business support services.

- What types of stakeholders are/ have been considered in the energy efficiency decision-making literature?
- In what ways can stakeholders influence decisions to invest, or not, in energy efficiency? That is, behavioural factors proven to influence stakeholder choices.
- What geographies and sectors are represented in the literature?
- What do findings tell us about SME policy and programme design?

## 5.2 Rapid Evidence Assessment

A Rapid Evidence Assessment (REA)<sup>8</sup> was undertaken to gain an overview of the evidence on SME energy efficiency decision-making, and to identify any knowledge gaps. REAs are often used to present evidence-based recommendations to inform policy and other decision-makers. They are usually completed over a short timescale compared to systematic reviews and rely on the development of set inclusion<sup>9</sup> and exclusion criteria<sup>10</sup> and search terms.

The following **search terms** used included: “energy efficiency”; “SME”, “behavioural”; “decision-making”; “non-domestic”; and “non-economic factors”. Sources used to identify research were Google Scholar, LEAP4SME partner repository, reference lists.

The REA resulted in **88 outputs (studies)**, with 26 selected for full review.

Information was extracted from **26 studies selected for full review** included location, methods, sample, sector, behavioural factors, policy, and programme recommendations.

### 5.2.1 Results

#### 5.2.1.1 Research/ study characteristics

---

<sup>8</sup> Varker, T., et al., (2015). Rapid evidence assessment: increasing the transparency of an emerging methodology. *Journal of evaluation in clinical practice*, 21(6), 1199-1204.

<sup>9</sup> Published during 2013-2022; English language; primary research and reviews; studies considering behavioural factors influencing SME investment in energy efficiency.

<sup>10</sup> Studies focusing on domestic energy efficiency and/ or consider wider sustainable or pro-environmental behaviours; book chapters; research involving companies with more than 250 employees.

23 studies selected for full review included **primary research** as opposed to literature reviews<sup>11</sup>. Looking at how the primary research was approached, there was a **tendency to use mixed methods** (typically, interviews/ questionnaires, with samples ranging from 3 – 750 SMEs). Other approaches used included case studies, energy assessment/ programme evaluations, and quantitative analysis, albeit to a lesser extent.

Sectors represented at the international level were heavily skewed towards **manufacturing** sectors including metal, textiles, chemical and petro-chemical industries, and timber processing, owing to their **energy-intensive** nature and associated regulation. There were a few studies, in Europe, on SMEs in horticulture, building/ construction, hospitality and retail.

Much of the primary research selected was conducted with SMEs located in **Europe**, especially Italy (6), Sweden (3), Germany (2), Portugal (2), UK (2), Netherlands (1) and Slovenia (1). Three studies included multiple EU member countries. Three international studies were conducted in the US, New Zealand, and China.

Studies identified in the UK context included **qualitative research** such as case studies of SMEs in the building/ construction sector – focusing on sole traders and small firms, and retail and hospitality businesses focusing on small SMEs only.

For the majority of smaller, often **less-energy intensive**, SMEs represented in the UK studies, the type(s) of equipment, the processes involved, and the services provided varied greatly. For example, a large portion of a food retailers energy use and costs will typically be for refrigeration, similar for other food and drink-related businesses within the hospitality sector. For retailers of material goods, lighting, heating, air conditioning and ventilation typically comprise most of the energy bill and energy-related costs. This means that audits and other energy efficiency support need to be flexible enough to cater to **firm-specific energy demand and usage**. Importantly, that includes identifying and understanding where SMEs are more likely, and more able to, make energy efficiency improvements, in view of their businesses features and core processes (See Section 4.3 on expert interviews for further discussion on **energy intensive and non-energy intensive SMEs**).

---

<sup>11</sup> While more than several reviews were identified in the initial screening, a number of these considered behavioural factors in the context of domestic energy efficiency and/ or corporates, and so were excluded from the analysis.

### 5.2.1.2 Behavioural factors identified by the REA

Preliminary analysis of the studies selected resulted in a list of factors that can influence SME decision-making and investment in energy efficiency. Examples identified through the REA can be roughly grouped into **professional and industry-related factors** and **employee attributes**.

#### Professional and industry-related factors

- Sharing information, contacts and learnings through professional **networks and memberships** can be done across sectors and geographies<sup>12</sup>. Being part of such networks can allow SME decision-makers to access information more readily, especially if it's a trusted group of local and/ or industry stakeholders<sup>13,14</sup>.

#### Employee attributes

- Decisions to invest in energy efficiency can be related to **management and/ or business owner sensitivity to energy efficiency, staff ambition and entrepreneurial mindedness**<sup>15</sup>,
- Likewise, **awareness of climate change and broader environment issues**<sup>16</sup>, **pride in work** and 'doing a good job', developing or maintaining **positive working relationships**, and the **variety and challenge** brought about by energy efficiency<sup>17</sup> can facilitate adoption and investment in [more] energy efficient technologies, processes, and practices.

---

<sup>12</sup> <https://www.theccc.org.uk/publication/how-can-policy-better-support-smes-in-the-pathway-to-net-zero-energy-saving-trust/>

<sup>13</sup> Jalo, N., Johansson, I., Kanchiralla, F. M., & Thollander, P. (2021). Do energy efficiency networks help reduce barriers to energy efficiency?-A case study of a regional Swedish policy program for industrial SMEs. *Renewable and Sustainable Energy Reviews*, 151, 111579.

<sup>14</sup> Johansson, I., Johnsson, S., & Thollander, P. (2022). Impact evaluation of an energy efficiency network policy programme for industrial SMEs in Sweden. *Resources, Environment and Sustainability*, 9, 100065.

<sup>15</sup> Cagno, E., & Trianni, A. (2013). Exploring drivers for energy efficiency within small-and medium-sized enterprises: First evidences from Italian manufacturing enterprises. *Applied Energy*, 104, 276-285.

<sup>16</sup> Declich, A., Quinti, G., & Signore, P. (2020). SME's, energy efficiency, innovation: A reflection on materials and energy transition emerging from a research on SMEs and the practice of Energy Audit. *Matériaux & Techniques*, 108(5-6), 505.

<sup>17</sup> Murtagh, N., Owen, A. M., & Simpson, K. (2021). What motivates building repair-maintenance practitioners to include or avoid energy efficiency measures? Evidence from three studies in the United Kingdom. *Energy Research & Social Science*, 73, 101943.

## 5.3 Expert interviews

Expert interviews aim to:

- Understand the role of behavioural factors in SME decisions to invest in energy efficiency.
- Identify approaches that drive SMEs to invest in energy efficiency, including the role of audits.

Five academics representing four countries (Australia, Italy, Sweden, UK) identified through the REA were invited to participate in an interview via Teams. Snowballing to identify others, including a UK-based practitioner. Interview questions are based on findings of the REA (Appendix A).

### 5.3.1 Findings

**Focusing on organisation and/ or person-specific values can engage SMEs.** Three interviewees, based in the UK, consider that widening the scope of engagement to climate change more broadly – rather than focus solely on energy and energy efficiency, for example – can prompt engagement beyond expected [cost] savings. That, in turn, could lead to broader public engagement via SME staff and customers.

- *“...most business support models...potentially miss an opportunity for some longer-term impact by just focusing on energy”.*
- *“Any kind of service that goes down that [values] road needs to embrace that broader [sustainability]”.*

**Some business owner(s) and/ or sectors are more open to values-led engagement.** Such businesses are an important driver for the development and uptake of mass market solutions. Businesses in general are increasingly more likely to draw on their values to position themselves, their product(s) and/ or service(s). In addition, key events or trigger points provide opportunities for certain stakeholders to discuss energy efficiency opportunities, options, and upgrades.

- *“...whether or not business owners bring all of that value system, by which we mean caring about the environment...whether they bring that to work or not...that will vary*

*according to the individual(s) and I guess there's probably a sectoral dependency to that".*

- *"Patience is really important because businesses, SME's only get round to this stuff when it suits them in their business cycle and their asset replacement cycle".*

**Trusted intermediaries are an important route to engagement and implementation of energy efficiency measures.** Two interviewees highlighted the roles of [local] 'middle actors' such as electricians, shop fitters, and accountants. Another highlighted that energy suppliers may be less suited to engaging SMEs in energy efficiency, notably in the UK. In practice, this means that policy and programmes should consider who already engages with [different] SMEs on regular basis, and to what extent can they support their clients with energy efficiency and decarbonisation.

- *"...the most common people [SMEs] talk to for business advice is their accountant...if you can get an army of accountants...willing to talk about energy investments, then that's a great thing".*
- *"Small enterprises usually put their trust in their historical providers of technology".*
- *"SMEs have such broken relationship with their energy suppliers that I think that there's no point doing much with [them] because they're not trusted...[and] tend to interact at times when they're only thinking about billing [and not] the installation of equipment or changing business processes...[and] interact at the wrong time".*
- *"That local angle really helps as well because businesses do care about their local reputation."*

**SME decision-making and behaviour is complex and reflects the heterogeneity among them more generally.** For less- or non- energy intensive SMEs in particular, the multiple benefits of energy efficiency<sup>18</sup> are important drivers of energy efficiency, along with the 'energy efficiency culture'<sup>19</sup> of an organisation.

---

<sup>18</sup> [Multiple Benefits of Energy Efficiency – Analysis - IEA](#)

<sup>19</sup> König, W., Lötze, S., Büttner, S., & Schneider, C. (2020). Establishing energy efficiency—drivers for energy efficiency in German manufacturing small-and medium-sized enterprises. *Energies*, 13(19), 5144.

- “[SMEs have] a hybrid of semi formal decision making and gut feel...depending on how big they are and how family owned they are...they’ll be somewhere on that spectrum”.
- “[Energy costs for non-energy intensive industries] are so small compared to other business costs like staff and rent...that they really don’t give them, on its own, a good rationale for investing in energy efficiency. It needs to make commercial...or operational sense for them to do it”.
- “[For non-energy intensive industries] cultural elements...were relevant...you may leverage on energy efficiency to achieve productivity gains”.

**Financial support for audits has created an expectation for free and/ or subsidised high-level audits.** In addition, the provision of an audit on its own can have limited impact or may create further barriers to action. Effective solutions include providing links to pre-approved contractors and suppliers.

- “...they just couldn’t compete with the publicly funded [audits]”.
- “In our model, [an] initial audit is free because that’s what the market has come to expect from ERDF and that legacy”.
- “I’ve seen an awful lot of audit programs which haven’t had great traction on take up”.
- The worst thing is to make a good audit to a company without a solution...because you raise the problem and you do not solve it”.

## 5.4 Implications for SME policy and programme design

Based on the REA and expert interviews, recommendations for supporting SMEs to adopt and invest in energy efficiency and/ or energy audits are:

1. **Engage SMEs, especially the UK majority microbusinesses<sup>20</sup>, in relation to their professional and personal priorities and values.** External stakeholders and

---

<sup>20</sup> In the UK, most SMEs are microbusinesses with 1-9 employees, nearly 4% have up to 50 employees and the remainder comprise the largest SMEs. Smaller, or micro, SMEs have been shown in the research as more likely (than larger SMEs, for example) to have less time and resource, known to influence EE decision-making and investment, so it’s important for research to understand how

other intermediaries can use a values-led approach to engage and support [certain] SMEs, including early adopters.

