



JRC SCIENCE FOR POLICY REPORT

Survey of energy audits and energy management systems in the Member States

*Preparation of the
transposition of the
Energy Efficiency Directive
in Member States*

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Abstract:

Energy Audits and Energy Management Systems in Member States in the preparation for the transposition of the EED

This report, conducted by the Joint Research Centre for DG ENERGY, during the last trimester of 2013 and the first trimester of 2014, identifies the status of the programmes promoting Energy Audits and Energy Management Systems in the Member States of the European Union in order to realize which of the requirements of Article 8 of the Energy Efficiency Directive were already met and to understand the level of additional effort needed by the Member States to meet their obligations under the named article. The report aims also to identify eventual barriers and make recommendations on how the goals of Article 8 can be fulfilled.

Table of contents

Acronyms.....	2
1. Abstract.....	3
2. Introduction	4
2.1. The requirements of the Energy Efficiency Directive.....	4
2.2. Energy Audits and Energy Management Systems: an overview.....	4
2.2.1. Energy Audits	4
2.2.2. Benefits of an energy audit.....	5
2.2.3. International standards for energy audits	5
2.2.4. Energy Management Systems	6
2.2.5. Benefits of an energy management system	7
3. Energy Audits in the Member States: Current Status and Best Practice	7
3.1. An overview of existing programmes to promote energy audits in the Member States.....	7
3.1.1. What programmes are currently in place or are planned.....	7
3.1.2. Quality control of audits	22
3.1.3. Qualification and training of auditors	24
3.1.4. Contents, level of detail of energy audits.....	25
3.2. Activities to encourage SMEs to undergo energy audits	26
3.3. Energy Management Systems in the Member States	27
3.4. Preparing for implementation of Article 8.....	28
3.5. Barriers to the uptake of energy audits and energy management	29
4. Implementing Article 8 in the Member States: An Analysis	30
5. Conclusions.....	32

Acronyms

CHP	Combined Heat and Power installation
CEN	European Committee for Standardisation
DG ENER	European Commission Directorate General for Energy
EED	Energy Efficiency Directive
EnMS	Energy Management System
EU	European Union
EUR	Euro
ISO	International Organisation for Standardisation
JRC	the Joint Research Centre of the European Commission
SME	Small to Medium-sized Enterprises

1. Abstract

The present study has been conducted by the Joint Research Centre on behalf of DG ENER with the purpose to understand the status of programmes promoting energy audits and energy management systems in the Member States of the European Union. The objectives of this report are to assess the extent to which the requirements of Article 8 of the Energy Efficiency Directive (EED) are already met and to understand the level of additional effort needed by the Member States to meet their obligations under the named article. Another objective of this report is to identify eventual barriers and make recommendations on how the goals of Article 8 can be fulfilled.

This report was put together by sending a survey, during the last trimester of 2013, to different contact points in the Member States, such as members of energy agencies, governmental bodies responsible for the implementation and regulation of energy policy, energy efficiency experts, members of the academia. There were also performed interviews with national experts and representatives of standardization bodies that gave their input in the matters of the implementation of Article 8 throughout the European Union.

It was possible to gather contributions from contact points from the great majority of the Member States except from the cases of Belgium, Ireland and Luxembourg. For the cases of Belgium and Ireland, since these countries have been carrying, for many years now, consolidated programmes on the subject of energy efficiency and energy audits it was still possible to gather sufficient information to perform an evaluation on the status of their general policies. Also, during the workshop organized by the JRC on behalf on the implementation of Article 8 in the month of March of 2014, it was possible to contact with representatives from Member States, from the industry sector and from certification bodies that shared their view on the implementation of this article within their areas of action and expertise.

2. Introduction

2.1. The requirements of the Energy Efficiency Directive

In the EU's Climate and Energy package of legislation from 2009 sets three key objectives to be achieved by 2020: namely to reduce EU greenhouse gas emissions to 20% below 1990 levels; to increase the share of EU energy consumption produced from renewable resources to 20%; and to improve EU energy efficiency by 20%.

To provide a legal basis to the latter objective, the Energy Efficiency Directive¹, referred to hereafter as the Directive or the EED, was adopted in October 2012. The Directive quantifies the headline 20% energy efficiency target defined in the Climate and Energy package in terms of energy units, establishes a common framework of legally binding measures for the promotion of energy efficiency in the EU in order to the target by 2020, and paves the way for greater energy efficiency beyond that date. Measures include a requirement to establish energy efficiency obligations schemes or equivalent policy measures in all Member States, a requirement to draw up a roadmap for the renovation of all buildings up to 2050, an obligation to renovate annually 3% of buildings owned and occupied by central government, and an undertaking to conduct cost-benefit analyses for the deployment of combined heat and power (CHP) installations.

Additionally, Article 8 of the Directive addresses energy audits and places the following obligations on Member States with respect to the promotion of energy audits in their jurisdictions. Member States are required to promote the availability of high quality energy audits to all final energy customers. They must establish mandatory energy audits for larger enterprises that must be carried at regular intervals and must ensure that the minimum criteria for energy audits detailed in Annex VI of the Directive are upheld. Organisations that are implementing energy or environmental management systems are exempt from this requirement provided that the systems incorporate regular energy audits that meet the minimum criteria given in Annex VI. Furthermore, Article 8 requires the Member States to develop programmes to encourage small to medium-sized enterprises (SMEs) to undergo energy audits and implement the recommendations from these audits. Member States must also provide appropriate services to raise awareness among households about the benefits of energy audits.

As requirement to undergo mandatory and regular energy audits applies only to enterprises that are not SMEs a key task for Member States will be to identify relevant enterprises. Therefore a formal and standardized definition of SMEs is needed. The EED uses the definition given in Commission Recommendation 2003/361/EC. The category of micro, small and medium-sized enterprises are defined as "*enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million and/or an annual balance sheet total not exceeding EUR 43 million*".

2.2. Energy Audits and Energy Management Systems: an overview

2.2.1. Energy Audits

An energy audit is defined as a systematic inspection of energy use and energy consumption of a site, building, system or organisation with the objectives of establishing energy flows, identifying the potential for energy efficiency improvements and reporting them to the energy user. Annex VI of the Directive the minimum criteria that must be fulfilled by obligatory audits in order to comply with requirements:

¹ Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2012/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, OJ L 315, 14.11.2012, p.1.

- They must be based on measured up-to-date energy consumption data;
- They must contain a detailed review of the energy consumption profile of relevant buildings, operations or installations;
- They should, where possible address life-cycle costs (or returns on investment) rather than simple payback periods;
- Audits should be proportionate, and sufficiently representative to form a clear picture of energy performance and to enable identification of the most significant opportunities for improvement.

The Annex states that detailed and validated calculations should be presented for the measures proposed in energy audits so that the potential savings are clear. It further stipulates that it should be possible to store the data used in energy audits for historical analysis and for tracking performance.

2.2.2. Benefits of an energy audit

Quite apart from the legal obligations of the Directive, energy audits offer many benefits to both small and large energy consumers.

- Energy audits should identify the greatest opportunities for energy savings. Therefore they offer the opportunity to reduce the energy costs of an organisation. This improves profitability and enhances competitiveness;
- Energy audits can identify potential for improvement in business and production processes and thereby contribute to improved productivity;
- Energy audits can help organisations reduce the environmental impact of their activities;
- Energy audits can help some organisations to fulfil obligations under their national with respect to emissions to air and pollution control;
- Energy audits can also help improve employee satisfaction and project a positive image to customers and the wider community.

2.2.3. International standards for energy audits

While Annex VI provides minimum criteria for energy audits, the Directive does not contain much information about required or recommended audit processes, types of data needed or levels of detail in audit reports. It will be necessary to control that the quality and thoroughness of energy audits are sufficient to meet the energy savings goals of the Directive and are implemented to the same extent across all Member States. To ensure an effective implementation of Article 8 across the EU a common interpretation of the requirements of the EED and a consistent implementation of energy audits in each Member State is required. Although the EED does not refer to any specific standard with respect to implementation of the Article 8, adherence to international standards for energy audits can provide a consistent approach and ensure that audits undertaken are of a high quality.

The European standard EN 16247-1:2012 Energy Audits General Requirements defines the properties of a good quality energy audit. It specifies the audit requirements, a common methodology and defines the deliverables. It applies to all forms of organisations and all types of energy consumption, excluding energy consumption in private residences. The standard attempts to harmonise common aspects of energy auditing to bring more clarity and transparency to the market for energy auditing services. The audit process is presented as a series of steps: contract, start-up meeting,

data collection, fieldwork, analysis, report and hand-over of results. It does not address properties of an energy audit programme such as administration, auditing tools, training of auditors or quality control. In the preamble of the Directive it is stated that energy audits in the Member States should take relevant European and international standards such as EN 16247-1.

A number of further related European energy auditing standards are in development and are currently in draft form. This draft European standard prEN16247-2 addresses the specific requirements for energy audits for buildings or groups of buildings excluding private residences. Draft standard prEN16247-3 provides guidance for energy audits of industrial process. According to the proposed standard, an industrial site can incorporate one or more sections of activity, each with its own specific operating conditions, including production lines, offices, laboratories, research centres, packaging, warehouses and onsite transportation facilities. The standard can be applied to an energy audit addressing a complete industrial site or part of a site. Energy auditing of transportation systems is addressed by the draft standard prEN16247-4. A standard dealing with the qualification of auditors, prEN16247-5, is also planned and a first draft is currently in preparation.

Following the publication, in 2011, of the normative ISO 50001 that was that draws the guidelines for the implementation of Energy Management Systems, it is now in course the preparation for the launch of the normative ISO 50002 that gives guidance for the execution of energy audits comprising a detailed analysis of the energy performance of organizations, equipment, systems or processes. It is based on appropriate measurement and observation of energy use, energy efficiency and consumption. Energy audits are planned and conducted as part of the identification and prioritization of opportunities to improve energy performance, reduce energy waste and obtain related environmental benefits. An energy audit can support an energy review and can facilitate monitoring, measurement and analysis as described in ISO 50001, or it can be used independently. The energy audit process is presented as a simple chronological sequence, but this does not preclude repeated iterations of certain steps.

2.2.4. Energy Management Systems

In this survey we also attempt to assess the prevalence of Energy Management Systems (EnMS) in the Member States and the national efforts to promote energy management. An EnMS is a systematic process for continually improving energy performance. The Directive defines an EnMS as a *"set of interrelated or interacting elements of a plan which sets an energy efficiency objective and a strategy to achieve that objective"*. An energy management system can be applied to any organisation but is regarded particularly beneficial for energy intensive processes. Unlike a one-off energy audit an EnMS is a process of continuous improvement which requires that organisations continue to seek out new opportunities for energy savings in all areas of activity.

Establishing an EnMS requires an organisation to follow a series of defined steps. They typically include developing an energy policy and assigning responsibilities, identifying main energy users, setting goals and targets that are measurable, implementing actions that meet the goals, checking for success of actions, and continuous review of the system. Similarly to other management systems like the ISO 9001, the principle of Plan, Do, Check, Act also applies with the continuous improvement as a main driver for the evolution of such system.

Implementing an EnMS addresses an organisation's obligations with respect to obligatory energy audits. The Directive states that organisations that are implementing an energy or environmental management system that incorporates suitable energy audits will be exempt from the audit obligation in Article 8. Article 5 of the Directive also calls on Member States to encourage public bodies to incorporate energy management into their energy efficiency plans.

After the publication in 2009 the European standard for energy management EN 16001 that became the first international energy management standard that was built on national standards that were already in existence in a number of Member States, it was created the ISO 50001 in 2011 which is referred to in the preamble to the Directive it outlines a cyclical continuous improvement process as the standards that preceded it, respectively the ISO 9001 on Quality Management Systems and the ISO 14001 on Environmental Management Systems. ISO 50001 is a voluntary international standard developed by ISO, the International Organization for Standardization. ISO 50001 applies to organisations at any size, and gives guidelines for establishing, managing and improving their energy consumption and efficiency.

2.2.5. Benefits of an energy management system

With an energy management system an organisation can enjoy all of the benefits of energy audits outlined in the previous section. In addition to these an EnMS can offer the following benefits:

- As a continuous process, it can bring about on-going improvement in performance and productivity and can continue to reduce energy costs over a longer period;
- A successfully EnMS will ensure commitment from senior management to energy efficiency;
- An EnMS can involve all staff in an organisation in the improvement process;
- It fulfils an organisation's obligations with respect to Article 8 of the Directive.

3. Energy Audits in the Member States: Current Status and Best Practice

The present section of the report contains the results of our survey organized by the sub-topics embedded within the Article 8 of the directive. There were collected inputs from 25 contact points from the 28 Member States and this section reflects the main findings collected from the answers received from the different parties, received during the last trimester of 2013. Overall there were collected 31 questionnaires, not being possible to get information from the contacts realized with Belgium, Ireland and Luxembourg. In the cases of Belgium and Ireland, due to the fact that these countries have in place consolidated policies regarding Energy Audits, it was still possible to gather general information from their programmes.

The following sub-chapters aim to give an overview of the results obtained in the survey sent. In the sub-chapter 4.1 are represented the best practices of existing programmes to promote energy audits and how they function in these Member States, followed by some examples of how Member States are complying with the requisites on quality control of audits, the qualification and training of auditors and the contents and level of detail of energy audits for the different programmes already in place..

3.1. An overview of existing programmes to promote energy audits in the Member States

3.1.1. What programmes are currently in place or are planned

One of the main objectives of the survey sent to the different contact points was to assess if Member States had already in place programmes with the objective of promoting energy audits and what were their main drives or in the case of inexistent

programmes in place if there were policies already aligned for the near future in order to comply with the Article 8 requirements.

From the responses obtained it was possible to realize that the majority of countries have programmes already in place or planned. From the countries with consolidated programmes ongoing, the majority has in place voluntary agreements that somehow promote energy audits, even if indirectly, leading to a compliance with the directive. This is because that the realization of energy audits under these programmes are to be considered as satisfying the requirements of the mandatory requirements for non-SMEs realization of energy audits, "implemented under voluntary agreements concluded between organisations of stakeholders and an appointed body and supervised by the Member State concerned, or other bodies to which the competent authorities have delegated the responsibility concerned, or by the Commission".

From the responses received the following existing programmes exist either on a voluntary or mandatory basis. In the figure below it is possible to get an overview perspective of the status of the type of programmes in place.

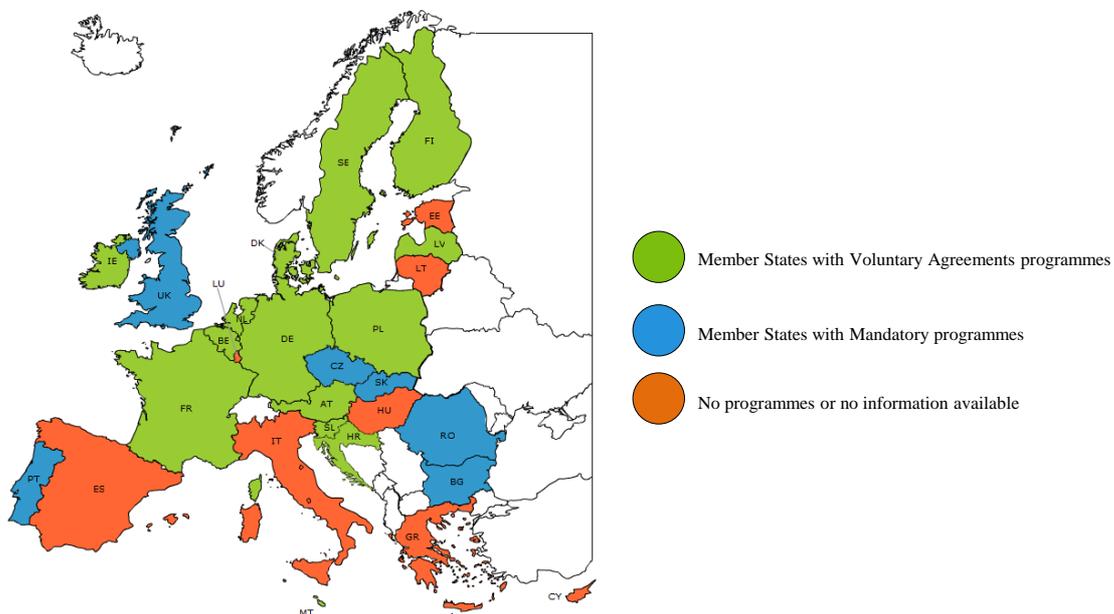


Figure 1 – Types of programmes in place in the EU 28

The following Member States represented the Best Practices in Member States with **Voluntary** programmes in place:

Austria

The klima:aktiv, the climate protection initiative promoted by the Austrian Energy Agency, acts as the umbrella for the soft measures on energy efficiency. The Energy Saving programme and more specifically the Efficient Companies Programme has the objective to raise awareness for energy efficiency in industry by organizing information events in cooperation with sector associations, promoting the implementation of Energy Management Systems according to ISO 50001, implement energy efficiency measures in industrial enterprises in co-operation with private partners and implement standardized energy audits by organizing trainings for energy auditors.

Being a federal state, Austria has different programmes for the promotion of energy audits depending on the region. Within the regional audit support programmes, companies can get financial support for the execution of energy audits. Depending on the region the subsidy can go up to 75% of the audit cost. With the promotion of

different processes to be audited, the duration of the audits can go from one to five days. This is due to the fact that in Austria, every year have been promoted different technology specific audit tools like compressed air, pumps, fans, ventilation and air conditioning, steam systems, chilling systems or lighting systems initiatives. These programmes have been in place for more than 5 to 10 years, depending on the regions with great success.

Information from audits is collected as a first step on a regional level by the regional program manager which then passes on different types of information like the main energy saving measures suggested and/or implemented which are collected on a national level in a national database.

On a national level klima:aktiv promotes, on a yearly basis, training courses for energy auditors which are financed by the Ministry of Environment. There are several training programs for auditors available, but only for the "auditors of residential buildings" a standardized basic training is available. For auditors of large industrial companies the Austrian Energy Agency developed a series of specific advanced training courses on motor driven system, steam, cooling, ventilation and AC systems or lighting systems. These trainings are advanced training courses aimed at experienced energy auditors who can also get training on Guidelines to conduct special audits, auditing according the EN 16247 and get familiarized with the templates for audit reports. A basic training programme for auditors in industrial companies is planned to be in place as soon as the unique requirements for qualification of auditors are published.

There are available subsidies for investment in programmes promoted by the Klima Energie Fonds, the Climate and Energy Fund, that subsidizes energy efficiency measures which can be associated to the audit programmes allowing the access to lines of funding for the implementation of measures related to areas such as heat pumps and heat recovery installation, air conditioning and cooling, LED lamps installation, upgrading to IE3 motors or thermal building refurbishments.

Belgium

In Belgium it there is not a federal energy agency for energy efficiency and each region develops its own set of incentives and regulations regarding energy efficiency. For industry, the energy efficiency policy has been focussed on voluntary agreements between industry and the regional governments of Flanders and Wallonia. In Flanders, these agreements are "benchmark" agreements that are signed by individual companies with energy consumptions larger than 0.5 PJ per year. In the Wallonia region, voluntary agreements, named Branch Agreements, have been signed by 13 sector associations which commit themselves to a quantified energy efficiency improvement over the years.

The Benchmarking Covenant was drawn up for the participation of large energy intensive industries, from all industrial sectors in order to transform the region's industry sectors in one of the most efficient in the world. Participation is possible per site and by the participation in the covenant, industries commit themselves to bring or keep energy efficiency of their process installations on the level of the 'best international standard'. As compensation for the efforts of the industries, the Flemish Government guarantees that it does not impose additional measures concerning energy efficiency or CO₂ reduction.

At last one year and a half after entering the covenant, the participants draw an Energy Plan which contains all measures necessary to realize and maintain the best international standard. From that moment on, the industry will annually draw up a monitoring and progress report.

The Auditing Covenant is also a voluntary agreement promoted by the Flemish government that focuses on medium-sized energy-intensive industrial companies with consumptions between 0.1 and 0.5 PJ per year and that do not fall inside the scope of the benchmarking covenant. The companies commit themselves to perform an energy efficiency audit and to implement cost-effective measures.

Companies that sign the Auditing covenant have an energy audit conducted in their facilities and are obliged to implement the energy-saving measures proposed from the audit. The measures offered by the Flemish Government are the same as in the benchmarking covenant.

The Walloon region government has established, with considerable success, the Branch Agreements. These are made on a voluntary basis between the government and the different industrial sectors, represented by their federations. The first step of the procedure is the signing of a declaration of intent by all companies in the sector wanting to take part in the agreement. After this, Energy Audits financed by the public authorities are carried out on every industrial site by independent auditors formally recognized by the same public authorities. Based on improvement measures identified by the audits, each of the companies defines an objective for improving their energy efficiency and reducing greenhouse gas emissions. The sector association consolidates the individual company objectives and determines the sectorial objectives followed by the actual signing of the sectorial agreement by the companies, the professional federation and the regional government. This agreement specifies the arrangements for monitoring the agreement and the penalties to be applied in the event that the stated objectives are not met. Participating companies have to report on a yearly basis on the progress made and the federation produces a consolidated progress report.

The energy audits provide an analysis of energy flows of the activities of each site and identify a range of actions to be implemented, which are feasible and cost effective based on the calculation of a payback period. All audit results are sent to the regional government for validation and progress of the implementation of measures is evaluated by the annual calculation of an energy efficiency indicator.

In what concerns the financing of energy audits the Walloon Region Energy has developed the AMURE programme that gives companies a subsidy to carry out an energy audit in their facilities. This audit is conducted according to a set of specifications defined by law and performed by an approved expert by the Walloon Region. The purpose of this audit is to empower the company to evaluate the viability of investments in a more efficient use of energy and develop a comprehensive plan to improve energy efficiency of the company. After the signing of the agreement, the audit report must be submitted to the Walloon region within a period of no more than one year. The amount of the subsidy is 50% of the audit cost excluding VAT.