2. **Event-driven interventions that involve local, historical, and/ or trusted stakeholders provide opportunities may be particularly effective.** In practice this might be aligning energy efficiency advice and improvements with business milestones and changes, and requiring or incentivising other actors, such as tradesman, to support small businesses to become more energy efficient. Of course, not all SMEs owners will own the space in which their business operates – many lease premises and may require the landlord’s permission to make changes to the building’s fabric and/ or heating system.
3. **Provide and require knowledge and awareness of energy efficiency issues as part of professional education,** over and above production specific energy efficiency knowledge.
4. **Energy advisors and auditors need the expertise and tools to be able to identify and communicate potential improvement options, in addition to, an understanding of the investor and investing businesses priorities and values.** Advisors and auditors should be clear on the technicalities and costs of energy efficiency measures for SMEs, and be able to translate the risks, alternatives, and if applicable, longer-term solutions.
5. **Distribute information on the availability of public and private funds through business networks, trade bodies and relevant government agencies.** Providing instructions to managers and employees as to how to apply for certain funds may also help.

---

behavioural factors can be addressed by policy and SME EE programs, especially to support those who may find it more challenging than others to invest in, and adopt EE technologies and practices.



## 6. Framework for design policy programmes for energy audits in SMEs

In this section a framework for design policy programmes for energy audits in SMEs has been developed. The general structure based on 12 basic elements (as proposed by Väisänen et al., 2002) has been adapted to the SMEs. The basic elements proposed were therefore specified for SMEs based on the know-how acquired during the LEAP4SME project. Some good practices have been used to adjust the policy recommendations. Two examples have been fully developed and compared: a programme for EE in industrial SMEs (mainly medium), and a stand-alone programme for development of audits in services SMEs. This section has been completed with some suggestions to improve current policies.

### 6.1 Basic elements of an energy audit programme for SMEs

To define the framework for the development of policy programmes for energy audits in SMEs we consider 12 basic elements as defined in (Väisänen et al., 2002) and reported in Figure 11. In fact, the Guide for Developers of Energy Audit Programmes contains a structured analysis of the topics that need to be considered at the beginning and throughout the duration of an energy audit programme. The basic elements proposed were therefore specified for SMEs based on the know-how acquired during the LEAP4SME project through the analysis of existing policies, good practices, surveys and national and international observatories in nine European countries.

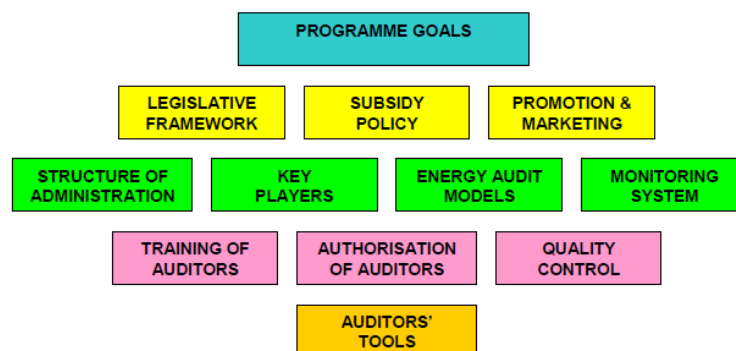


Figure 11 - The 12 basic elements of and Energy Audit Programme as defined in (Väisänen et al., 2002)

The development of policies dedicated to EE in SMEs is a very difficult task, as has already been emphasised several times. However, a structured approach based on the analysis carried out by the different partners in the different European countries can improve the efficiency of policies and their results in terms of audits and energy efficiency measures carried out.

This chapter will briefly present the 12 basic elements of an energy audit programme for SMEs, detailing each of them with examples.

### 1. Programmes goals

The first step in the design of an energy audit program for SMEs is the definition of the scope of the policy. The disparity in size and core business of SMEs, and the different incidence of energy and resources costs, requires specific support measures and energy audit approaches. Hence, as highlighted by the previous work (in this report and in other WP3 and WP4 deliverables) programmes should be tailored according to a strategic segmentation of sectoral activities (i.e. industrial vs. tertiary), energy consumption (i.e. intensive or non-intensive industries) and/or enterprise class size (i.e. micro vs. medium enterprises). Hence, a preliminary step for setting goals is the definition of the policy target groups.

Then, the program goals can be defined. The stand-alone programmes include only the development of the audit, while the audit can also be considered as a part of a more comprehensive mechanism including the implementation of EPIAs.

It is important to define since the beginning of design of the mechanism the duration of policy in order to provide a stable framework for long term voluntary mechanisms or develop eventual short-term policies to cope with sudden changes in economic situations (i.e. pandemic or energy crisis).

Therefore, specific goals of the programme could be defined as:

- Number of annual and total energy audit volumes for target groups.
- Annual (or total) final energy savings (i.e. kWh or toe) associated with the implementation of EPIAs included in the audit.
- Annual (or total) greenhouse gas emissions (i.e. tCO<sub>2eq</sub>) associated with the implementation of EPIAs included in the audit.

- Investments (direct and indirect) triggered by the audit program (i.e. EUR private/ EUR public).

The definition of well-defined programme goals is the key to successful implementation.

## 2. Legislative Framework

The Energy Efficiency Directive consider two categories of enterprises related to energy audit: obligated and non-obligated. The recent recast of the EED modify the obligated companies definition, from non-SMEs to companies with a final energy consumption higher than 10TJ/y. Hence, for non-obligated companies (the majority of the SMEs) the policy framework for EE in SMEs should be based on voluntary agreements. In the design of these programmes, it is important to analyse the national legislative framework to identify and manage potential overlapping with other support tools or obligations (i.e. State aid). Additionally, in order to effectively implement the policies for SMEs, it is important to act a regional level. Hence, regional legislation and normative must be taken into account.

## 3. Subsidy Policy

The programmes for SMEs should include financial support to cover the energy audit cost, partially or completely. Indeed, energy audits will not be introduced in this type of companies, due to lack of resources. The intensity of the subsidy must be tailored to the sector and size of the company. Moreover, the subsidy should be balanced in order to encourage companies to participate in the program and at the same time limit public expenditure. The program can also include the mandatory implementation of one or more EPIAs: in this case, EPIAs should be, at least partially, subsidised. The experience gained by partner countries with various programmes has indeed shown that the non-funding of interventions is an obstacle to the overall effectiveness of the programme. In fact, due to limited financial resources, many companies do not undertake the energy audit, knowing that they cannot subsequently invest in interventions, not fully understanding the potential of the audit itself.

Several economic instruments are available to be included in the support program, such as loans, subsidies, tax deductions, grants and funds. The choice should be based on the targeted sector and company characteristics.

## 4. Promotion & Marketing

Lack of information and awareness is one of the main barriers to the successful implementation of the programmes in SMEs. For this reason, a support program for energy

audit in SMES, needs promotional and marketing activities in order to be effective. Depending on the target sector, trade associations could play a key role in promoting the program and disseminating related information. At the same time, trade associations can help to ease the resistance of companies to invest in energy efficiency, to foster the exchange of best practices between companies and to create connections with market players.

The most common promotion tools are information/guidance instruments, awareness raising policies, capacity building and training, and self-assessment tools. The promotion policies are usually managed by energy agencies.

The marketing instruments are more complex to implement but more effective. These mechanisms could include the creation of networks, the one-stop-shops and EE platforms. In the marketing tools, the role of economic support bodies (i.e. Chambers of Commerce) and policymakers facilitate the bridge the gap between energy market players (i.e. auditors or ESCOs) and the SMEs.

## **5. Structure of administration**

When a support program is created, the structure of its administration should be defined, in terms of the interactions among different activities and the role of the key players. For energy audit programs for SMEs, ministries and regional administrations should cooperate in the designing and administration. Other players can be added in the management of the mechanism, for example energy agencies can manage data collection and monitoring of the results.

## **6. Key Players**

We consider the definition of key players in four categories according to (Väisänen et al., 2002). Specifically, for energy audit programs for SMEs, these four key players are

- Administrator: is the responsible body of the mechanism. In the Art.8 EED (focused at national level) are the ministries in charge of the MS. However, in the SMEs policies can be the regional administrations. The administrator is the main responsible of planning the policy.
- Operating agent: this player is the manager and developer of the mechanism. The technical aspects related to the implementation of the mechanism and the monitoring of results are in charge of these agents. Energy agencies (as LEAP4SME partners)

are usually the operating agents of the mechanisms (under the mandate and in close collaboration with the administrators).

- Auditor is necessary to carry out the diagnosis. It could be a independent professional or an ESCO, and the level of certification required can vary as function of the aim of the policy.
- The client is the SME that is audited.

The interactions between the key players is crucial to promote the access to the mechanisms in an effective manner.

### **7. Energy Audit Models**

The energy audit model must be coherent with the program goal and the subsidy policy. It should be defined by the administrator, choosing among different options depending also on the target sector. Energy audit requirements should be more stringent (aligned with international standards, certified auditors, ...) when the program covers also the funding of EPIAs and for energy intensive sectors. In other cases, for example tertiary sector and micro enterprises, more simplified models (self-assessment tools, energy accountability) should be considered, and their characteristics should be clearly defined. Clearly, the subsidy should be proportional to the complexity of the energy audit model to be adopted.

### **8. Monitoring systems**

Monitoring the results is a key aspect to assess the cost effectiveness of any support program. However, for programs devoted to SMEs, there is a general lack of quantitative assessments and methodologies (with notable exceptions of Swedish programmes). Mid-term evaluations of the programme are necessary to assess the achievement of goals. KPIs should be defined to assess the effectiveness of the programme according to a set of indicators.

### **9. Training of auditors**

In order to ensure that the quality and the effectiveness of audits is above a certain predetermined level, it may be necessary to provide an information/training campaign for auditors, especially in the case of sectoral programmes. The content of the campaign will be closely linked to the selected audit models and to the certification required for the auditors.

The training campaign for auditors can also have the objective to create a network of auditors 'accredited' to work within the programme itself and therefore more visible and trustworthy for

companies. Indeed as highlighted in point 4 trusted intermediaries are an important factor to engage companies and subsequently to implement energy efficiency measures.

#### **10. Authorization of auditors**

The authorisation of auditors must be directly linked to the audit model chosen for the programme. In the case of audits consistent with the EN 16247:1-4 standard, only auditors with appropriate certifications (i.e. EN 16247:5) that guarantee an adequate level of competence and audit quality shall be considered. In the case of simplified support programmes dedicated for example to the tertiary sector and micro enterprises, it is not necessary to require specific certification for auditors, but only an appropriate professional qualification. Furthermore, for these simplified systems, chambers of commerce could, for example, play the role of auditors and be more effective thanks to their direct link with companies.

#### **11. Quality control**

The Operating Agent is responsible for audit quality control and must allocate financial and human resources for this task in the programme definition phase. This control is an important element because it is closely linked to the effectiveness of the use of public funds, and the way in which it is implemented is closely related to the audit model selected. In the case of a more structured energy audit in line with technical regulations, it will be necessary for the Operating Agent to first define guidelines for the minimum content of audits. Moreover, the personnel in charge of quality control should have specific professional background. By contrast in simplified schemes, it is not necessary to define specific guidelines but only to provide a list of minimum elements to be included in the audit. For this reason, quality control can be carried out by personnel who do not need specific technical skills. Quality control is closely linked to training of auditors and their authorisation.

#### **12. Auditors' tool**

To improve the effectiveness of the program the Operating Agent must provide the auditors with a series of dedicated operational tools. These tools must include templates for drafting the audit, spreadsheets for the accounting of energy consumption and related compilation guidelines, including sectoral ones where necessary. It is also very important to structure the audit acquisition web portal in such a way as to be easy to use for auditors but at the same time useful for the quality verification and evaluation phases of the program by the Operating

Agent. It is important to provide training sessions dedicated to the tools and the web portal to facilitate their use and improve their diffusion.

### 6.1.1 Programme administration

The programme administration defines the interactions between the different key players on the mechanism. The role of administrator usually is focused on the programme goals, legislative framework and financing issues. Meanwhile, the role of the operating agents is focused on the management of the mechanisms including training, authorisation, quality control, monitoring, reporting to the Administrator, guidance of the auditors, promotion, etc. Thus, the role of the agents impact on the interaction with auditors and SMEs. There are four different interactions between the key players (Väisänen et al., 2002) (Figure 12).

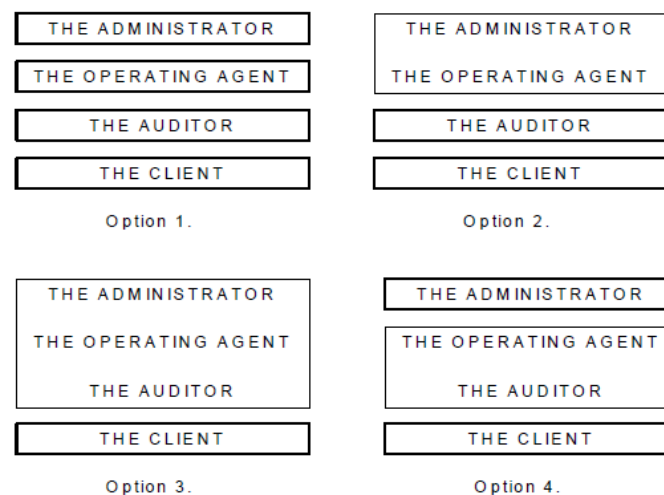


Figure 12 – Interactions between key players for programme administration as defined in (Väisänen et al., 2002)

The first option is usually applied to the Art.8 EED mandatory schemes. Generally, the ministry is the Administrator of the mechanism and delegate the management to a public non-governmental organization (mainly National Energy Agencies). This scheme extensively applied to large enterprises, can be replicated to the SMEs, generally when the audit requirements and the associated incentives are relatively high (i.e. the industrial energy-intensive SMEs programme in Italy “Energivori”).

The second option is similar to the Option 1, but Administrator and Operation Agent are the same body. This approach is observed in the countries where the National Agency is part of

the designated Ministry (i.e. Netherlands, Bulgaria or Hungary). Other possibility of this approach is linked to the cases where the responsibility and authority for planning, implementing and operating energy efficiency programmes is given to a national non-governmental organisation with adequate personal and economical resources (i.e. France or Malta).

Option 3 is an excellent option to promote the development of energy audits in SMEs in the form of “one-stop-shops”. The role of the Administrator, Operating Agents and Auditors are coordinated internally in a system where the SME directly select the auditor and the cost of the audit is covered (fully or partially) by the Energy Agency (with the support of the Administrator). Two successful programmes with this scheme have been implemented in Ireland (Support Scheme for Energy Audits, SSEA<sup>21</sup>, managed by SEAI) and Malta (Promotion of Energy Audits in SMEs Scheme, SME-EA<sup>22</sup>, managed by EWA). In the SSEA mechanism the SMEs with an energy expenditure higher than 10.000 € can apply to a voucher of 2000 € to develop an energy audit (that usually cover more than 90% of the audit cost) to be carried out by a certified auditor from the programme database. More than 1000 SMEs was engaged in the first year of this programme. The SME-EA scheme represents an excellent example of tailor policy by strategic segmentation, with different intensity of the grant (from 1000 to 5000€) as function of the size of the enterprise (small and medium) and sector (NACE C - manufacturing- and I -accommodation and food service activities, vs. the rest of economic activities). Once the application is approved, the certified and listed auditor carry out the audit. The quality of the audit is verified by EWA and, after the approval, the grant is transferred to the enterprise.

Lastly, the option 4 is very interesting approach to the integration of the manager players and the auditors. An excellent example was Fedesco, a public ESCO promoted by the Belgian federal state in 2005. Prior to its integration 2015 in the Belgian Buildings Agency the ESCO developed 450 audits and invested 27,4 million € using the separate contractor-based model and promoting advanced EPC models. Other example is the US Industrial Assessment Centres programmes that provide direct support to the development of audits to SMEs by means of IACs based on universities. The universities carry out free-of-charge the audits in the SMEs, and government fund this activity with aid to the centres and a variable part as

<sup>21</sup> [Energy Audits for SMEs | Business | SEAI](#)

<sup>22</sup> [Energy Audits for SMEs - EWA \(gov.mt\)](#)



function of the number of audits. The database is public, and more than 21.000 audits have been carried out since 1976. The Art.11(6) of the recast EED suggests this kind of approach to encourage SMEs to carry out energy audits<sup>23</sup>.

## 6.1.2 Monitoring and evaluation of the programme

Monitoring and evaluation are fundamental elements to assess the effectiveness of any support program. Relative to energy audit programs for SMEs, policy makers are interested in learning about the effectiveness of the allocated resources, but also to gather more energy-related information on a sector where data are particularly scarce<sup>24</sup>. Also, companies and auditors may be interested in sector specific information, for example to assess the energy performance and benchmarking. In an energy audit program for SMEs, monitoring can be considered as a continuous activity over the lifetime of the program, where different levels can be identified as follows:

1. Assessing the expenditure level to support the energy audits
2. Assessing the number of energy audits supported
3. Computing the overall saving potential in terms of program beneficiaries and number of proposed measures per audit
4. Computing the theoretical potential savings of the implemented measures
5. Gathering information at company level on the measured savings of the implemented measures
6. Verifying the saving results on a sample basis

Depending on the program structure, not all the levels of monitoring activity should be implemented: this choice belongs to the Operating Agent and is connected to other elements of the programs. If a monitoring level is enforced, it should be in place since the beginning of

---

<sup>23</sup> Member States shall develop programmes with the aim of encouraging and providing technical support to SMEs [...] to undergo energy audits and to subsequently implement the recommendations arising from those audits. [...], Member States may set up mechanisms, such as energy audit centres for SMEs and microenterprises, provided that such mechanisms do not compete with private auditors, to provide energy audits. They may also provide other support schemes for SMEs, including where such SMEs have concluded voluntary agreements, to cover the costs of energy audits and of the implementation of highly cost-effective recommendations arising from the energy audits[...].

<sup>24</sup> LEAP4SME Deliverable 2.1 Mapping SMEs in Europe: Data collection, analysis and methodologies for estimating energy consumptions at Country levels

the program. Each level of monitoring activity is associated to specific requirement and data. The operating agent should create a database to collect information and allow the computation of saving and other KPIs. The data relating to energy performance obtained from the monitoring itself may be of interest to companies and auditors to compare themselves with companies in the same sector and identify efficiency opportunities. This database should be directly connected to the web portal created by the Operating Agent to collect the energy audit. The database should be flexible to allow taking into account eventual changes in monitoring system. The information content of each activity level changes during the program lifetime.

The following table briefly describes the contents of each level of monitoring activities, the operational difficulties and the cost dependence on program size.

*Table 12 Levels of programme monitoring activity*

Level of monitoring activity	Contents of the activity level	Difficulty in managing the activity level	Cost dependence on program size	
1	Expenditure	Looking at the number and sector of beneficiaries and the actual subsidy received	Low	None
2	Number of energy audit	Assessing the number of audits by company size and sector	Low	Medium
3	Saving potential	Analysing the energy audits, with focus on the estimation of total energy saving potential, calculated on all program beneficiaries and all EPIAs proposed in the energy audits	Medium	Medium
4	Potential savings of implemented measures	Identifying the EPIAs that were implemented and estimating the corresponding savings	Medium	High
5	Measurement of savings	Integrating the theoretical estimation with the computation of savings based on pre and post measurement of consumption at company level or on surveys	High	High
6	Verification of results	Checking the implemented measures on a sample basis, selecting them basing on representativeness criteria	Medium	Medium

Evaluation refers to the verification of the programme achievements and it allows to assess if the program needs adjustments, should be closed, or kept in force unaltered. Evaluation involves a third party, usually the Administrator of the program, and it is usually carried out at the end of a program or a mid-term stage. Evaluation has a strong connection with monitoring since its quality depends on the quality of all the levels of monitoring.

The monitoring and evaluation system should be designed together with the other elements of the programme, for example the programme goals, the promotion and marketing, the energy audit models. Often the link is twofold: for example, program quantitative goals have no meaning if they could not be evaluated, and evaluation cannot be performed in absence of quantitative goals. In general, the cost of a program monitoring and evaluation system, in terms of human resources and money, is proportional to the information that can be obtained.

An important aspect is also to disseminate the results to show the success of the mechanism and make information public, including examples of audits and interventions in specific information campaigns for SMEs.

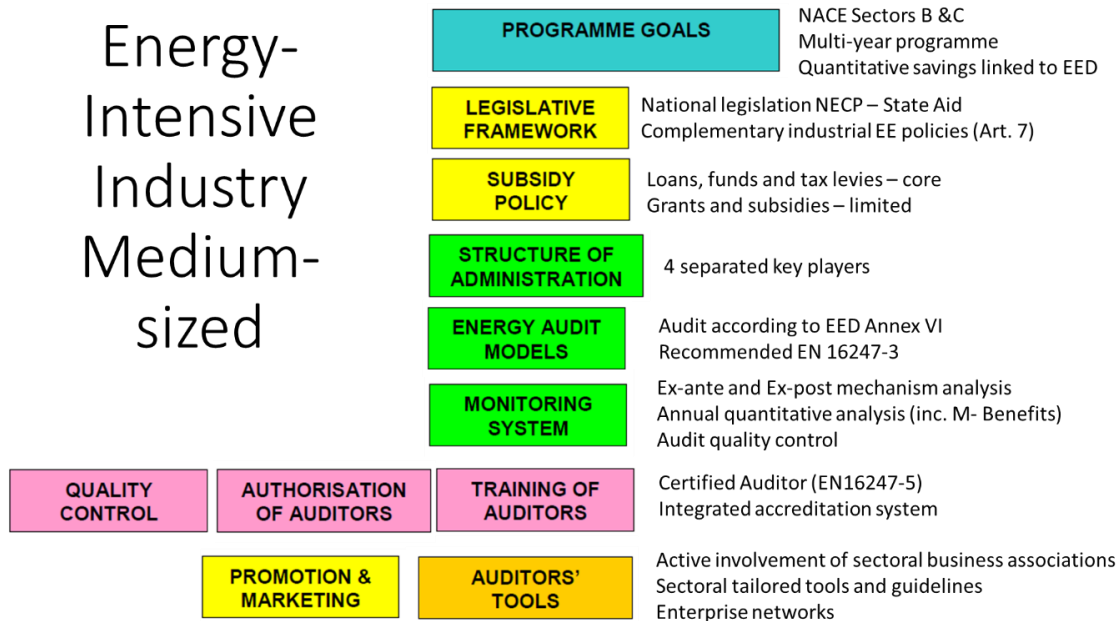
## 6.2 Examples of policy design for SMEs

Two case studies will be presented in this section. The disparity in size and core business of SMEs, and the different incidence of energy and resources costs, requires specific support measures and energy audit approaches. The first case study is related to the development of an energy audit policy targeted to medium sized companies belonging to energy intensive sectors, while the second one is targeted to small companies in the service sector. These two case studies were chosen for two different reasons: first, energy intensive industries are key actors to be involved in energy audit support programs due to the significance of their consumption; second, small sized companies in tertiary sector are difficult to engage with and targeted policies are particularly scarce. In both examples, the case studies are presented referring to the structure shown in Figure 11 and explained in detail in previous sections.