The Energy Audits from the AMURE programme must meet the specifications described by the agreement and be by independent auditors approved by the Walloon Region.

Denmark

Denmark has had a voluntary agreement scheme since 1996. This voluntary programme requires that a signatory company implements an Energy Management System according to ISO 50001 that has followed the Danish standard denominated DS2403, created in the absence of an international standard. This programme is open either to non-SMEs as to SMEs and companies have to make a comprehensive evaluation of their energy consumption patterns and implement measures identified with a payback horizon of less than four years. Companies joining the voluntary agreement get a rebate on the CO₂ tax applicable to all fossil energy sources.

If the company does not comply with the prerequisite of the certification of the Energy Management System, the evaluation of energy consumption and the implementation of the measures identified, then the agreement is made void, and the company has to pay back the tax rebate. The evaluation of the energy consumptions or special investigations allow for a comprehensive analysis of energy consumption of a process, plant, or overall production and energy system and include an evaluation of the profitability of energy efficiency projects.

The Danish Energy Agency has developed collective agreements with industrial sector associations that can negotiate with the Energy Agency on behalf of groups of

enterprises in their sector, like paper, glass or cement industries, gathering information from companies with similar processes, while signing the agreements.

Energy Audits are performed by registered energy consultants that have to pass certain criteria to be registered and the information gathered in the audits is collected centrally by the Energy Agency while the quality of such audits is assumed to be assured by the professionals performing audits that must keep a high standard in order to maintain their registry as energy consultants.

Finland

Finland has had an Energy Audit Programme operational since 1994 managed by Motiva, the Finnish state owned body, which is responsible for the development of the energy audit models, training and certification of auditors. In this programme energy audits are made according to specific models for different customer groups (industry including both SME's and energy intensive industry, public and private services sector and energy industry) and have been subsidised since then. The subsidies attributed to the participants in the voluntary Energy Audits Programme go up to 40 to 50 % and are provided by the Ministry of Employment and Economy. The condition for granting subsidies is that the implementation and reporting guidelines are actually followed through.

The Finnish Energy Efficiency Agreement Scheme has in place Action Plans for 5 specific industrial sectors and 3 private service sectors and also general action plans for industry, the public sector, and service SME's which are not falling under specific sectors. In all action plans there is an obligation to figure out the different energy uses and possible energy efficiency improvement measures and the vast majority of energy audits in most sectors are conducted under this umbrella. Industrial companies can also use energy audit models developed for the service sector for its regular facilities, such as office buildings.

The main objective of the subsidized audits is to get a comprehensive picture of energy consumption and how it is split to different consumption areas as well as to find out possible energy efficiency measures including calculations on energy saving potential and investments costs. Calculations made by auditors are based on the data (observations, questionnaires, measurements) gathered during the field work as well as information gathered from other sources from the audit subject. The savings are calculated by engineering estimates for the proposed measures based on the data collected.

The Energy Audit Programme manages a database organized by Motiva that gathers the information of all subsidized audits. Energy audits carried under the Energy Audit Programme are carried out by authorised energy auditors trained by Motiva that promotes this training programme for subsidised energy audits auditors. All auditors need to have a sufficient energy technical back ground education to be allowed to participate the auditors' trainings.

Germany

Germany has had in place two types of programmes promoting energy audits at a federal level. Starting in 2008, the KfW, the German Promotional Bank has been promoting a voluntary energy audit programme aimed for SMEs. This programme consists in the attribution of grants for onsite energy audits for companies with less than 250 employees and consists of an initial audit of two days that has its costs covered up to 80% and a detailed audit of up to ten days and has its costs covered up to 60%. In this programme the auditors have a standard report template in which are required to fill a detailed list of recommended measures. This programme has been successfully working since the beginning with about 5000 audits per year, with roughly two to three energy efficiency measures being adopted per audit. In most cases these are building related measures. This audit programme benefits from a close relationship with regional

partners like local industry chambers or energy agencies that make the bridge between companies and the promoting partner. The companies that are object of energy audits can also benefit from the KfW soft loan programme for financing energy efficiency investments, even if it is recognized that despite the existence of this soft loan programme, financing is still a barrier for many companies.

Also at a federal level there has been in place since 1998 the "BAFA Vor-Ort Beratung" programme that consists of an Energy Audit aimed for house owners with a subsidy being given depending on the size of the building. This programme subsidizes audits on residential buildings and an on-site inspection is mandatory. The audit reports have minimum content requirements and must contain recommendations and quantifications of measures to be implemented. After the audit the information is collected centrally at the Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA).

While for the BAFA Vor-Ort-Beratung, are the auditors that apply for the subsidy, in the KfW Energieberatung Mittelstand, the company that gets audited applies for the subsidy directly with an invoice of the auditor and a report from the auditor being required.

For both programmes the requirements on the qualification of auditors are similar. Auditors must have proven qualifications such as a degree in engineering or be authorized to issue energy performance certificates plus further professional training and years of experience in the energy field. Independence is also a major issue on the ability of auditors that may not be hired or take provisions from, or have a share in an energy utility, or a producer of products used when implementing energy efficiency measures and also be neutral respecting to the producer, provider and distributor of energy.

Ireland

The Sustainable Energy Agency of Ireland (SEAI) has been promoting several programme supports for industry with considerable success.

The Large Industry Energy Network (LIEN) is a voluntary grouping of companies, organized by SEAI, that work together to develop and maintain robust energy management. LIEN organizes regular workshops, seminars and site visits in which members keep up to date on best practices and new technologies. By learning from experts and sharing knowledge and experiences, members save valuable research time, invest wisely and maximise returns. By participating in LIEN, members commit to develop an energy management programme, to set energy targets, undertake an annual energy audit and produce an annual statement of energy. Companies can be members if they spend more than €1m on energy yearly or are part of the Energy Agreements Programme.

The Energy Agreements Programme (EAP), which is a subset of LIEN was launched in May 2006 and is a voluntary programme suited for large energy consumers. The companies commit to implement an Energy Management System according to the ISO 50001 within 12 months after the signing of the agreement with SEAI as a path to maximise energy saving in their activities. In return, SEAI provides advice, networking assistance and financial support. In this process SEAI performs an agreement gap analysis that is carried out to determine the gap between where the companies are and what they need to do to achieve certification. This allows for the companies to know what actions they have to take and what kind of resources the companies will need to allocate to achieve such certification. The gap analysis is performed by third party experts contracted and trained by SEAI and takes up to two days, while the Irish National Accreditation Body supervises the quality of the assessment.

For each EAP member, SEAI allocates an Agreement Support Manager (ASM) that helps members with advice and visits onsite, while helping the members meet their EAP commitments. Depending on the sector, ASM can provide technical support in areas they are most familiarized since ASM possess a mix of technical/business/relationship management skills and experience of energy management in industry.

In what concerns the support for SMEs, SEAI has developed an SME Support Centre with services of advice, mentoring and also training in energy management tailored for this type of companies. There is a set of tools suited for SMEs with material easy to use in order to make a successful energy saving campaign. These sets of tools are provided in the form of templates for calculating energy usage and cost savings. Another of the tools developed by SEAI is the Energy Map that is an online application that provides a step by step guide to creating a best practise action plan for SMEs. This Energy Management Action Plan is divided into 20 steps that companies can follow themselves in order to implement their energy management system without having the costs of a certification. By registering online, companies can easily track their progress through the whole process.

Netherlands

Currently in the Netherlands, the voluntary agreements are the policy instruments that stand out as a success towards the promotion of energy audits and energy efficiency savings. In what concerns Legal and Regulatory Framework obligation for companies to examine energy saving options (energy audit) for enterprises (including ETS) and buildings. This is laid down in the Environmental Act and is under development the adjustment of the legal framework as a result of the EED.

Regarding the promotion of Energy Audits, the Long Term Agreements (LTA) are voluntary agreements signed between Sector Organizations, Ministries, and Competent Authorities. The first generation of LTA (LTA1) started in 1992 with a focus in onsite Process Efficiency. The second generation of the LTA (LTA2) that started in 2001 had a change of focus of the objective of the programme with more attention being given to Life Cycle Efficiency, where the companies are obliged to implement Energy Management Systems and also be more concerned about the sustainability of energy by generation onsite and in the procurement of different energetic sources. The third generation of the LTA (LTA3) that started in 2009 has the focus on the long term on energy consumption. This is made by the elaboration of Road Maps with the thought on what is need to remain competitive and energy efficient in the coming years. The great majority of industry is covered by the LTA with more than 70% coverage with an overall involvement of 1100 companies from 17 industry sectors.

There are two main actors in LTA. The sector associations and the enterprises themselves. While the sector associations have the responsibility to intermediate between enterprises and the government, and to report annually on the sector progress, initiate sector initiatives and develop communication to association's members on energy efficiency issues, enterprises have to implement an Energy Management System according to Dutch Specifications that is similar to EN16001 or ISO 50001, formulate an Energy Efficiency Plan and implement opportunities identified in such plan and report annually their progress on energy performance.

Companies inside the LTA are obliged to draw the Energy Efficiency Plan every four years from the outcomes of the audits by establishing energy efficiency goals, define energy efficiency measures concerning processes, supply and product chain and sustainable energy and must define a time plan for the implementation of the measures. During this period companies are accompanied by external expert support that backs the companies to implement such plan.

The energy audits within the voluntary agreements must comply with minimum criteria, even if carried out as a part of an energy management system. Energy Audits are based on real and updated data and energy consumption is divided between buildings facilities, industrial operations and transportation.

As support schemes, the LTA mechanisms cover the costs of the audit experts and the costs of the feasibility studies, provides financial incentives through the Energy Investment Deduction and gives access to credit lines.

Sweden

In Sweden there has been in place, since 2005, a voluntary agreement between industry and the government named "Programme for Improving Energy Efficiency in Energy Intensive Industries" (PFE). Companies that are willing to participate get a tax reduction on electricity. Even if it is a voluntary programme, once signed, the requirements are legally binding.

Energy Intensive Enterprises that participate in the PFE have the requirement to perform an Energy Review and implement a certified energy management system according ISO 50001. The achievements of the requirements are checked by the Energy Agency and only energy intensive industries can participate in the programme. The duration of the participation in the PFE is of five years. In the first two years the company has to achieve certification for a standardized energy management system. It must also carry out an energy review, which leads to the identification of energy efficiency opportunities. In the remaining three years the participant company has to implement the measures identified and to submit a report to the Swedish Energy Agency on the energy management system implemented the energy review and the list of measures identified. At the end of the five year period a final report has to be submitted in order to summarize the actual savings of the implemented measures.

The involvement in the PFE gives participating companies access to tools for the successful implementation of the programme such as manuals on Energy Management Systems, energy audits, analysis and mapping and also provides templates for life cycle costing and guides to procedures on purchasing energy-intensive equipment and project planning. Seminars for programme participants and best practice dissemination are held on a regular basis.