### 6.2.1 Energy intensive medium sized companies



# Energy-Intensive Industry Medium-sized



*Figure 13 – Case study on energy intensive medium sized company*

Figure 13 shows the proposed structure of an energy audit support program for energy intensive medium sized company. The multi-year program could be targeted to NACE Sectors B and C and it should include as goals quantitative savings linked to EED. To be effective this program should be part of a long-term permanent, stable, and predictable regulatory framework to support energy efficiency actions. This program should be consistent with the existing National legislation, transposing EED, and policy objectives, as included in the NECP. Moreover, state aid regulation should be taken into account. Due to the high energy weight in the expenditure profile of this company type, it is likely that energy audit are already developed by these companies. For this reason, the subsidy policy should be oriented to financing the implementation of the EPIAs (which could also include introducing a EMS) identified in the energy audit rather than to supporting the energy audits themselves. The subsidy policy could include as core elements loans, funds or tax levies, while grants and subsidies should be used in a limited way. Four separated key players should be involved in the program: the relevant Ministry as program administrator, the national energy agency as operating agent, the certified auditors and the companies. In terms of energy audit models, the audit to be developed should be consistent with EED Annex VI and EN 16247-3: this will ensure the quality and effectiveness of the support scheme. The monitoring of the program is another key element, considering the relevance of such companies in terms of energy consumption. The monitoring

system should include ex-ante and ex-post mechanism analysis, as well as audit quality control and annual quantitative analysis, also including non-energy benefits when relevant. Certification of the auditors should be proportional to stringent requirements of the energy audits quality (in terms of compliance with international standards and qualifications). The promotion of the program, as well as the elaboration of the auditors' tools, should be done by the operating agent with an active involvement of sectoral business associations. In terms of auditors' tools, sectoral tailored tools and guidelines need to be circulated as much as possible. Existing company networks, at local or sectoral level, could also play a role, together with business associations, in sharing the auditors' tools. In this sense, the creation of such networks could be encouraged.

The proposed example is aligned with a notable work from the IETS TCP Annex XVI Energy efficiency in SMEs (Johansson et al., 2019). The proposed guideline for designing energy efficiency policies and programmes for small and medium-sized industries includes seven major steps, that include tailor policies by strategic segmentation, definition of quantitative goals, defining subsidy policies, monitor the policy. Two additional steps are presented: a review current policies (as presented in the section 2 of this deliverable) and review barriers and drivers for the targeted sector group based on literature review or surveys and questionnaires.

*Table 13 Levels of programme monitoring activity*

<b>Design Step</b>
<b>Decide primary target sector group</b>
Map the annual energy
<b>Review the current energy policies</b>
<b>Make an energy efficiency potential estimation</b>
<b>Review the barriers and drivers for energy efficiency</b>
Suggest appropriate policy
<b>Evaluate the impact of the policy programme</b>

### 6.2.1 Small sized companies in services sector

Small  
Services  
Enterprise



Figure 14 – Case study on small sized company in the service sector

Figure 14 describes the twelve basic elements of a possible energy audit programme targeted to small sized companies in the service sector, namely NACE sectors G, I, J. In this case, the stand-alone programme could have a duration of 1-2 years and it could be renewed. The programme goals could be set in qualitative terms, considering the development of an energy audit culture as main goal. Indeed, in these sectors energy audit or energy monitoring are still not widely used. As in the previous example, also in this case the national legislative framework should be considered, in particular relative to NECP and “de minimis” aid scheme. To the reflect the relatively high number and small dimension of companies in the targeted sectors, the program would be more effective is implemented at regional level: then, the regional legislative framework should also be considered. Depending of the local production structure, the Region could decide to focus on specific sectors. Grants and subsidies should be used, in the form of vouchers, supporting and motivating small companies to develop energy audits and, providing the financing needed to introduce EPIAs. In order to reduce the administrative burden, the program should have a light structure, involving only two players: a subject, acting as programme administrator, operating agent and auditor, and the targeted

company. One-stop-shop are an example of a possible structure and management of this program. The light structure should be reflected also in the requirements of the energy audit model: this program is targeted to companies having a low energy maturity and scarce energy technical competences. Thus, the audit scheme should be streamlined and include a simple accounting and self-assessment of the energy consumed by the main company services. The requirements for the auditors should be less stringent, without the need of specific certification but limited to professional qualification. The monitoring of the program would include as quantitative elements the number of beneficiaries having carried out an energy audit. Other aspects such as multiple benefits should be evaluated in qualitative terms. The involvement of local organisations, such as Chambers of Commerce, is necessary to ensure the effectiveness of the program. These actors could play a key role in promoting information and training campaigns as well as in supporting an extensive distribution of auditors' tool at local level.

The following table 14 summarises and compares the two case studies and highlights the link with the recommendations collected in D4.1.

*Table 14 Comparison of two case studies*

Basic Elements	Medium Sized – Industry	Small Sized Tertiary Sector	Key Recommendation <sup>25</sup>
<b>Programme goals</b>	<ul style="list-style-type: none"> <li>Quantitative goal: savings from EPIAs identified in the EA and adopted</li> <li>Long-term policy</li> </ul>	<ul style="list-style-type: none"> <li>Qualitative goal: carrying out audits and EPIAs</li> <li>Medium-short term policy, possibly renewable</li> </ul>	Tailoring Policy framework
<b>Legislative framework</b>	<ul style="list-style-type: none"> <li>Contribution to long-term national targets identified in the NECP</li> </ul>	<ul style="list-style-type: none"> <li>Stand-alone programme going together with other EE incentive programmes for SMEs not linked to binding targets</li> </ul>	Policy framework
<b>Subsidy Policy</b>	<ul style="list-style-type: none"> <li>High incidence of energy costs</li> <li>Introduction of tax relief on energy tariffs and soft loans</li> </ul>	<ul style="list-style-type: none"> <li>Difficult access and lack of technical expertise</li> <li>Grants and easy-to-manage financial support (one-stop-shop)</li> </ul>	Addressing financial constraints

<sup>25</sup> LEAP4SME - D4.4 Policy recommendations report.



<b>Promotion and marketing</b>	<ul style="list-style-type: none"> <li>• Involvement of trade associations to inform enterprises and assist with sectoral guidelines for auditing</li> <li>• Role of enterprise networks to share good practices on energy efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Provide extensive information on the incentive</li> <li>• Supply of information tools to be distributed to businesses</li> </ul>	Raising awareness
<b>Structure of administration</b>	<ul style="list-style-type: none"> <li>• Option 1 in Section 5.1.1</li> </ul>	<ul style="list-style-type: none"> <li>• Option 3 in Section 5.1.1</li> <li>• Service supply rather than economic support</li> </ul>	Policy framework
<b>Key players</b>	<ul style="list-style-type: none"> <li>• Administrator: Ministry</li> <li>• Operating agent: National Energy Agency</li> <li>• Auditor: certified auditor</li> </ul>	<ul style="list-style-type: none"> <li>• Administrator: regional or national authority</li> <li>• Operating agent and auditor: regional agency or Chamber of Commerce</li> </ul>	Policy framework
<b>Energy Audit models</b>	<ul style="list-style-type: none"> <li>• Energy audit consistent with the EN 16247 1-4 standard and EED Annex VI</li> <li>• Accounting for non energy benefits</li> </ul>	<ul style="list-style-type: none"> <li>• Simplified audit</li> </ul>	Monitoring (by firms)
<b>Monitoring systems</b>	<ul style="list-style-type: none"> <li>• Number of audit</li> <li>• Number of EPIAs and investments</li> <li>• Achieved savings</li> <li>• Presence and quantification of non energy benefits</li> <li>• Audit quality control, total or on a cost effectiveness basis depending on program resources</li> </ul>	<ul style="list-style-type: none"> <li>• Number of audit</li> <li>• Number of EPIAs and investments</li> <li>• Presence of non energy benefits</li> </ul>	Monitoring (by policy makers)
<b>Auditors</b>	<ul style="list-style-type: none"> <li>• Certification of auditors</li> </ul>	<ul style="list-style-type: none"> <li>• Identification of professional categories</li> </ul>	Monitoring (by firms)
<b>Auditors' tool</b>	<ul style="list-style-type: none"> <li>• Energy consumption monitoring template and compilation guidelines</li> <li>• Sectoral guidelines</li> </ul>	<ul style="list-style-type: none"> <li>• List of contents of simplified audit</li> </ul>	Monitoring (by firms)



## 6.3 Opportunities for improving existing schemes

A number of 29 policies selected as good practices by the project partners has been analysed in order to understand the level of implementation of the recommendations in the different policies. The details of the policies are presented in Appendix B. 16 policies includes both large enterprises and SMEs, the other 13 (marked in bold in the tables) are only to SMEs.

The majority of the policies include the execution of an energy audit. However, the monitoring of the policies should be improved due to the fact that half of the programmes don't report the number of audits carried out. Additionally, the programmes are generalist, without sectoral segmentation (only energy intensive industries), hence tailoring to specific sectors should be addressed.

The second category of analysed information is focused on "Implementation of energy efficiency measures". The energy audits provide detailed information about the EPIAs (that can be linked with high quality audits according to EED Annex VI and certified auditors). However, the identification of multiple benefits is explicitly reported only in seven policies (24%), with particular attention to water consumption and GHG emissions. The implementation of the EPIAs included in the EA is only mandatory in five programmes that involve energy-intensive companies (both large enterprises and SMEs), obligated companies according to EED, or in policies focused on implementation of EPIAs (where EA is mandatory to access to the mechanism). The policies only for SMEs only include voluntary implementation of EPIAs. The economic support to the implementation of EPIAs is observed in 13 policies (45%), directly included in the programme or with additional policies. This support (generally loans) covers only the voluntary implementation of EPIAs.

The "quantification of energy savings" is directly linked to the energy audits. However, the statistics of mean potential savings for each EA is still underreported (only six policies provide this data). The quantification of multiple benefits is still a challenging task. Only five policies provide information about the multiple benefits analysed (cost reduction, water savings, carbon footprint and raw materials), but no specific data are available.

The fourth analysis is centred on the "Costs of Energy Audits". From a general point of view, the only-SMEs programmes cover from 50% to 100% of the audit costs (generally up to 75%),

and this cost varies from 750€ to 6000€. In the case of policies that cover large enterprises and SMEs, the cost of the EA is generally paid by the companies.

Finally, the programmes usually are linked to the EED transposition or economically supported by the European Regional Development Fund (ERDF, eight policies). It should be useful to diversify the economic funds mixing European, national and regional funds with private mechanisms.

In summary, the main recommendations to improve current energy efficiency policies to SMEs should include:

1. The monitoring system of the policies should be improved, including specific metrics and doing the results public available.
2. The policies should be tailored to specific sectors to increase its effectiveness.
3. The qualitative and quantitative of multiple benefits should be taken under consideration.
4. The stand-alone programmes for development of EA in SMEs, should be complemented with additional programmes to support the voluntary implementation of EPIAs.

## 7. Summary and conclusions

The aim of this report is to generate a framework for the development of national SMEs energy audit programmes and schemes from four complementary sources: 1) literature review of worldwide policies, 2) surveys from 44 policymakers, 3) extensive information of nine LEAP4SME national agencies partners, and 4) behavioural research to identify decision-making and investment in SMEs. The findings presented in this deliverable provide key elements for policy makers, to develop more effective SMEs policies, and to policy evaluators and researchers, to better address the topic and methodology of future studies. This work is complemented by the analysis of the observatories (D4.1 Report and main proceedings on EU and National observatories), the Report on the Integration of SMEs energy audit policy with other legislation and programmes (D4.3). All these reports converge in D4.4 Policy recommendations report.

After an introductory section 1, the section 2 presents a structured literature review of the contributions analysing the main policies and measures related to energy efficiency in SMEs. A comprehensive overview of the policies developed for EE in SMEs, increasing the qualitative analysis of policies (64 policies from 21 countries), and deepen the quantitative analysis of the policies (14 policies from ten countries)

The energy efficiency taxonomy shows that usually the policy support to EE in SMEs is based on voluntary agreements, to limit the economic and administrative burden. Hence the SMEs are generally excluded from the prescriptive policies which are based on binding measures. Recent studies demonstrate that the most successful approaches are 1) the development of energy audits, 2) the balance of the economic and supportive policies, 3) the implementation of energy efficiency networks as cost-effective actions for industrial SMEs, and 4) targeting interventions through strategic segmentation (usually focusing on Energy Intensive Industrial SMEs).

Among the policy evaluation studies, it was possible to extrapolate quantitative results on 14 programmes from 10 countries: six stand-alone energy audit programmes, four mechanisms including the energy audits as part of more general schemes of energy efficiency in SMEs, two policies for energy intensive industries (including both SMEs and large companies), and two energy efficiency networks. The in-depth analysis of evaluation studies has been developed referring to the number of SMEs, number of implemented EPIAs per EA, program cost, achieved and potential savings, public and EPIAs cost effectiveness, and payback period. The range of the analysed data depends on the type of policy and presents a high variability. The most successful mechanisms in terms of involvement of SMEs and public cost-effectiveness are the stand-alone EAs policies, confirming the crucial role of energy audits to encourage energy efficiency in SMEs.

From the literature review some common insights raised:

- To allow a better understanding of policy performance and to compare different policy mechanisms, a harmonized approach for the evaluation of EE policies for SMEs would be needed, in terms of specific methodologies and indicators.
- Quantitative studies on the topic are still scarce, in terms of the policies and countries analysed as well as the number of SME covered; moreover, an effective comparison

among them is limited due to the high heterogeneity of adopted approaches and/or lack of information about them.

- All evaluation studies reporting quantitative information are focused on policies including the adoption of EA. In this sense, EA seem to be a pre-condition for developing a quantitative evaluation of savings and cost effectiveness of the program.
- According to some policy schemes, EA certification is mandatory. However, due to the complexity of the implementation of certified energy audits and energy management systems in non-energy intensive SMEs, the implementation of simplified forms should be taken under consideration by policymakers.
- Targeted policies and tools, tailored as function of the size, sector and energy intensity of the company, appear to be a successful approach to overcome barriers for EE in SMEs
- A more integrated approach combining different economic and supportive instruments may help SMEs in improving EPIAs implementation rate, starting from no-cost EE and low-risk interventions.
- The most successful strategies include the engagement of local or regional associations instead of national governments, due to the more common territorial connotation of SMEs activity.
- Capacity building programmes and learning networks (which are well received by SMEs) as part of a broader range of support, can help ensure the longevity of the policy, as SMEs develop their own skills that help them undertake energy audits and implement EPIAs

In section 3 has been analysed the answers from official representants from public organizations to a survey on energy efficiency on SMEs. A total number of 44 organizations from 23 countries provided feedback to the survey. The answers are strongly different considering three categories: Ministries, National Agencies and Regional agencies. At national level, both agencies and ministries consider that the general overview of the EE policies is sufficiently adequate. However, for ministries, policies for audits and implementation of EPIAs are insufficient. The perception of insufficient policies for EPIAs implementation is also shared by national agencies. It is important to note that the opinion about policies for energy audits, and the implementation of EPIAs is sensibly more negative at regional/local level than at

national level. This result could reveal a problem in the implementation at local level of national policies, being the local scale crucial to engage SMEs.

The importance of incentives for the development of energy audits in SMEs is underlined by the response of the national agencies with 48% considering them of extremely high relevance and 39% of high relevance. Ministries also consider important the incentives have high relevance, but at the same level than training. For ministries, two aspects are more important than economic incentives: the qualification of the auditors (to ensure a high-quality audit) and the dedicated non-financial support to SMEs. The importance of incentives is particularly critical for the implementation of Energy Performance Improvement Actions (EPIAs) that present an extremely high/high relevance for the 96% of the national agencies and 66% of the ministries. Policies for SMEs should be tailored. According to the agencies and ministries the policies must include the energy consumption and it is also recommended to include the sector (e.g. industry, tertiary) and the size of the enterprises (micro/small vs medium).

In section 4 some aspects related to the development of policies have been analysed internally to the consortium in the nine involved countries. Specifically, three aspects have been deepened. Firstly, interviews with key experts from LEAP4SME national energy agencies have been developed. Secondly, the national agencies have been explicitly asked about the best tailoring approach for the development of policies. The opinion of LEAP4SME partners is that the policies must include the energy consumption and also the sector (industry, tertiary...), and it is recommended to include the size of the enterprises (micro/small vs medium). And thirdly, a summary of previous results (partially unpublished) has been included: 1) detailed availability of data for policy; and 2) recommendations from current policies analysis.

In section 5, behavioural research has been developed in order to try to identify the energy efficiency decision-making and investment in SMEs. Two complementary analyses have been carried out. On the one hand, Rapid Evidence Assessment (REA) was undertaken to gain an overview of the evidence on SME energy efficiency decision-making, and to identify any knowledge gaps. On the other hand, five academic experts representing four countries (Australia, Italy, Sweden, UK) identified through the REA were invited to participate in an interview aim to understand the role of behavioural factors in SME decisions to invest in energy efficiency, and identify approaches that drive SMEs to invest in energy efficiency, including the role of audits.

Based on the REA and expert interviews, recommendations for supporting SMEs to adopt and invest in energy efficiency and/ or energy audits are:

- Engage SMEs, especially microbusinesses, in relation to their professional and personal priorities and values. External stakeholders and other intermediaries can use a values-led approach to engage and support SMEs, including early adopters.
- Event-driven interventions that involve local, historical, and/ or trusted stakeholders provide opportunities may be particularly effective. In practice this might be aligning energy efficiency advice and improvements with business milestones and changes, and requiring or incentivising other actors, such as tradesman, to support small businesses to become more energy efficient.
- Provide and require knowledge and awareness of energy efficiency issues as part of professional education, over and above production specific energy efficiency knowledge.
- Energy advisors and auditors need the expertise and tools to be able to identify and communicate potential improvement options, in addition to, an understanding of the investor and investing businesses priorities and values. Advisors and auditors should be clear on the technicalities and costs of energy efficiency measures for SMEs, and be able to translate the risks, alternatives, and if applicable, longer-term solutions.
- Distribute information on the availability of public and private funds through business networks, trade bodies and relevant government agencies. Providing instructions to managers and employees as to how to apply for certain funds may also help.

In section 6 a framework for design policy programmes for energy audits in SMEs has been developed. The general structure based on 12 basic elements (as proposed by Väisänen et al., 2002) has been adapted to the SMEs. The basic elements proposed were therefore specified for SMEs based on the know-how acquired during the LEAP4SME project through the analysis of existing policies, good practices, surveys and national and international observatories in nine European countries. Some good practices have been used to adjust the policy recommendations. Two examples have been fully developed and compared: a programme for EE in industrial SMEs (mainly medium), and a stand-alone programme for development of audits in services SMEs. This section has been completed with some suggestions to improve current policies in the LEAP4SME countries.

## Appendix A - Expert interviewee topic guide

*The REA identified multiple SME owner and/ or decision-maker characteristics influencing investment in energy efficiency:*

*Attitudes, beliefs & values; entrepreneurial mindedness; family opinion<sup>26</sup>; staff ambition, interest & motivation; expectations & risk perception<sup>27</sup>; acceptance of new energy efficient practices; pride in work<sup>28</sup>; networks; knowledge*

- 1) Of those listed above, what do you view as the most prominent factor(s) influencing decisions to invest in energy efficiency by SMEs?

*Studies suggest that the heterogeneity of SMEs is the key challenge of finding a one-size-fits-all solution for SME decarbonisation.*

- 2) Do you think there are certain initiatives that are more likely to work across all types of SMEs? For example, are you aware of existing [successful] business support models at the country, regional and/ or local levels.

*Research suggests that changes in SMEs depend highly on the leader/s or owner/s values, or the organisation's value.*

- 3) What kind of approach do you think will work to influence these changes? Especially considering that we are trying to influence changes in businesses that do not see energy efficiency crucial to their business goal.
- 4) Does the potential/ market for SME audits differ between size, sector and sub-sector, notably because of the diversity in energy use profiles<sup>29</sup>?
- 5) What features of an audit/ audit process/ auditor can positively or negatively influence SME decisions to invest in energy efficiency?
- 6) Our behavioural research identified an important role for 'middle actors'<sup>30</sup>. What type(s) of external actors can and/ or should play a role supporting SMEs to invest in energy efficiency?

<sup>26</sup> Especially in family ownership structures.

<sup>27</sup> For example, poor knowledge of energy efficient technology may lead to overestimation of risks of investment, or negative experience/s of auditors selling a single commercial solution i.e. a new product.

<sup>28</sup> For example, challenge, learning new skill/s, developing and maintaining good working relationships.