In Sweden, energy audits are carried out by energy consultants and in the case of the PFE are often made in cooperation with the companies' own staff. Energy Audits within the PFE must be carried out both with a long term and short term vision, which means that companies must consider changes that can influence their energy use over a ten year period.

Since certification is obliged for the participant companies in PFE, the quality control is assured by the Energy Management Systems certification bodies. Although spot-checks are made by the Swedish Energy Agency.

Another programme in place, since 2010, is the Energy Audit support programme that is suited mainly for SMEs. It is given a grant of € 3500 until a maximum of 50% of the audit cost. In this programme onsite checks by the energy agency are not done but the quality checks are still made by the analysis of reported data to the Swedish Energy Agency. The overall use of energy is considered including processes, buildings and other usages and a report on how the energy is used in the different parts of the site is produced. The outcome of these audits is a set of recommendations measures to improve the energy efficiency, resulting in an energy plan.

United Kingdom

The United Kingdom has had in place since 2001 the Climate Change Agreements (CCAs) that aim to achieve energy savings and energy efficiency improvements in energy-intensive industries. These voluntary agreements contain targets for eligible industry sectors to increase energy efficiency or reduce carbon dioxide (CO₂) emissions. An operator holding a CCA can claim a discount on their energy bills that reached up to a 65% tax rebate provided that they met specific targets. The new stage of the CCA that will roll up to 2023 allows participants to claim a discount at the revised rate of 90% for electricity and 65% for other fuels.

There are two types of CCA agreements. The Umbrella agreements that set commitments for eligible industry sectors, and are negotiated between the sector

associations and the Department for Energy and Climate Change and the Underlying agreements that contain targets allocated by the sectors to the operators in each sector.

The new phase of the CCA scheme applies to 51 sectors with umbrella agreements, The CCAs cover a wide range of industry sectors, from major energy-intensive processes, such as steel, chemicals and cement, and agricultural businesses. The CCAs are set for two-yearly intervals covering a ten year period and the individual operators targets combine to give the sector target overall.

The mechanisms that are used to monitor the compliance of the agreements are managed by the Environment Agency that keeps a web-based register. Operators are obliged to report their performance every two years via the sector associations and are developed independent facility audits performed by contractors appointed by the Environment Agency.

If an operator is under performing considering the initial target, must 'buy-out' by paying a penalty for equivalent figure in tonnes of CO₂. In the case of over-performance this may be banked for own future use.

The United Kingdom is to publish an Energy Savings Opportunity Scheme (ESOS) with the objective to comply with the requirements of the EED. In this framework, energy audits will be mandatory for large enterprises every four years, with the possibility to implement an Energy Management System in order to comply with the ESOS.

The following Member States represented the Best Practices in Member States with **Mandatory** legal framework in force:

Bulgaria

According to the Energy Efficiency Act energy audits are obligatory for every industrial enterprise having annual energy consumption over 3000 MWh and for public buildings with a total floor area over 500 m². The term of validity of one energy audit of an industrial enterprise is of 5 years. Summaries of all audits are collected centrally in Sustainable Energy Development Agency (SEDA).

As part of the obligation of performing energy audits in order to achieve the national targets for energy savings to 2016, industrial enterprises above the energy consumption threshold of 3000 MWh have then to implement certain mandatory individual savings targets. Measures recommended by energy audits must be implemented in such a degree as to ensure the achievement of individual targets of each enterprise. Companies are also required to have specialized staff in charge of energy efficiency, to draw up plans and programs and to submit an annual report to SEDA about the implemented energy efficiency activities and achieved energy savings. Exceptions to these obligations are large industrial installations that are included in the trading of emission allowances.

Owners of private buildings with an area of more than 500 m² are obliged to perform an energy audit, implement the measures identified in the audit in a three year period according an individual energy saving target. Public buildings with an area of more than 500 m² need to have an energy efficiency plan and implement measures of energy management.

Energy audits within the mandatory framework are controlled by SEDA. In the case that audits are prepared in the framework of any specific energy efficiency program usually it is decided that control is not necessary because the chosen Project Assistant is the only one who executes the audits or if the audits are executed by many licensed energy auditors the Project Assistant is those who take care about the quality control.

In what concerns funding the Energy Efficiency and Renewable Sources Fund (EERSF) that was established through the Energy Efficiency Act adopted by the Bulgarian Parliament in February 2004 has the combined capacity of a lending institution, a credit guarantee facility and a consulting company. It provides technical assistance to

Bulgarian enterprises, municipalities and private individuals in developing energy efficiency investment projects and then assists their financing, co-financing or plays the role of guarantor in front of other financing institutions.

The underlying principle of EERSF's operations is a public-private partnership. The Fund pursues an agenda fully supported by the Government of Bulgaria, but it is structured as an independent legal entity, separate from any governmental, municipal and private agency or institution.

During 2011 in Bulgaria launched programme "Bulgarian Energy for Competitive Industry Financing Facility (BEECIFF)" which is funded by the EU/EBRD Energy Efficiency Finance Facility Fund. The program is fully geared to support SMEs in the preparation of projects for increasing energy efficiency. Under this programme were trained licensed energy auditors across the country to perform simple energy audits in SMEs and present examples of good practices. The purpose of the programme is to assist SMEs in auditing to obtain grant funding up to 50% of the investment needed to improve energy efficiency.

Czech Republic

Energy audits are one of the key instruments for energy efficiency improvements in both the public and private sector and have been introduced in the Czech Republic in the beginning of 2001. Energy Audits were made compulsory for any entity which submitted request for financial support for energy efficiency-related measures from the State programme for promotion of Renewable Energy Systems and the Rational Use of Energy, and for energy consumers of which total annual energy consumption reached or exceeded a certain threshold specified in the ordinance of the law (35 thousand GJ per year for private consumers and 1,5 thousand GJ per years for any public institution) with the exception that an energy audit does not have to address individual buildings of which annual consumption is less than 700 GJ per year.

The obligation for Energy Audits development by end-users consuming more energy than the stipulated by the legislation had to be fulfilled within 3 years since the entry of the law in force (i.e. by the end of 2004). For public sector institutions, there were provided grants for energy auditing under condition that recommended measures would be really implemented.

Quality control of Energy Audits is limited to the definition of a common format prescribed by the legislation and energy auditors are required to obey its stipulations and take responsibility for its correctness. Furthermore, audits worked out for the purpose of submitting an application for financial support from any support programme are subject to a control by the programme administrators. That also contributes to better quality of Energy Audits. Since 2013 each auditor must upload basic information on any Energy Audit completed into a national register kept by the Ministry.

Portugal

Portugal has had mandatory regulations concerning energy audits since the 1980's. Following the previous experience, in 2008 the Portuguese government put in place the SGCIE - Management System of Intensive Energy Consumptions - that aims to promote energy efficiency and to monitor consumption of energy intensive installations. It applies mainly to the industry sector, namely individual plants or installations with energy consumption greater than or equal to 500 toe per year. The operators (owners or companies exploiting installations covered by SGCIE) are obliged to register the plant or installation on a website managed by ADENE, the Portuguese Energy Agency, to undertake a comprehensive Energy Audit, which has to be undertaken by individual auditors or audit companies recognized by the Portuguese Directorate General for Energy and Geology (DGEG). Companies have also to submit an Energy Consumption Rationalization Plan (PREn), together with the Energy Audit Report, for DGEG's approval, with the period of implementation of the PREn depending on the energy consumption

level of the plant: 6 years, if ≥ 1000 toe per year or 8 years above 500 toe per year and below 1000 toe per year. After approval by DGEG, the PReN is converted into an Energy Consumption Rationalization Agreement and penalties are foreseen for operators that, after implementing the energy saving measures contained in the PReN, do not reach the targets set. Operators are also obliged to submit a Progress Report on PReN's implementation to ADENE, every 2 years.

Operators of plants with total energy consumption lower than 500 toe per year may also adhere to SGCIE on a voluntary basis. These will have the same obligations and incentives as those obliged to follow the regulation.

DGEG has the role of supervision and inspection and is the governmental organization that gives final approval to the Rationalization Plans submitted by the Operators, and analyses and decides on the requests presented by individuals and companies for qualification as energy auditors. ADENE, being responsible by the operational management of SGCIE, assures the normal operation of the system and manages the website responsible to gather the registry of PReNs by the Operators or the submission of requests for accreditation of Consultants. ADENE also checks the energy audit reports and PReN's uploaded in SGCIE website, before sending them for DGEG's approval. In the extreme cases that the submitted PReNs are not satisfactory, ADENE also performs energy audits after a meeting and a visit to the plant in order to evaluate the work made in the audit and identify possible additional energy saving measures not included in the original PReN.

Through the National Energy Efficiency Fund, financial incentives for energy efficiency improvements are provided to operators for the realization of energy audits and/or energy monitoring and management systems. Grants cover part of the costs in the case of energy audits (only valid for plants with a total consumption between 500 and 1,000 toe/year) and 25% of eligible costs for the purchase and installation of energy consumption monitoring equipment and Energy Management Systems. Since 2013 operators who comply with SGCIE regulation can benefit from tax incentives, namely a tax exemption for certain fuels (coal, fuel oil, oil coke, LPG, and natural gas) and for electricity.

Romania

In Romania, there is a legal framework that dictates that companies that are recording more than 1000 toe per year are obliged to annually make an energy audit elaborated by an energy auditor empowered by the Romanian Agency for Power Conservation, according to legal regulations. This audit is then at the basis of the establishment and implementation of energetic efficient improvement measures. The companies have also to prepare an energy efficiency master plan based on three timings of implementation of energy efficiency measures: short term measures (no cost or low cost measures), medium term (payback period for energy efficiency investments less than 3-5 years) and long term measures (mainly big investments related to change of technology). Finally, companies consuming more than 1000 toe per year have also to have a certified energy manager. This energy manager is the responsible to send an annual a report to ANRE, the National Regulatory Authority for Energy, regarding the main indicators of energy consumption and have to renew their certification every three years. Companies have the alternative to outsource the energy management activities by hiring an energy service company that, like the energy managers, have to be accredited by ANRE. In order to assure the quality of energy audits, minimum quality criteria have been defined in the legislation together with a code of conduct for the realization of audits.

Economic operators annually consuming an energy between 200 and 1000 toe, must perform an energy audit every 2 years made by a legal entity or person authorized by the ANRE under the conditions of the law.

To become an auditor recognized by ANRE, a professional needs to be a graduate in energy or related specialities or in the area of civil engineering. Besides the criteria of

qualification a specific training programme before the recognition is mandatory, being provided by accredited universities or AAECR, the Romanian Auditors Association.

Public administration and local authorities in towns with over 20000 inhabitants must also develop energy efficiency programs. The same occurs to companies and local government units that own more than 25 vehicles and are required to develop monitoring programs and management of fuel consumption for the vehicles owned.

In order to get an understanding of the big picture of the situation of programmes promoting energy efficiency and mores specifically energy audits, the table below gives is given an overview of the programmes in place from the answers extracted from the survey realized.

Member State	Description of Programmes	Type of mechanism
AT	<p>Within the regional audit support programs companies can get financial support for energy audits. Depending on regions the subsidy is up to 75%. Depending on the topic of the audit the duration can be from 1-5 days (also depending on the region).</p> <p>The programs are in place for more than 5-10 years depending on regions</p>	Voluntary
BE	<p>Starting in the early nineties, the Wallonie Region has been proposing the signing of voluntary agreements with the industrial sector to reduce emissions of greenhouse gas emissions or improve energy efficiency, denominated sector agreements. Throughout the years there were several specific industrial sectors (chemicals, paper, steel, glass, cement, ...), and normally heavy energy consumers that have been engaged in the process.</p> <p>These sectorial agreements represent "win-win" partnership commitments between the Wallonie region and the industry. While the region gets industries engaged with a number of commitments on energy performance, the proposed sector benefits in return for various financial and administrative benefits from the region administration.</p> <p>In the Flanders region it has been developed the Benchmarking Covenant that was drawn up for the participation of large energy intensive industries, from all industrial sectors in order to transform the region's industry sectors in one of the most efficient in the world. As compensation for the efforts of the industries, the Flemish Government guarantees that it does not impose additional measures concerning energy efficiency or CO2 reduction.</p> <p>The Auditing Covenant is also a voluntary agreement promoted by the Flemish government that focuses on medium-sized energy-intensive industrial companies with consumptions between 0.1 and 0.5 PJ per year and that do not fall inside the scope of the benchmarking covenant. The companies commit themselves to perform an energy efficiency audit and to implement cost-effective measures.</p> <p>Companies that sign the Auditing covenant have an energy audit conducted in their facilities and stay obliged to implement the energy-saving measures proposed from the audit.</p>	Voluntary
BG	<p>The Energy Efficiency Act energy audits dictates an obligatory audit for every industrial enterprise having annual energy consumption over 3000 MWh and for public buildings with total floor area over 500 m2. The term of validity of one energy audit of industrial enterprise is 5 years</p> <p>Started in 2012 and ended in 2013 the Energy Efficiency and Green Economy Programme foresaw a higher percentage of grant intensity (% of total eligible costs) in case of energy audit driven projects, as well as a bonus grant for the technology-driven projects based on an optional energy audit with the SMEs being the beneficiaries are the SMEs.</p> <p>Starting in 2012 and ending in the end of 2015, the Operational Programme "Support for energy efficiency in multifamily residential buildings" supports implementation of energy efficiency measures in multifamily residential buildings in 36 urban centres . Financial assistance for implementation of energy efficiency measures is granted to associations of condominium owners. The Operational Programme covers 100 % of the cost of the energy audit of the building, including the preparation of a technical passport.</p> <p>The above mentioned programmes promote the energy audits indirectly. Currently there are not existing programmes on direct promotion of the energy audits.</p>	Mandatory

Member State	Description of Programmes	Type of mechanism
CY	<p>Programs to promote energy audits (for the period 2004-2013): Grant scheme for individuals, legal Entities, Organisations as well as Public Sector Institutions which are engaged in economic activities. The aim of the scheme is to provide financial incentives in the form of governmental grants and/or subsidies for the materialization of investments in the field of energy conservation and promotion of renewable energy sources. This scheme requires the submission of an energy audit report which should include at least a Technical Design analysis along with a financial analysis. The financial incentive is of 30% of the approved spent budget with a maximum amount of €50 000. The cost of Energy Audits can be included in the approved spent budget of the scheme and therefore be subsidised by 30% as well.</p> <p>Planned programmes to promote energy audits: Continuation of the grant schemes, utilizing EU structural and cohesion funds for the period 2014-2020. These proposals aim to increasing the energy efficiency in public buildings and for operating new incentives programmers for energy efficiency measures in all households, industries and tertiary sector. Within the scope of these schemes, there are plans for the promotion of energy audits.</p>	Voluntary
CZ	<p>Energy Audits are compulsory for any organization who submits a request for financial support for energy efficiency-related measures from the State programme for promotion of RES and RUE, and for energy consumers of which total annual energy consumption reached or exceeded a certain threshold specified in the national law (35k GJ/year for private consumers and 1,5 k GJ/year for any public institution), with the exception, that an energy audit does not have to address individual buildings in which annual consumption is less than 700 GJ/year.</p>	Mandatory
DE	<p>In Germany at a federal level, there are two programmes aimed for energy audits:</p> <p>The "Energieberatung Mittelstand" programme, promoted by the KfW, the German Promotional Bank, is an energy audit aimed and small and medium enterprises. In this programme there are two levels of audits, an initial audit and a detailed audit. The subsidies for the initial audit cover up to 80% but at most 1280€, the subsidies for the detailed audit cover up to 60% but at most 4800€.</p> <p>The "BAFA Vor-Ort Beratung" programme that is promotes energy audits aimed at house owners. The programme subsidizes audits on residential buildings and has been in place since 1998.</p>	Voluntary
DK	<p>Denmark has, since 1996 a voluntary agreement scheme, which requires, among other things, participating companies to implement energy management system ISO 50001. Audits are available for SMEs and non SMEs</p>	Voluntary
EE	<p>The Estonian Government, supported, from 2004 until the end of 2013, energy audits for households, covering 50% of the audit cost, (but not more than 700 euro) through the KredEx fund. These audits were meant to support household owners' renovation plans.</p> <p>It is still unclear if there will be any support for energy audits for the following years.</p>	Voluntary
ES	<p>No specific programmes for the promotion of energy audits on a concerted national level</p> <p>Due to Spain having 17 main autonomous communities, the country has 18 (one country programme and 17 local programmes) energy programmes and each region allocates the resources as they wish every year. There are particular programmes in certain regions.</p>	Non existing
FI	<p>Finland has had in place, since 1994, an Energy Audit Programme. In this programme, energy audits are performed according to specific models for different customer groups (industry including both SME's and energy intensive industry, public and private services sector, energy industry) and have been subsidised since then.</p> <p>In Finland there is also in place the Energy Efficiency Agreement Scheme where there are specific action plans for 5 industrial sectors and 3 private service sectors. In addition there are also general action plans for industry and service SME's which are not falling under the specific branches. In all action plans there is an obligation to figure out possible energy efficiency improvement measures and the vast majority of energy audits in most sectors are conducted under this "umbrella"</p>	Voluntary

Member State	Description of Programmes	Type of mechanism
FR	<p>In France, it has been the responsibility of ADEME, the national environmental and energy agency, to develop an audit program for the last twenty years. Energy is the main topic addressed by this agency with special concern in energy savings in buildings, industry, transports, and with the development of Renewable energy sources.</p> <p>The promotion of this program is mainly assumed by ADEME's regional divisions often in relationships with the Regional Councils. Concerning the Industry sector, ADEME works with the different federations and organizations to develop the promotion of this program.</p> <p>This audit program consists on:</p> <ul style="list-style-type: none"> - Financial support - Technical assistance by an auditor (the auditor has to be independent: not linked to any business interest but energy savings). - Audit guides 	Voluntary
GR	<p>There is no totally integrated energy audit scheme in Greece as required by the Article 8 of EED.</p> <p>Legally, the procedures, requirements and guidelines for the conduction of energy audits were established.</p> <p>Nevertheless, incentives for the promotion of energy audits are planned to be provided within the framework of the new programming period 2014-2020, with special attention given to SMEs.</p>	Non existing
HR	<p>There is a programme in Croatia, EPEEF that provides financial support for energy audits and building certification through calls for proposals on a yearly basis (first call for proposals was launched in 2004). Calls for proposals are aimed at public buildings, commercial buildings and dwellings, public lightning and industrial facilities. Financial support is provided through a grant scheme (up to 40-80% of eligible investment costs, depending on the area status or other special conditions).</p>	Voluntary
HU	<p>In Hungary, the nature of the energy audits support offered to participants is given as information and technical assistance.</p> <p>At the present time the concept of the energy audit programme is worked out, and the development of the energy audit system is in planning phase.</p>	Non existing
IE	<p>The Sustainable Energy Agency of Ireland has been promoting several programme supports for industry:</p> <p>The Energy Agreements Programme (EAP), launched in May 2006 allows for large enterprises to implement an Energy Management System according to the ISO 50001 in return of advice, networking assistance and financial support.</p> <p>For SMEs, SEAI provides services of advice, mentoring and also training in energy management tailored for SMEs. There is a set of tools suited for SMEs with material easy to use in order to make a successful energy saving campaign.</p>	Voluntary
IT	<p>At the present time there aren't any specific programmes at a national level to promote energy audits in Italy</p> <p>There are in place some measures from different entities at a more regional dimension</p>	Non existing
LT	<p>Currently there are no special programmed programmes in order to promote or support energy audits in Lithuania.</p> <p>As part of a programme on renovation of public buildings, the owners of these buildings had the possibility to get financial support and technical assistance (including for energy audits) in the 2007-2015 period.</p>	Non existing
LV	<p>In Latvia there is a programme called the "Climate Change Financial Instrument: <i>Complex solutions for greenhouse gas emission reduction</i>" which is a state co-funded programme, which promotes energy efficiency and renewable energy resource implementation in enterprises and municipal buildings. The financial support granted to the applicant depends on the achieved CO2 reductions and the classification of applicant. Energy audits are a mandatory requirement and it has to include information on potential energy and CO2 emission savings.</p> <p>Besides this, there is also a programme that supports residential building renovation – which provides a maximum of 60% of state co-financing to residential building apartment owners who are willing to renovate their buildings. The submission of applications was closed in 31st of July 2013 and the buildings' energy audits are mandatory and were submitted together with the project application and technical documentation.</p>	Voluntary for buildings
LU		No answer collected