<sup>29</sup>For example, energy intensive nature of SME; diverse requirements for refrigeration, HVAC, lighting, electrical equipment.

<sup>30</sup> For example, repair and maintenance (electricians, plumbers, installers, and construction workers), trade bodies and other industry representatives, professional/ peer networks, suppliers, landlords.



## Appendix B – Information about current policies in LEAP4SME countries

Agency	Designation	The programme includes the execution of an energy audit	Number of energy audits		
	<i>Programme/policy/initiative name (in english)</i>		<i>How many energy audits are carried out per year (average)? (2020; 2021; 2022).</i>		
<b>ADENE</b>	SGCIE (Intensive Energy Consumption Management System)	Yes	159	178	120
<b>AEA</b>	Audits for large enterprises according to the Austrian Energy Efficiency law - in line with EED Article 8	Yes	-	-	-
<b>CRES</b>	Special levy on pollutant emissions (SLPE) for SMEs with energy audits	No	-	1	1
	Athens Business Green Toolkit: Upgrading businesses in the Historic Center of Athens with terms of Green Operations.	Yes	-	1	-
<b>EIHP</b>	Public calls for energy audits and energy management systems	Yes	-	-	-
	Public calls issued by local communities	Yes	-	-	-
	Mandatory energy audits for large enterprises	Yes	-	-	-
	Energy items within national plan for resilience and recovery	No	-	-	-
<b>ENEA</b>	Article 8 implementation (which includes the Energy Intensive Industry programme mentioned in D3.3)	Yes	11,068 EAs = 8256 (from Large Enterprises Art.8, 1410 also EIs) + 2812 (from SMEs EIs)	924 EAs = 654 (from Large Enterprises Art.8, 46 also EIs) + 270 (from SMEs EIs)	600 EAs = 330 (from Large Enterprises Art.8, 48 also EIs) + 270 (from SMEs EIs)
<b>EST</b>	Business Energy Scotland	Yes	-	-	-
	Invest Northern Ireland	Yes	-	-	-
	Coventry and Warwickshire Green Business Programme	Yes	-	-	-



	GEP Environmental-Emphasis CO2 Reductions-Energy Audits	Yes	-	-	-
KAPE	Energy Plus	Yes	6	15	0 (new call has just opened)
	Thermomodernization Loan for Enterprises	Yes	30	23	-
AEA	Regionalprogramme der Bundesländer, Federal support programmes, example: OekoBusiness Vienna, programme modules with Energy Efficiency focus; example Vienna	Yes	-	-	-
	KMU-Energieeffizienzcheck, SME Energy Efficiency Voucher	Yes	272	-	-
EIHP	Public calls for energy audits and energy management systems	Yes	-	-	-
	Public calls issued by local communities	Yes	-	-	-
	Energy items within national plan for resilience and recovery	No	-	-	-
ENEA	Technology and Innovation for Energy saving and Energy Efficiency	Yes	408 energy audits		
	Regional programmes for energy efficiency/ energy audits (2016-2022)	Yes	Not all Italian regions have joined the calls and among those that have implemented a regional call only Lombardy (further details about Lombardy calls in the following sections), Sardinia (58 companies, 29 of which also reported energy efficiency interventions) and Campania 79 were funded in the second phase of 1RC. The 2nd RC 160. The call of the Emilia Romagna region has also obtained good results (156 financed companies)		
	Regional programmes for energy efficiency/ energy audits: Lombardy 1st call (2017)	Yes	194 energy audits		
	Regional programmes for energy efficiency/ energy audits: Lombardy 2nd call (2020)	Yes	208 energy audits		
EST	Coventry and Warwickshire Green Business Programme	Yes	-	-	-
	GEP Environmental-Emphasis CO2 Reductions-Energy Audits	Yes	-	-	-
EWA	Promotion of Energy Audits in Small and Medium Enterprises	Yes	7	18	16
	Managing Essential Resources in Retail through Consumption Analysis - MERCA	Yes	0	0	21

Agency	Designation	Implementation of energy efficiency measures					
	Programme/policy/initiative name (in english)	Is it possible to clearly identify the energy efficiency measures addressed during the audit? [Yes/No]	Is it possible to clearly identify the efficiency measures related with non-energy benefits (water-energy nexus, materials or other resources)? [Yes/No]	Is the implementation of the energy efficiency measures required/mandatory within the programme? [Yes/No]	If the implementation is required/mandatory, please describe the type of obligation.	Does the programme/policy/initiative cover the cost of the energy efficiency measure implementation? [Yes/No]	To which extent are the implementation costs covered (percentage, threshold etc.)?
ADENE	SGCIE (Intensive Energy Consumption Management System)	Yes	No	Yes	Mandatory: Decree-Law	No	-
AEA	Audits for large enterprises according to the Austrian Energy Efficiency law - in line with EED Article 8	Yes	No	No	-	No	-

CRES	Special levy on pollutant emissions (SLPE) for SMEs with energy audits	No	No	No	The implementation is not mandatory	No	Not applicable
	Athens Business Green Toolkit: Upgrading businesses in the Historic Center of Athens with terms of Green Operations.	Yes	Yes ( <i>water-energy nexus</i> )	No	-	Yes	80,00%
EIHP	Public calls for energy audits and energy management systems	Yes	No	No	-	Yes	-
	Public calls issued by local communities	Yes	No	No	-	Yes	-
	Mandatory energy audits for large enterprises	Yes	Yes	Yes	mandatory, target of the programme	No	-
	Energy items within national plan for resilience and recovery	No	No	No	-	Yes	-
ENEA	Article 8 implementation (which includes the Energy Intensive Industry programme mentioned in D3.3)	Yes	No	In the mandatory EAs according to Art.8 the implementation of EPIAs in NOT MANDATORY. The implementation of EPIAs from	For the EIIP the obligation is to implement at least one EPIA addressed in the energy audit during the 4 years period after the audit.	No	-

				EAs is MANDATORY in the Energy Intensive Industry Programme.	Alternatively the enterprise must implement an ISO 50001 Energy management system.		
<b>EST</b>	Business Energy Scotland	Yes	Yes	No	-	Yes	SMEs are offered access to a loan to cover the cost of the chosen measures
	Invest Northern Ireland	Yes	Yes	No	-	Yes	10% of total eligible project costs for large businesses, 20% for medium and 30% for small and micro.
	Coventry and Warwickshire Green Business Programme	Yes	Yes	No	-	Yes	Grants of between £1,000 and £20,000 to fund up to 40% of the cost of installing energy efficiency measures
	GEP Environmental-Emphasis CO2 Reductions-Energy Audits	Yes	-	No	-	No	-
<b>KAPE</b>	Energy Plus	Yes	Yes	Yes	Increasing energy efficiency is conditional on prior completion of an energy audit	Yes	Subsidy intensity in the form of a loan of up to 85% of eligible costs with the possibility of a 30% write-off.
	Thermomodernization Loan for Enterprises	Yes	No	Yes	Investments in renewable energy sources (RES) and deep	Yes	The maximum amount of the Loan is PLN 1,000,000.00, - One enterprise may receive a maximum of one Loan from the

					comprehensive energy modernization of buildings, increasing energy efficiency by at least 25% compared to the baseline as determined by an energy audit		Fund. - The maximum loan period is 120 months
AEA	Regionalprogramme der Bundesländer, Federal support programmes, example: OekoBusiness Vienna, programme modules with Energy Efficiency focus; example Vienna	Yes	No	No	-	No	-
	KMU-Energieeffizienzschek, SME Energy Efficiency Voucher	Yes	No	No	-	No	-
EIHP	Public calls for energy audits and energy management systems	Yes	No	No	-	Yes	-
	Public calls issued by local communities	Yes	No	No	-	Yes	-

	Energy items within national plan for resilience and recovery	No	No	No	-	Yes	-
ENE A	Technology and Innovation for Energy saving and Energy Efficiency	Yes	No	No	-	No	-
	Regional programmes for energy efficiency/ energy audits (2016-2022)	No	No	No	-	-	-
	Regional programmes for energy efficiency/ energy audits: Lombardy 1st call (2017)	Yes	No	No	-	No	-
	Regional programmes for energy efficiency/ energy audits: Lombardy 2nd call (2020)	Yes	No	Yes	EPI improvement >2% of the average in the last 2 years	No	-
EST	Coventry and Warwickshire Green Business Programme	Yes	Yes	No	-	Yes	Grants of between £1,000 and £20,000 to fund up to 40% of the cost of installing energy efficiency measures
	GEP Environmental-Emphasis CO2	Yes	-	No	-	No	-

	Reductions-Energy Audits						
EWA	Promotion of Energy Audits in Small and Medium Enterprises	Yes	No	No	-	No	-
	Managing Essential Resources in Retail through Consumption Analysis - MERCA	Yes	No	No	-	No	-

Agency	Designation	Quantification of potential energy savings			
	<i>Programme/policy/initiative name (in english)</i>	<i>Is it possible to quantify the savings that result from the energy efficiency measures addressed? [Yes/No]</i>	<i>Is it possible to quantify the savings resultant only from non-energy benefits? [Yes/No]</i>	<i>Please, describe how the quantification of non-energy benefits is performed (if applicable).</i>	<i>Which are the global savings per audit (toe; average)?</i>
ADENE	SGCIE (Intensive Energy Consumption Management System)	Yes	No	Depends on the type of measure - usually no; in the future DL yes	100 toe

<b>AEA</b>	Audits for large enterprises according to the Austrian Energy Efficiency law - in line with EED Article 8	Yes	No	no data, on individual and voluntary basis	260 toe
<b>CRES</b>	Special levy on pollutant emissions (SLPE) for SMEs with energy audits	No	No	Not applicable	Not available data
	Athens Business Green Toolkit: Upgrading businesses in the Historic Center of Athens with terms of Green Operations.	Yes	No	-	-
<b>EIHP</b>	Public calls for energy audits and energy management systems	Yes	No	-	-
	Public calls issued by local communities	Yes	No	-	-
	Mandatory energy audits for large enterprises	Yes	Yes	-	-
	Energy items within national plan for resilience and recovery	No	No	-	-
<b>ENEA</b>	Article 8 implementation (which includes the Energy Intensive Industry programme mentioned in D3.3)	Yes	No	-	-
<b>EST</b>	Business Energy Scotland	Yes	No	-	-
	Invest Northern Ireland	Yes	Yes	Cost savings; Water saving calculated in cubic meter	-



	Coventry and Warwickshire Green Business Programme	Yes	Yes	Cost savings, Reduced carbon footprint (in tons)	-
	GEP Environmental-Emphasis CO2 Redudctions-Energy Audits	Yes	No	-	-
KAPE	Energy Plus	Yes	Yes	In terms of reducing the consumption of primary raw materials (monitoring water consumption) - Data will be possible to determine only after the period of achievement of the energy effect. The data is not yet available.	-
	Thermomodernization Loan for Enterprises	Yes	No	No	-
AEA	<b>Regionalprogramme der Bundesländer, Federal support programmes, example: OekoBusiness Vienna, programme modules with Energy Efficiency focus; example Vienna</b>	Yes	No	-	-
	<b>KMU-Energieeffizienzcheck, SME Energy Efficiency Voucher</b>	Yes	No	-	5,7
EIHP	<b>Public calls for energy audits and energy management systems</b>	Yes	No	-	-
	<b>Public calls issued by local communities</b>	Yes	No	-	-