Member State	Description of Programmes	Type of mechanism
MT	<p>In 2012, Malta Enterprise launched an EU part- funded Energy Grant initiative to support enterprises realise that actions could be taken to reduce energy costs. The rationale presented to businesses was that by implementing energy efficiency measures, businesses will see good returns on investment and increase profitability, whilst in doing so they would also be taking initiatives in favour of the environment.</p> <p>Malta Enterprise has been offering Energy Audits to organizations without any costs to businesses. Once an enterprise requests an Energy Audit at its premises, Malta Enterprise will contract an engineer on the enterprise's behalf, who will conduct an audit within a period of four weeks. The auditor collects information about the facility operations and performance together with an evaluation of suggested energy conservation measures. Utility bills are reviewed and additional metering of specific energy-consuming systems may be performed to supplement utility data, while meetings with key personnel are conducted so as to provide a better understanding of major energy consuming patterns.</p> <p>An overall financial analysis is also provided for each energy saving measure proposed. Options for improvements are accounted so that the enterprise can weigh the cost of improvements against future energy savings and prioritise according to those that offer best value for money.</p>	Voluntary
NL	<p><u>Legal and Regulatory Framework:</u></p> <p>Current: Obligation to examine energy saving options (energy audit) for enterprises (including ETS) and buildings laid down in a.o. Environmental Act Under development: Adjustment of the legal framework as a result of the EED and currently signing national energy agreement between all stakeholders and the promotion of an Energy performance check for SME's (subject of energy agreement).</p> <p><u>Promotion measures:</u></p> <ul style="list-style-type: none"> - Via energy covenants with industry and facility buildings. Energy audits are obligatory within this covenant. - Organizations (not part of the energy covenants) that are above a certain threshold of energy use are obliged to perform energy audits <p><u>Support measures:</u></p> <ul style="list-style-type: none"> - Establishment of an expertise centre for knowledge development and transfer for businesses and governments (starting in 2014) - Energy covenants that include: knowledge transfer, audit support and monitoring - Information and education via Energy Centre NL for SME's 	Mandatory and Voluntary
PL	<p>In Poland there has been in place, since 2011, a programme that introduces energy efficiency audits under the Energy Efficiency Act where it is presented a system of white certificates. This offer is dedicated to all kind of energy efficient investments in companies, and among the subjects are SMEs, however not as the main focus.</p> <p>In the Buildings sector the "Thermomodernisation and Renovation Act" from 2008 established supporting system for thermomodernisation of residential, common habitation and buildings servicing local government purposes. Support was given in the form of a bonus equivalent to 20% of the loan, or 16% of the cost of investment, or 2 year savings. This system was operating since 1998.</p> <p>The additional condition to be qualified for bonuses were the amount of energy savings that had to be achieved, e.g. for complex thermomodernisation it meant at least 25% of final energy in regards to an initial stage. Every audit is verified by a third independent party (chosen by the Bank of National Economy) with the bank collecting data from the supported audits. This programme it is not expected to be continued in 2014.</p> <p>Other examples of programs where energy audits are required are the programmes financed by Regional European Funds under the Environment and Infrastructure implemented at national and local levels. To apply for these programs different variations of energy audit forms prepared for the Thermomodernisation Fund, which is now being stopped due to budget costs, were used. The examples of programs supporting thermomodernisation of existing building are the Green Investment Scheme, LEMUR managed by the National Fund for Environmental Protection and Water Management</p>	Voluntary
PT	<p>In Portugal in has been in place since 2008 the SGCIE – Management System of Intensive Energy Consumptions that promotes energy efficiency monitors consumption of energy intensive installations. It applies mainly to the industry sector, namely individual plants or installations with energy consumption greater than or equal to 500 toe/year.</p> <p>Through the National Energy Efficiency Fund, financial incentives for energy efficiency improvements are provided to companies for energy audits and/or energy monitoring and management equipment/systems. Grants cover part of the costs in the case of energy audits (only valid for plants with a total consumption between 500 and 1,000 toe/year) and 25% of eligible costs for the purchase and installation of energy consumption monitoring equipment and Energy Management Systems (up to 10,000 EUR, which can increase 15% or 25% if the plant only uses natural gas and/or biomass).</p>	Mandatory

Member State	Description of Programmes	Type of mechanism
	Companies who comply with SGCIE regulation can benefit from tax incentives, namely a tax exemption for certain fuels (coal, fuel oil, oil coke, LPG, and natural gas) and for electricity (since August 2013).	
RO	Obligations for economic operators that are yearly recording more than 1000 toe to have certified energy managers, to produce a declaration of the energy consumption and go through an Energy audit.	Mandatory
SE	In Sweden there is in place a major programme regarding energy audits. The PFE program is a voluntary programme aimed at companies that are energy intensive. In this programme the companies are required to perform an energy review and implement a certified energy management system which is checked by a certification body. The achievements of the requirements are checked by the energy agency. Companies participating in this programme are entitled to a tax rebate and are obliged to implement the energy efficient measures identified. Also, there is in place, since 2010, the Energy Audit support program dedicated mainly for SMEs, providing a grant of 3500 Euro with a max of 50% grant of the Audit cost. 800 Energy audits performed already	Voluntary
SI	Currently there is no programme to promote energy audits on a national level. For the last 2 years large energy suppliers (limit: over 300 GWh of sales in electricity, 75 GWh of natural gas and district heat) are providing energy efficiency programme financing and some of them are also financing energy audits for industry and commercial/public buildings. Financing depends on company size, mostly 50% for micro SMEs, 40% for SMEs and 30% for large companies. These companies issue several tenders per year, but not all of them include energy audits.	Voluntary
SK	According to the Energy Efficiency Act there is the requirement to industry and agriculture enterprises with certain level of energy consumption to undergo an energy audit. Currently in the Slovak Republic, there is no support mechanism aimed directly to support energy audits.	Mandatory
UK	The UK Government Energy Saving Opportunity Scheme is not yet in place but will consist of a mandatory energy audit system with assessments every 4 years. All large UK enterprises are included, but not SMEs and the public sector.	Mandatory Planned

3.1.2. Quality control of audits

In Member States with mandatory energy audits programmes in place, the information from energy audits is usually gathered by central or regional governmental bodies that processes the information from the audits. The quality requirements are established in legal diplomas and often occur that the quality criteria are left for the auditors to comply with.

In this sub-chapter we present the cases of Member States with programmes that represent the best practices on the procedures in order to assure that Energy Audits are being performed in a high level standard according with the quality requirements needed in such an instrument.

In Bulgaria in the energy audits obliged by the Energy Efficient Act, industrial enterprises must submit a summary of the energy audit to the Sustainable Energy Development Agency which then checks the information contained in the energy audit summary, checks the implementation of energy conservation measures and the completeness of the required set of documents. In the cases of energy audits under specific energy programmes, a project assistant is appointed to verify and accept the audits. This project assistant then performs a conformity assessment of the technical requirements related to the eligibility of the projects.

In Czech Republic there is broad definition of a common format for energy audits prescribed in the legislation. Energy auditors are required to obey the legal stipulations and take responsibility for its correctness. Furthermore, audits performed for the purpose of submitting an application for financial support from any support programme

are subject to a control by the programme administrators. Since 2013 each auditor must upload basic information about any Energy Audit completed into a common national register kept by the Ministry. However, since the passing of energy audits from voluntary to a mandatory state it has been acknowledged that the quality of audits has decreased as the organizations' main ambition is to meet the formal requirements set in the legislation rather than actually improving their energy efficiency performance.

In Portugal companies within the status of large energy consumers have to deliver an online energy audit and a plan for approval. The approved plan becomes then a Rationalization Agreement of Energy Consumption. Every two years, organizations must deliver an online execution and progress report and to gain access to incentives and penalties are foreseen for the non-compliance of targets. It is realized an indirect quality control of audits made by a central body that analyses the energy consumption rationalization plans that are realized after the energy audits performed in the large energy consumers' facilities. When this plan is considered unsatisfactory, this central body makes a technical visit to the plant and identifies additional energy saving measures or carries out a new energy audit.

While in Member States with mandatory energy audits programmes in force, quality control is usually made through the analysis of summaries of energy audits and random checks by central bodies, in countries with voluntary energy audits programmes in place, quality control is verified by the sectorial organizations promoting these programmes such as regional energy agencies. In order to get access to the funding, the findings of the audits must be reported to the body that attributes such funding. Normally, in these cases, all audits are systematically evaluated. However, it was possible to find cases of Member States with voluntary programmes in place that do not perform any quality checks on the audits and leave to the auditors the onus to deliver high quality audits. This normally happens in the case of countries that promote specifically EnMS, and the quality control is assumed to be made through the certification bodies.

Below are presented the cases Member States with voluntary programmes in place that stand out in what concerns the quality control of energy audits:

In Austria programmes are promoted in a regional level and energy audit reports are collected by the regional program manager. Information is first collected on a regional level and most relevant information (e.g. main energy saving measures suggested and/or implemented) is collected on a national level within a national database.

In Finland Motiva, as a state owned expert company promoting the efficient use of energy is responsible for the qualification of auditors and then makes the follow up and quality control for the audit reports.

In France the results of audits are transmitted to the ADEME in 2 different ways. The results are sent to this central body in the form of a summarised electronic data form and also receive the completed report of the audit. Both of these are saved in a database and each audit is read by an engineer and a validation is given.

In Latvia each building energy audit submitted to the responsible agency or governmental body responsible for energy efficiency resource allocation is thoroughly checked for errors and other failures since the funding is granted in the case of defined energy efficiency levels and/or CO₂ emission reductions are reached.

In the Netherlands the Dutch energy agency performs a formal check of energy audits performed within sector covenants. For enterprises outside the sector covenants, municipalities or provincial bodies perform a formal check with the support of an expertise centre.

In Sweden there are two different quality controls for the two different programmes promoting energy audits. For the PFE programme, quality control is assured by the Energy Management Systems certification bodies within the programme. After this, there are still spot-checks being made by the Swedish Energy Agency. For the Energy Audit

support scheme there are no on-site checks but there is a quality check on reported data by the energy agency.

3.1.3. Qualification and training of auditors

The qualification of energy auditors in the different Member States was another of the main focus of the survey. The objective was to realize if Member States have already in place training programmes for energy auditors and what kind of qualifications the auditors are required to have to perform such audits. According with the results of the survey realized and by the contacts made with some Member States representatives, the qualification of auditors is still an issue of concern for some. The countries without a strong concerted policy on energy audits are concerned mainly on quantity instead of quality because even if there are already formal requirements to become an auditor there is still not a great number of auditors that may be suitable in order to satisfy the demand that will arise when implementing mandatory energy audits programmes for large organizations. Nevertheless, the majority of countries have established minimum qualification requirements for a professional to be able to perform an energy audit.

In a general way, in the European Union Member States, the main criterion to be an energy auditor is one of years of experience in the field of energy efficiency, followed by official formation in this area of expertise like a bachelor or Master's degree in engineering. It was possible to identify that the Member States that already have in place programmes regarding energy audits have defined minimum criteria for individuals to be qualified as energy auditors. The majority of the countries with such programmes, only professionals with higher education on related subjects (engineering, architecture...) and with relevant professional experience (minimum 3 years) may be auditors. In some countries, besides the criteria of formation and professional experience, there is still the need to attend specific training programmes and pass evaluation of competency exams in order to be classified as a certified auditor.

For example, in Austria there are several qualification requirements for auditors, including years of experience, reference projects and minimum training. Up until now all regional programs have their own qualification requirements but it is planned to be developed a set of requirements for the entire country. For auditors of large industrial companies the Austrian Energy Agency developed a series of specific training courses like motor driven systems (pumps, ventilation, compressed air, etc.), steam systems or cooling/chilling systems. These trainings are "advanced training courses" suited for experienced energy auditors. Basic training as such is not available at the moment for auditors in industrial companies, but will be developed as soon as the unique requirements for qualification are published.

In Bulgaria the Sustainable Energy Development Agency maintains a public register for the companies carrying out audits on energy efficiency and the certification of buildings. Eligible entities must meet the following requirements: minimum set of technical means for collecting data, available qualified staff (energy efficiency consultants) with at least three specialists in the field of architecture and civil engineering, a specialist on thermal energy and an electrical engineer. These experts must have a bachelor (with at least 3 years of experience) or a master's degree (with at least 2 years of experience). The energy efficiency consultants should successfully pass an exam on energy audits and certification of buildings. The scope of the examination material, as well as the evaluation procedure is prepared by universities according to an educational plan similar in all the country.

In the Czech Republic there is a legal designation for people defined as eligible for performing energy audits that need to fulfil a certain level of education and a multi-year practical experience (e.g. university degree of technical character and 3 year long practical experience or completed secondary technical school and 6 year long practical experience). The energy auditors have also to undergo a set of exams organized by the Ministry for Industry and Trade of the Czech Republic. After this successful applicants are

placed in an official list kept by the Ministry. Training programmes for new aspiring energy auditors are available and organized by umbrella organizations such as the association of energy auditors.

In the Netherlands audits are executed by selected consultants qualified in an open tender procedure. These consultants have to operate following a guiding document for the audit process developed by the Dutch Agency. The criteria for the qualifications of energy auditors were defined by the Federation of Energy Consultants (FEDEC) that developed a certification for energy auditors under accreditation of the Dutch Council for Accreditation. In what concerns the training, FEDEC organizes training programmes that were developed by universities and allow energy consultants to attend and achieve the requirements to be an energy auditor.

In Portugal individual auditors or consulting audit companies recognized by the Portuguese Directorate General for Energy and Geology (DGEG) are responsible for carrying out energy audits within the SGCIE – Management System of Intensive Energy Consumptions. Accreditation is attested by the DGEG after an evaluation of proficiency (qualifications and professional experience) of the candidates. In order to be an auditor, individuals should be engineers with at least 5 years of experience in facilities of the type of those ones covered by SGCIE, or have 3 years of specific experience in the fields of energy auditing and consultancy. They must also provide evidence to have access to equipment to perform energy audits. For companies performing energy audits, these should make proof of having activity related to audits and/or industrial design in the energy field, as well as have access to equipment for carrying out energy audits and have at least one energy auditor recognized by DGEG. In what concerns training, several organisations, regularly offer training programmes on energy efficiency (energy management and energy audit in industry) and other related topics that contribute to improve the qualification of Portuguese technical experts. The training courses “Energy Management in Industry”, provided by the national energy agency, ADENE, since 2005, include lectures and a field training practical part (prospecting auditors perform energy diagnosis of their own companies facilities, putting in practice the theoretical knowledge learned in classes by applying a simplified energy audit methodology).

In Slovakia an energy auditor must fulfil the qualification requirements written in the energy efficiency legislation and as qualifications must have an university degree of technical specialization, economics or natural science with a focus on mathematics, physics or chemistry, professional experience in energy consulting/advice or technical-economic analysis of the use of energy. The experience years must be of at least 4 years if the professional has a complete undergraduate university degree (bachelor) or 3 years if has a completed graduate university degree (MSc., Ing.). Besides the fulfilment of these criteria, the professional has still to pass an examination of professional competence to practice as energy auditor. There is no requirement that an applicant must attend any training programme for energy auditors but still has to pass the examination. Energy auditors are obliged to take part in re-training every three years after the registration on the list of energy auditors published by the Ministry of Energy, which is organized by the Slovak Innovation and Energy Agency.

3.1.4. Contents, level of detail of energy audits

Annex VI of the EED has established the minimum criteria for energy audits, giving in this way a set of guidelines for Member States to follow while developing a legal framework on energy audits and for organizations while implementing a methodology for energy audits in their own structure. In the survey sent to different Member States, the contact points were asked about the thoroughness and level of detail of energy audits for which state support is provided. It was possible to detect two main trends in the level of detail put on energy audits.

In countries like Estonia or Czech Republic the Auditing process is very detailed with 3 years of energy consumption being analysed, building envelope and HVAC installations thoroughly evaluated. It is made a description of the current status of the buildings or

premises to be audited - forms of energy used, names of energy suppliers and contractual conditions incl. prices, calculation of total energy balance for the 3 years. After this, savings are divided into different packages according to the level of investments and planned measures assorted into low, medium, and highly capital intensive solutions.

In Austria and Bulgaria, audits are not very extensive, at least in a first stage. In Austria a rough audit is financed, while in Bulgaria, energy audits are partial and related to specific activities and measures that are previously planned to be to be implemented. However, despite being directed to specific sectors of organizations the audits are still executed with the assessment of the monthly energy consumption for one year, expected consumption after the implementation of the proposed measures, as well as others costs related to the specific measures being evaluated.

In Germany there are two types of thoroughness of audits, depending of the programme. While in the BAFA Vor-Ort Beratung, an on-site inspection is mandatory and the reports must contain recommendations and quantifications on measures to be taken, for the KfW Energieberatung Mittelstand, a two phase audit is suggested. After an initial audit with less elements being audited, a more detailed audition is undertaken.

In France, Energy audits respect the BPX 30 120, a French standard compatible with the EN 16247 European Standard for Energy Audits. Energy consumption is detailed by vector (electricity, gas, oil) and by utilities (steam, heating compressed air) or process. After this breakdown, the potential savings are determined by the auditors that must clarify the way the savings were calculated. Recommendations are listed according the payback time and the payback is evaluated in agreement with the enterprise.

In Latvia the level of detail of energy audits is also rather high. First it is performed a preliminary energy consumption assessment followed by an onsite inspection with data collection by measurements. After the onsite assessment, there is a further gathering of additional information, followed by data analysis. After the data analysis the energy efficiency measure calculations are made leading to the preparation of the final report. In order to obtain get the calculations, energy consumption data are normalized according to the Latvian legislation. The building model is inputted in a software modelling application and the energy consumptions (onsite measured and modelled) data are compared. The difference of energy consumption between measured and calculated data cannot exceed 10%. When the building model is verified, the energy measures are implemented in the model, from which the energy efficiency measure savings are calculated.

In Sweden there are two different types of quality control for the two different programmes in place. For the PFE the energy audits and analyses are carried out in an overall system perspective, which means that companies have to consider how their production processes, or parts of these processes, and supporting systems can work together to achieve an overall energy efficiency improvement. Audits under the PFE consider both long term and short term timelines. These audits must then consider the results of this long term analysis when considering matters that involve changes in their energy use. In the Energy Audit support scheme, energy audits must include the overall use of energy (heat, electricity, fuels etc.) including processes, buildings and other usages. A report on how the energy use is allocated in different parts of the site audited is produced and recommendations on measures to improve energy efficiency are proposed, resulting in the end of an energy plan.

3.2. Activities to encourage SMEs to undergo energy audits

The point 2 of Article 8 of the EED aims to Member States develop programmes to encourage SMEs to undergo energy audits and the subsequent implementation of the recommendations from these audits. It was possible to realize that there are a significant number of countries with programmes in place to encourage SMEs to undergo energy audits. However there are still Member States that do not have such programmes

in force or even in sight. Nevertheless it was possible to identify good examples of programmes suited for SMEs even if not specific to these companies.

In Bulgaria the Energy Efficiency and Green Economy Programme foresees a higher percentage of grant intensity (% of total eligible costs) in case of energy audit driven projects, as well as a bonus grant for technology-driven projects based on an optional energy audit if the beneficiaries are the SMEs. The Energy Efficiency and Renewable Sources Fund provides low-interest loans covering up to 75% of the resources required for implementation of energy audits and of projects for improving energy efficiency in SMEs and others. There is also the BREECL which is a program that provides grants to SMEs up to 15% of the project. Energy audits are an obligatory document, are executed by a Project Assistant and the cost is covered by the programme. The programmes present in Member States like Austria, Germany, Finland or Sweden presented in the previous chapters are tailored for SMEs and promote energy audits specifically for these types of companies

There are examples of Member States that even if the programmes are not designed for SMEs only, these companies can still participate, like the cases of Cyprus or even Denmark where the voluntary scheme obliges for participating companies to implement an energy management system according to the ISO 50001, or in the Netherlands or Ireland where SMEs can participate in the voluntary agreements and implement an Energy Management System with the support of the governmental bodies.

3.3. Energy Management Systems in the Member States

While evaluating the responses from the survey about the state of Energy Management Systems implementation in the Member States it was possible to understand that even if in some cases, these tools are mostly present due to private initiative from enterprises that wish to improve their energy performance, there are cases of Member States that with the resource of programmes promoted by public bodies are contributing for the implementation of these systems in their industrial structure. Programmes in Member States like Denmark, Germany, the Netherlands, Sweden, Finland or Ireland has allowed these countries to gain a high level of expertise in relation to ISO 50001 which is the standard most generally implemented.

A great part of the responses received from Member States showed the impression that besides the cases of countries with programmes with specific requirements for the implementation of Energy Management Systems, the ones without these kin of programmes still do not a full notion about the number of companies with Energy Management System implemented.

Another finding was that in Member States with programmes promoting Energy Management Systems if it was not for the existence of such programmes the demand for Energy Management Systems would be much less and it remains to see if whether the transposition of Article 8 will change this or whether companies will demand only audits rather than complete Energy Management Systems.

In the Netherlands even if there is a significant number of companies (around 20) with a certified ISO 50001 system, a bigger part of the enterprises have a certified ISO 14001 management system in place where energy is included as significant environmental aspect. Within the third stage of the LTA covenants enterprises have the obligation to implement an energy management system and within the paper sector implementation of ISO 50001 is being promoted and support is being offered to the respective enterprises.

In Sweden there is an estimation of more than 100 enterprises certified, mainly energy intensive industrial companies and the activities to develop EnMS are made in networks of energy intensive SMEs in order to introduce simplified versions of the systems.

Germany is the world country with more enterprises certified by the ISO 50001 with more than 2000 certifications. The major reason to this kind of figures relates to the fact

that enterprises that implement an Energy Management System can obtain exemptions from electricity tax. In order to get access to this benefits, companies must prove that they have an energy management system (certified by DIN EN 16001 or DIN EN ISO 50001) implemented to receive tax discounts or alternative systems for SMEs including audits at the latest by 2015. Companies may benefit from reductions on electricity or energy taxes of up to 90%. EN ISO 50001 certification or EMAS registration is a prerequisite for granting of these tax reductions and SMEs may choose to operate "alternative systems for energy efficiency improvement, satisfying the requirements of EN 16247-1 in order to get the tax reductions.

Another mechanism in Germany is the Exemption from EEG-levy. Since 2000 Germany uses the Feed in tariff system "Erneuerbare Energien Gesetz" (EEG) to support electricity generation from renewable sources and the subsidies are passed on to electricity consumers who pay the so called EEG-levy. In order to sustain international competitiveness, exemptions of payment are possible, when companies have a certified Energy Management System.

It was easily noticeable by the comparison from the number of certified companies and the existence of incentives that Energy efficiency by itself is not yet the driving force for the implementation of an EnMS and incentives are the main drivers for companies to get ISO 50001 certified.