	Energy items within national plan for resilience and recovery	No	No	-	-
ENE A	Technology and Innovation for Energy saving and Energy Efficiency	-	No	-	-
	Regional programmes for energy efficiency/ energy audits (2016-2022)	-	-	-	-
	Regional programmes for energy efficiency/ energy audits: Lombardy 1st call (2017)	Yes	No	-	8,67
	Regional programmes for energy efficiency/ energy audits: Lombardy 2nd call (2020)	Yes	No	-	6,67
EST	Coventry and Warwickshire Green Business Programme	Yes	Yes	Cost savings, Reduced carbon footprint (in tons)	-
	GEP Environmental-Emphasis CO2 Redudctions-Energy Audits	Yes	No	-	-
EWA	Promotion of Energy Audits in Small and Medium Enterprises	Yes	No	-	On Average 75,500 kWh per audit (6.492 toe)
	Managing Essential Resources in Retail through Consumption Analysis - MERCA	Yes	No	-	-

Agency	Designation	Energy audits costs for Enterprises (particularly Non-SMEs)				Any link with other policies
	<i>Programme/policy/initiative name (in english)</i>	<i>Does the programme/policy/initiative cover the costs of the audit? [Yes/No]</i>	<i>To which extent are the costs covered (percentage, threshold etc.)?</i>	<i>Is the data regarding the audit costs provided by the applicant to the programme/policy/initiative? [Yes/No]</i>	<i>If Yes, please indicate an average value (if available). Please describe what this value comprises.</i>	<i>Is there any link/cooperation/interaction with other policies (e.g. EED art.7, local policies, EU funds)?</i>
<b>ADENE</b>	SGCIE (Intensive Energy Consumption Management System)	No	-	No	-	EED art. 7 and 8
<b>AEA</b>	Audits for large enterprises according to the	No	-	No	-	UFI

	Austrian Energy Efficiency law - in line with EED Article 8					
CRES	Special levy on pollutant emissions (SLPE) for SMEs with energy audits	No	The cost of the energy audit has not been determined by the programme.	No	-	<a href="#">Ανακοίνωση της Επιτροπής — Κατευθυντήριες γραμμές για τις κρατικές ενισχύσεις στους τομείς του περιβάλλοντος και της ενέργειας (2014-2020) (dapeep.gr)</a>
	Athens Business Green Toolkit: Upgrading businesses in the Historic Center of Athens with terms of Green Operations.	Yes	Fixed maximum amount for each action: 2500€	Yes	2500€	<a href="https://www.espa.gr/en/pages/NewsFS.aspx?item=1308">https://www.espa.gr/en/pages/NewsFS.aspx?item=1308</a>
EIHP	Public calls for energy audits and energy management systems	Yes	-	Yes	-	-
	Public calls issued by local communities	Yes	-	Yes	-	-
	Mandatory energy audits for large enterprises	No	-	No	-	-
	Energy items within national plan for resilience and recovery	No	-	No	-	-

<b>ENEA</b>	Article 8 implementation (which includes the Energy Intensive Industry programme mentioned in D3.3)	No	-	No	-	Yes
<b>EST</b>	Business Energy Scotland	Audit is free	-	Not applicable, audit is free	-	Yes, Scottish govt and ERDF
	Invest Northern Ireland	Audit is free	-	Not applicable, audit is free	-	Yes, Horizon 2020; Industrial Symbiosis service
	Coventry and Warwickshire Green Business Programme	Audit is free	-	Not applicable, audit is free	-	Yes, European Union Development Fund
	GEP Environmental-Emphasis CO2 Reductons-Energy Audits	Audit is free	-	Not applicable, audit is free	-	Yes, ERDF
<b>KAPE</b>	Energy Plus	Yes	Costs under the "Preparation of the project" category are eligible up to an amount not exceeding 10% of the total eligible costs of the project, including the costs of the environmental audit and energy audit.	No	-	-
	Thermomodernization Loan for Enterprises	No	-	No	-	-

AEA	Regionalprogramme der Bundesländer, Federal support programmes, example: OekoBusiness Vienna, programme modules with Energy Efficiency focus; example Vienna	Yes	1st step: Check – subsidised 8 hours consultancy (advice) by a qualified consultant (cofinanced with € 480 excl.) 2nd step: Energieeffizienz - subsidised 20 hours consultancy (advice) with energy focus by a qualified consultant (cofinanced with € 1,200 excl.)	-	-	UFI
	KMU-Energieeffizienzcheck, SME Energy Efficiency Voucher	Yes	90%	-	750	CO2 was mandatory to report.
EIHP	Public calls for energy audits and energy management systems	Yes	-	Yes	-	-
	Public calls issued by local communities	Yes	-	Yes	-	-
	Energy items within national plan for resilience and recovery	-	-	-	-	-
ENEA	Technology and Innovation for	Yes	75% of total expenditure for EA with a threshold of 5000€	Yes	6.000 €	- ENERGY AUDIT matching demand/supply of Experts in Energy Management to carry out energy audits

	Energy saving and Energy Efficiency				<p>in 500 SMEs requesting them</p> <p>- ENERGY EFFICIENCY WORKS matching demand/supply of clean technologies and energy efficiency services funding to carry out the most effective works for improvement (in terms of innovation, energy saving, environmental benefits and competitiveness) in 100 SMEs subjected to energy audit.</p> <p>Almost 90 works for improving energy efficiency of SMEs. 4,000 toe saved</p>	
	Regional programmes for energy efficiency/ energy audits (2016-2022)	Yes	-	Yes	-	art 8.
	Regional programmes for energy efficiency/ energy audits: Lombardy 1st call (2017)	Yes	50% of total expenditure for EA with a threshold of 5000€	Yes	<p>On the basis of the contributions paid and the number of diagnoses carried out, an average EA cost of 7200€</p>	50% Ministry of Economic Development (art. 8. Lgs.D. 102/20014 ) + 50% Regional Operative Program 2014 – 2020

					can be estimated	
	Regional programmes for energy efficiency/ energy audits: Lombardy 2nd call (2020)	Yes	50% of total expenditure for EA with a threshold of 8000€ expenditure for monitoring systems ( software and hardware) are eligible	Yes	On the basis of the contributions paid and the number of diagnoses carried out, an average EA cost of 8500€ can be estimated	70% Ministry of Economic Development (art. 8. Lgs.D. 102/20014 ) + 30% Regional Funds
EST	Coventry and Warwickshire Green Business Programme	Audit is free	-	Not applicable, audit is free	0	Yes, European Union Development Fund
	GEP Environmental-Emphasis CO2 Reductions-Energy Audits	Audit is free	-	Not applicable, audit is free	0	Yes, ERDF



EWA	Promotion of Energy Audits in Small and Medium Enterprises	Yes	<p>Scheme A (under de minimis regulation) 100% capped at €5,000 for medium sized enterprises NACE C and I; €3,000 medium sized enterprises all other NACE codes; €3,000 small sized enterprises NACE codes C and I (subgroup 55); €1,000 small enterprises all other NACE codes.</p> <p>Scheme B (under GBER) - cappings as per scheme A but companies are refunded up to 70% if small and 60% if medium.</p>	Yes	Cappings reflect average costs for each category.	Indirect link to Article 7 when the recommended cost effective measures are implemented through available financial aid.
	Managing Essential Resources in Retail through Consumption Analysis - MERCA	Yes	100%	No	-	Yes, in line with government policy the aim of MERCA is to assist SMEs in NACE G to become more sustainable.

## References

- Abadie, L. M., Ortiz, R. A., Galarraga, I., & Markandya, A. (2012). Energy efficiency policy in the USA: The impact of the Industrial Assessment Centres (IAC) programme and State and Regional Climate Policy actions. In *The Dynamics of Environmental and Economic Systems: Innovation, Environmental Policy and Competitiveness* (pp. 61–82). Springer Netherlands. [https://doi.org/10.1007/978-94-007-5089-0\\_4](https://doi.org/10.1007/978-94-007-5089-0_4)
- Abeelen, C., Harmsen, R., & Worrell, E. (2016). Planning versus implementation of energy-saving projects by industrial companies. Insights from the Dutch Long-Term Agreements. *Energy Efficiency*, 9(1), 153–169. <https://doi.org/10.1007/s12053-015-9355-1>
- Anderson, S. T., & Newell, R. G. (2004). Information programs for technology adoption: The case of energy-efficiency audits. *Resource and Energy Economics*, 26(1). <https://doi.org/10.1016/j.reseneeco.2003.07.001>
- Andersson, E., Arfwidsson, O., Bergstrand, V., & Thollander, P. (2017). A study of the comparability of energy audit program evaluations. *Journal of Cleaner Production*, 142, 2133–2139. <https://doi.org/https://doi.org/10.1016/j.jclepro.2016.11.070>
- Backlund, S., & Thollander, P. (2015). Impact after three years of the Swedish energy audit program. *Energy*, 82, 54–60. <https://doi.org/https://doi.org/10.1016/j.energy.2014.12.068>
- Blumberga, A., Āzis, R., Reinbergs, D., Pakere, I., & Blumberga, D. (2021). The bright and dark sides of energy efficiency obligation scheme: The case of Latvia. *Energies*, 14(15). <https://doi.org/10.3390/en14154467>
- Bressers, H., de Bruijn, T., & Dinica, V. (2007). Integration and communication as central issues in Dutch negotiated agreements on industrial energy efficiency. *European Environment*, 17(4), 215–230. <https://doi.org/10.1002/eet.454>
- Bröckl, M., Illman, J., Oja, L., & Vehviläinen, I. (2014). Energy Efficiency in Small and Medium Enterprises. *Nordic Council of Ministers*. <https://www.diva-portal.org/smash/get/diva2:708035/FULLTEXT01.pdf>
- Catarino, J., Henriques, J., & Egreja, F. (2015). Portuguese SME toward energy efficiency improvement. *Energy Efficiency*, 8(5), 995–1013. <https://doi.org/10.1007/s12053-015-9325-7>
- Cornelis, E. (2019). History and prospect of voluntary agreements on industrial energy efficiency in Europe. *Energy Policy*, 132. <https://doi.org/10.1016/j.enpol.2019.06.003>
- Cornelis, E., Kimura, O., Karlsson, M., Paramonova, S., Thollander, P., Jiménez-Navarro, J. P., Morales, I., & Bertelsen, C. W. (2015). *IEA IETS Annex XVI. Energy Efficiency in SMEs. Task IV: Energy services and business models for industrial SMEs*. IETS TCP. International Energy Agency, Paris.
- DOE. (2013). *IMPACT: Industrial Technologies Program, Summary of Program Results for CY 2009*. U.S. Department of Energy.