3.4. Preparing for implementation of Article 8

The EU definition of SMEs in a broad point of view is generally accepted on the matters of size and economic indicators described in the EED throughout the Union. Nevertheless one of the main subjects raised by countries with programmes already in place is the one concerning that companies should be obliged to undertake energy audits on an energy consumption criterion instead of the one now proclaimed in the directive that relates to the number of employees, turnover and balance sheets.

It was possible to identify Member States that have yet to decide how to identify the companies that will be required to undertake energy audits according to the Energy Efficiency Directive, since the information relating to the size of companies is not available to the entities responsible for the transposition of the Directive. However, in the majority of member states it is possible to identify companies by its size and economic performance, even if one of the main issues concerning the identification of companies obliged to perform energy audits may be the fact that the ministries or energy agencies responsible for energy matters enforcement usually are not the ones with the information about the turnover, balance sheet or numbers of employees of enterprises which may lead to a flaw in the communication between governmental entities and leave companies without complying with this required criterion.

There are some Member States that within the context of the harmonization of national laws with the EED are planning to have a requirement for the energy competent authorities to keep a registry of non-SMEs easing the identification of companies which are obliged to undertake audits. This will be especially facilitated in Member States, like the Czech Republic for instance that has already under the same "umbrella" the energy and economic matters. In Germany there is an indirect incentive in order to identify large companies since these can benefit of a reduction of their tax liabilities by proving that they have an energy management system in place, which in Germany signifies a great part of the national industrial structure.

The way to communicate to different companies their obligations is still one of the matters that it is not very well defined at this moment in a significant number of Member States. Nevertheless, Member States that have already decided how to communicate the obligations of non-SMEs and have the ability to identify target companies are planning of addressing such companies by a written announcement that they have to perform energy audits or through sector federations that will communicate to their associates their obligations.

3.5. Barriers to the uptake of energy audits and energy management

In this section are identified the main responses of Member State representatives when asked to acknowledge any significant barriers to the implementation of Article 8 of the Energy Efficiency Directive or to the promotion of energy audits and Energy Management Systems in their countries. The main findings in this section relate to the difficulties presented by Member States to identify the companies that are obliged to perform energy audits according to its size, the tardiness of the transposition of the EED requirements into national law, the predictable lack of financial resources from companies to comply with the EED requirements and still the lack of interest in energy audits as a tool for a better performance, and the little development of guidelines to establish the criteria on the quality of audits and the qualification of auditors in order to comply with the EED requirements.

Identification of companies obliged to perform audits

While analysing the replies obtained from countries that have had consolidated programmes for the promotion of energy audits, like Denmark, Finland, Portugal or the Netherlands, the main obstacle for the implementation of Article 8 was the criterion defined in the EED to identify the companies obliged to perform energy audits every four years. In all these countries these companies are identified by a criterion of an energy consumption threshold instead of a size of the company criterion as defined in the directive. The argument is that it might be difficult to identify the companies since central authorities may not have enough information to assess every non-SME in their territory due to being too diverse and under different regulatory bodies' supervision, meaning that some companies may fly under the radar without being properly identified. There was stated also by these countries' representatives the impression that the extra amount of work needed to perform such evaluation may not be useful for the purpose of identifying the target companies that should perform energy audits on a mandatory basis since the legal framework now present already accomplishes with this objective.

Lack of national legal transposition

Another barrier identified for the implementation of Article 8 identified was still the lack of integration of the directive requirements on national legislation at such an advanced stage of the timing for its transposition, with countries still needing to incorporate parts of the directive in their legal framework in order to make a total transposition. It was especially noted that there is still a need to promote Energy Management Systems in the national legislation, since these tools are neglected until now, as the implementation of Energy Management Systems is being driven mainly by the market forces.

Lack of financial resources of companies

The subject of financial resources needed by the companies to adapt to the directive requirements, especially SMEs, was another of the main barriers identified by countries without any programmes in place, since these organizations may have limited financial resources to take care of energy aspects due to the fact that energy costs are sometimes of minor importance for their core business. For this matter it was stated that the costs and administration burden for the enterprises should be considerably light so they can cope with the additional work load that arises when implementing this kind of energy policy. Allied to the lack of proper financial resources by the companies, the lack of state grants was also a barrier identified by Estonian and Greek responses moreover that energy audits still represent a product of low interest for such companies.

Low interest from companies

An additional barrier found by Member States when promoting energy audits was that there is still a notion, particularly in small enterprises and non-intensive energy consumers that an energy audit is a low interest product since the companies or house owners may not be willing to pay even for subsidized audits due to having different expectations or needs than the audits offer, avoiding additional hassle.

In countries with voluntary agreements in place, one of the challenges that may occur when transposing the directive is that it may present as a difficulty to stimulate enterprises that fall under the EED obligatory requirements, to enter these same voluntary agreements.

The need of adjustment of federal governmental structures was another of the barriers found by federal states since some of them have already in place different bodies that regulate energy efficiency programmes in different regions, but not necessarily all, and due to the administrative independence of the regions, lack a concerted structure on a national level. Therefore it was identified the need to still create the figure of the body that will regulate and define a minimum common method for performing energy audits programmes and how to divulge the information needed by the different stakeholders.

Qualification of Auditors

The qualification of energy auditors is a subject that was broadly raised as a barrier to fully implement the EED. While the EED refers that audits may be carried out by in-house experts, there is a general concern about how to define the independence and the qualification of these internal auditors.

Despite that a great number of Member States have already in place the appropriate legal framework for the procedures of energy audits. While in some Member States the option was to leave to certification bodies to define the criterion to become an energy auditor, some are still in the need to define in a legal diploma what these criteria will be.

The number of qualified professionals to perform energy audits was another of the barriers pointed, since there are still flaws in the quantity and quality of auditors capable to give a proper response for the demand that will arise when the EED comes in full implementation. Training programmes for auditors are still scarce in some Member States which may lead to a lack of auditors to comply with the predicted demand. The same occurs with the man power needed to make the quality control of the audits since the Member States that are more lagging in the implementation of the EED are still in the need to adjust their structures to accommodate their necessities to evaluate and control the audits being performed.

Quality of audits

The quality of audits as stated in Annex VI of the EED was another of the points raised by the majority of responses, stating that the definition of energy audit minimum requirements only outlines guidelines that are not mandatory, giving a great flexibility in the transposition and its interpretation which may lead to a different and not harmonized approach throughout the different member states, and can also cause a nuisance for enterprises with installations in more than one country. It was also suggested that the reference to a defined European standard to be adopted across all Member States may avoid a greater discrepancy of the quality requirements of audits, avoiding the outcome of having all kind of energy audits that still comply with the EED obligations and Annex VI but cannot be compared among themselves.

4. Implementing Article 8 in the Member States: An Analysis

As a result of the analysis of the survey realized collecting responses from representatives from the great majority of Member States, it was possible to identify

three types of compliance towards the transposition of the Article 8 of the Energy Efficiency Directive. First are the countries with mandatory programmes in place that oblige large energy consumers to perform energy audits on a regular basis and that come nearest to the requirements of the article 8 of the EED. Secondly, the countries with voluntary programmes in place that can also meet the requirements of the Directive by the promotion of energy audits in agreements signed normally between sectorial associations and the governmental bodies and finally the Member States that still have a great amount of work to develop in order to meet the deadlines established for the transposition of the Directive into national law.

While countries with programmes in force, mandatory or voluntary, have already in place mechanisms to comply with the article's requirements, needing less effort to adjust their national structures to fully meet the terms of the requirements, there is still a large number Member States that are still in the planning phase or not even, which will lead to a great effort from all parties, government and enterprises, to adjust in order to comply with all the requirements.

Mandatory legal frameworks are still a minority among the Member States and only a few countries, which present good practices for others to follow as stated in the previous chapter, have this kind of mechanism in place. Even if it was possible to realize that some Member States are adjusting to the requirements of the directive, there is still a great work to be done in order to assure that large enterprises undertake energy audits every four years with a high level of quality, meeting the requirements of Annex VI and are performed in an independent way by qualified auditors. The existing types of programmes that encourage energy audits are mainly from voluntary agreements, especially from sectorial agreements with governmental promotion and mostly tailored for large companies, leaving SMEs still in the need to be addressed, since there is still a lack of attention toward the promotion of energy audits in this type of companies. The periodicity of energy audits in voluntary agreements is another subject that still needs to be addressed since basically only the programmes that promote the certification of Energy Management Systems, due to the requirements for the maintenance of such systems, oblige the execution of periodic audits.

Even if in the Member States with criterion already in force regarding the quality of audits, the level of quality is not similar in all Member States, which may lead to a great effort to ensure that audits are realized on a common ground throughout the European Union. This is especially important in the case of multinational companies with facilities in different locations and that if this common ground is not achieved may lead to a great fuss while undergoing energy audits with different criteria.

The same occurs with the criteria on the qualification of auditors. The Directive leaves for the interpretation of Member States to establish the minimum criteria for qualifications of energy auditors and in a great part of the Member States this is left for the programmes promoters or for the certification bodies that have the onus to guarantee that auditors have the qualifications to perform such technically demanding work, instead of being clearly stated in the national legislation. A common framework establishing criteria for training programmes could be a way to overcome this potential disparity.

Energy Management Systems are no strange for large energy consumers, even if sometimes these tend to disconsider them. Communication and incentives related to the implementation of such management tools are means to be taken into consideration when promoting them, following the cases of success previously mentioned.

As referred in the previous chapter the most significant barriers pointed by Member States representatives to the implementation of Article 8 of the EED relate to the difficulties found by Member States to identify the companies that are obliged to perform energy audits according to its size instead of defining them by an energy consumption threshold. The delay of the transposition of the EED requirements into national legislation and the expectable lack of financial resources from companies to comply with

the EED requirements were also points raised by the survey participants and that should be given a close attention to these subjects in order to avoid any more delays in the transposition of the article.

5. Conclusions

In conclusion, there is still a good amount of work to be made in the Member States in order to implement Article 8 in the different national legislations since at the present time there are still countries without any consistent policies in what concerns the fact that large companies shall have to perform mandatory energy audits every four years. Nevertheless it is possible to find good cases of Member States already complying with these requirements by the implementation of mandatory or voluntary programmes.

From the barriers identified by Member States, the clarification on the qualification of auditors and the quality of energy audits criteria and the ability to identify every non-SMEs were pointed as main obstacles for the correct implementation of the requirements of the directive and therefore should be taken into consideration when

As it would be expected, large companies and consequently large energy consumers represent the companies that somehow are already being taken care of in the subjects of energy efficiency since these are the ones that can contribute to large energy savings by the execution of energy audits and the implementation of the measures identified or by the implementation of Energy Management Systems. However, SMEs and their savings potential should be taken into consideration very seriously by the Member States while designing their energy policies and transposing the EED into national legislation. The same applies to the promotion of Energy Management Systems which until now have been promoted mainly by market forces or within voluntary agreements requisites and can really contribute for the maintenance of healthy energy consumption patterns in the various economic sectors.

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