- Ekins, P., & Etheridge, B. (2006). The environmental and economic impacts of the UK climate change agreements. *Energy Policy*, 34(15). <https://doi.org/10.1016/j.enpol.2005.01.008>
- Fleiter, T., Gruber, E., Eichhammer, W., & Worrell, E. (2012). The German energy audit program for firms—a cost-effective way to improve energy efficiency? *Energy Efficiency*, 5(4), 447–469. <https://doi.org/10.1007/s12053-012-9157-7>
- Fleiter, T., Schleich, J., & Ravivanpong, P. (2012). Adoption of energy-efficiency measures in SMEs—An empirical analysis based on energy audit data from Germany. *Energy Policy*, 51, 863–875. <https://doi.org/10.1016/j.enpol.2012.09.041>
- Gruber, E., Fleiter, T., Mai, M., & Frahm, B. J. (2011). Efficiency of an energy audit program for SMEs in Germany – results of an evaluation study. *Eceee 2011 Summer Study on Energy Efficiency: Energy Efficiency First: The Foundation of a Low-Carbon Society*, 663–673.
- Harris, J., Anderson, J., & Shafron, W. (2000). Investment in energy efficiency: a survey of Australian firms. *Energy Policy*, 28(12), 867–876. [https://doi.org/https://doi.org/10.1016/S0301-4215\(00\)00075-6](https://doi.org/https://doi.org/10.1016/S0301-4215(00)00075-6)
- Herce, C., Biele, E., Martini, C., Salvio, M., & Toro, C. (2021). Impact of Energy Monitoring and Management Systems on the Implementation and Planning of Energy Performance Improved Actions: An Empirical Analysis Based on Energy Audits in Italy. *Energies*, 14(16), 4723. <https://doi.org/10.3390/en14164723>
- Jalo, N., Johansson, I., Kanchiralla, F. M., & Thollander, P. (2021). Do energy efficiency networks help reduce barriers to energy efficiency? -A case study of a regional Swedish policy program for industrial SMEs. *Renewable and Sustainable Energy Reviews*, 151, 111579. <https://doi.org/https://doi.org/10.1016/j.rser.2021.111579>
- Johansson, I., Johnsson, S., & Thollander, P. (2022). Impact evaluation of an energy efficiency network policy programme for industrial SMEs in Sweden. *Resources, Environment and Sustainability*, 9, 100065. <https://doi.org/https://doi.org/10.1016/j.resenv.2022.100065>
- Johansson, I., Mardan, N., Cornelis, E., Kimura, O., & Thollander, P. (2019). Designing Policies and Programmes for Improved Energy Efficiency in Industrial SMEs. *Energies*, 12(7), 1338. <https://doi.org/10.3390/en12071338>
- Kimura, O., & Noda, F. (2014). Does regulation of energy management systems work? A case study of the energy conservation law in Japan. *Eceee Industrial Summer Study Proceedings*, 2.
- Lackner, P., & Kulterer, K. (2018). Energy-efficient business programme klimaaktiv supports Austrian industrial SMEs. *Eceee Industrial Summer Study Proceedings, 2018-June*, 293–300. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85049898702&partnerID=40&md5=e926ab191c2718ec8d557f6134dfc6ae>
- Lisauskas, A., Kveselis, V., Dzenajavičienė, E. F., Masaitis, S., & Perednis, E. (2022). Analysis of energy audits results and impacts: case of small and medium enterprises in Lithuania. *Energy Efficiency*, 15(7), 48. <https://doi.org/10.1007/s12053-022-10052-x>
- Malinauskaite, J., Jouhara, H., Ahmad, L., Milani, M., Montorsi, L., & Venturelli, M. (2019). Energy efficiency in industry: EU and national policies in Italy and the UK. *Energy*, 172,

255–269. <https://doi.org/10.1016/J.ENERGY.2019.01.130>

- Meath, C., Linnenluecke, M., & Griffiths, A. (2016). Barriers and motivators to the adoption of energy savings measures for small- and medium-sized enterprises (SMEs): the case of the ClimateSmart Business Cluster program. *Journal of Cleaner Production*, 112, 3597–3604. <https://doi.org/https://doi.org/10.1016/j.jclepro.2015.08.085>
- Muthulingam, S., Corbett, C. J., Benartzi, S., & Oppenheim, B. (2013). Energy efficiency in small and medium-sized manufacturing firms: Order effects and the adoption of process improvement recommendations. *Manufacturing and Service Operations Management*, 15(4), 596–615. <https://doi.org/10.1287/msom.2013.0439>
- Nigohosyan, D., Vutsova, A., & Vassileva, I. (2021). Effectiveness and efficiency of the EU-supported energy efficiency measures for SMEs in Bulgaria in the period 2014–2020: programme design implications. *Energy Efficiency*, 14(2), 24. <https://doi.org/10.1007/s12053-021-09933-4>
- Paramonova, S., & Thollander, P. (2016a). Energy-efficiency networks for SMEs: Learning from the Swedish experience. *Renewable and Sustainable Energy Reviews*, 65, 295–307. <https://doi.org/https://doi.org/10.1016/j.rser.2016.06.088>
- Paramonova, S., & Thollander, P. (2016b). Ex-post impact and process evaluation of the Swedish energy audit policy programme for small and medium-sized enterprises. *Journal of Cleaner Production*, 135, 932–949. <https://doi.org/https://doi.org/10.1016/j.jclepro.2016.06.139>
- Preziosi, M., Federici, A., & Merli, R. (2022). Evaluating the Impact of Public Information and Training Campaigns to Improve Energy Efficiency: Findings from the Italian Industry. *Energies*, 15(5), 1931. <https://doi.org/10.3390/en15051931>
- Redmond, J., & Walker, B. (2016). The value of energy audits for SMEs: an Australian example. *Energy Efficiency*, 9(5), 1053–1063. <https://doi.org/10.1007/s12053-015-9409-4>
- Rohde, C., Durand, A., Neusel, L., Barckhausen, A., & Jensterle, M. (2020). Energy efficiency networks: latest developments in Germany and in the world. *Eceee Industrial Summer Study Proceedings*, 2020 eceee, 23–33. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85132444269&partnerID=40&md5=04b623efe88cd92d50df8e2b2ba4ba7f>
- Sleich, J., & Fleiter, T. (2019). Effectiveness of energy audits in small business organizations. *Resource and Energy Economics*, 56, 59–70. <https://doi.org/https://doi.org/10.1016/j.reseneeco.2017.08.002>
- Seok, J., Kim, J., & Park, H. S. (2021). Regulatory and social dynamics of voluntary agreement adoption: The case of voluntary energy efficiency and GHG reduction agreement in South Korea. *Energy Policy*, 148. <https://doi.org/10.1016/j.enpol.2020.111903>
- Stede, J. (2017). Bridging the industrial energy efficiency gap – Assessing the evidence from the Italian white certificate scheme. *Energy Policy*, 104, 112–123. <https://doi.org/https://doi.org/10.1016/j.enpol.2017.01.031>
- Stenqvist, C., & Nilsson, L. J. (2012). Energy efficiency in energy-intensive industries-an

- evaluation of the Swedish voluntary agreement PFE. *Energy Efficiency*, 5(2). <https://doi.org/10.1007/s12053-011-9131-9>
- Suk, S., Liu, X., & Sudo, K. (2013). A survey study of energy saving activities of industrial companies in the Republic of Korea. *Journal of Cleaner Production*, 41. <https://doi.org/10.1016/j.jclepro.2012.10.029>
- Tanaka, K. (2011). Review of policies and measures for energy efficiency in industry sector. *Energy Policy*, 39(10), 6532–6550. <https://doi.org/10.1016/J.ENPOL.2011.07.058>
- Thollander, P., Danestig, M., & Rohdin, P. (2007). Energy policies for increased industrial energy efficiency: Evaluation of a local energy programme for manufacturing SMEs. *Energy Policy*, 35(11), 5774–5783. <https://doi.org/10.1016/J.ENPOL.2007.06.013>
- Thollander, P., & Dotzauer, E. (2010). An energy efficiency program for Swedish industrial small- and medium-sized enterprises. *Journal of Cleaner Production*, 18(13), 1339–1346. <https://doi.org/https://doi.org/10.1016/j.jclepro.2010.04.020>
- Thollander, P., Kimura, O., Wakabayashi, M., & Rohdin, P. (2015). A review of industrial energy and climate policies in Japan and Sweden with emphasis towards SMEs. *Renewable and Sustainable Energy Reviews*, 50, 504–512. <https://doi.org/https://doi.org/10.1016/j.rser.2015.04.102>
- Thollander, P., Rohdin, P., Moshfegh, B., Karlsson, M., Söderström, M., & Trygg, L. (2013). Energy in Swedish industry 2020 - Current status, policy instruments, and policy implications. *Journal of Cleaner Production*, 51. <https://doi.org/10.1016/j.jclepro.2013.01.021>
- Thollander, P., Zubizarreta-Jiménez, R., Morales, I., Kimura, O., Cornelis, E., Karlsson, M., Söderström, M., & Backlund, S. (2014). *Energy end-use policies and programs towards industrial SMEs – the case of Japan, Belgium, Spain and Sweden - IEA IETS Annex XVI Energy Efficiency in SMEs Task I*. IETS TCP. International Energy Agency, Paris. [https://iea-industry.org/app/uploads/annex-xvi-task\\_1.pdf](https://iea-industry.org/app/uploads/annex-xvi-task_1.pdf)
- Toro, C., Biele, E., Herce, C., Martini, C., Salvio, M., Threpsiadi, A., & Wilkinson-Dix, J. (2022). Overview of Energy Efficiency Policies and Programmes for SMEs in Italy. *Energy Evaluation Europe 2022, Paris-Saclay, France, 28-30 September 2022*.
- Väisänen, H., Christensen, W., Despretz, H., Espegren, K. A., Gaspar, C., Lytras, K., Meyer, B., Reinikainen, E., Sattler, M., & Starzer, O. (2002). *Guidebook for energy audit programme developers*. SAVE-project AUDIT II. <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=6674849b901d84015b59469e25561646d72751a6>
- van Hoof, B., & Lyon, T. P. (2013). Cleaner production in small firms taking part in Mexico's Sustainable Supplier Program. *Journal of Cleaner Production*, 41, 270–282. <https://doi.org/https://doi.org/10.1016/j.jclepro.2012.09.023>
- Wakabayashi, M. (2013). Voluntary business activities to mitigate climate change: Case studies in Japan. *Energy Policy*, 63. <https://doi.org/10.1016/j.enpol.2013.08.027>
- Wakabayashi, M., & Arimura, T. H. (2016). Voluntary agreements to encourage proactive firm action against climate change: An empirical study of industry associations' voluntary

action plans in Japan. *Journal of Cleaner Production*, 112, 2885–2895.  
<https://doi.org/10.1016/j.jclepro.2015.10.071>

Wohlfarth, K., Schlomann, B., Eichhammer, W., & Worrell, E. (2016). Chances for changes - Tailoring energy-efficiency measures to target groups. *2016 ECEEE Industrial Summer Study: Industrial Efficiency, 2016-Septe*, 137–149.  
<https://www.scopus.com/inward/record.uri?eid=2-s2.0-85045435874&partnerID=40&md5=dcc62f8629ffc3413f9bdfdeb5a23efb>