



CONCERTED ACTION  
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5

# Energy services and ESCOs, energy auditing, solving administrative barriers

Daniele Forni, ENEA/FIRE, IT

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## 1 Introduction and context

The Concerted Action for the Energy Efficiency Directive (CA EED) supports the effective implementation of the 2012/27/EU Energy Efficiency Directive (EED). By providing a trusted forum for exchange of experiences and collaboration, the CA EED helps Member States plus Norway to learn from each other, avoid pitfalls and build on successful approaches.

This report summarises the work carried out between January 2013 and March 2014 by the Concerted Action for the Energy Efficiency Directive (CA EED) on energy services, ESCOs, energy auditing and overcoming administrative barriers.

The role of energy audits was already important in the Energy Services Directive. The EED reinforced the provisions on the availability and quality of energy audits, with further measures aiming to overcome barriers limiting the widespread use of energy audits and the implementation of energy audit recommendations. The EED includes provisions for every stage of the energy audit chain: from the qualification/certification of the providers; to the characteristics of the audit; to information, support or obligations – depending on the type of user – to undergo an energy audit; to support for implementation of the recommendations arising from the energy audit.

In this context, the CA EED resulted in the sharing and discussion of the relevant experiences gained in some Member States (MS) as regards energy audits and the transposition of the EED. It also included discussion of other interesting international practice in this field that can be beneficial for the transposition and implementation of the EED.

An energy audit is a systematic procedure to evaluate the state of “energy health” of an organisation, service or system and to identify and quantify potential energy and economic saving opportunities. It is the first step in an energy services approach and in energy planning (e.g. energy review in the energy planning phase of ISO 50001). Within the CA EED, the first three Working Groups of Core Theme 5 were devoted to energy audits. The first one was dedicated to qualification/certification, minimum criteria and obligations;

the second to fostering the implementation of opportunities highlighted by energy audits and the last to the transposition of the energy audit obligation for large enterprises.

The information and good practices gathered from participants through a web-based questionnaire and from international papers on the topic were shared and discussed during the parallel sessions.

## 2 Energy audits: obligations and minimum criteria

### Minimum criteria for a high quality energy audit

As part of the transposition of Article 8 of the EED, Member States have to establish minimum criteria for energy audits based on Annex VI; they may also require assessment of connection to a heating/cooling network. The presence of these provisions in the existing energy audit framework was investigated via a web-based questionnaire and the results are presented in Table 1. The questionnaire also addressed the economic evaluation of energy efficiency measures and found that life cycle cost analysis was the least used of the requirements of Annex VI. A further investigation during the parallel session confirmed that life cycle cost analysis is not widely used, while the most common evaluation method is simple payback, followed by discounted payback. This was in some way surprising and was debated, since simple payback is an index that cannot be accepted when talking about financing.

A presentation from a representative of Deutsche Bank introduced the topic of the evaluation of savings in energy audits. A study of over 200 building retrofits in New York showed, on average, an over-evaluation of the savings.

An interesting tool from the USA is the building performance database<sup>1</sup>, developed by the Department of Energy to collect data from across the country on different buildings and energy efficiency upgrades. Thanks to its huge data set, this tool creates the opportunity to evaluate the typical return on investment of different efficiency measures, for different buildings, activity type, climate zones, etc.

In the subsequent discussion, it was noted that, to increase the chances that measures suggested by the energy audit will be implemented, the audit report, or at

least a part of it, should “speak the same language” as decision makers (e.g. Chief Financial Officers) or of the financiers. It should thus contain economic indicators like Discounted Payback, Internal Rate of Return, Return On Investment, etc.

Different tools for energy audits were discussed and prioritised; these were derived from questionnaire results, the Audit II<sup>2</sup> project and other sources. The most important ones are:

- Audit guidelines/handbook
- Templates for reports, designed to be uploaded to a database
- Collection of reports in a database
- Existence of benchmarks / target values.

### Recommendations

More finance-friendly indicators should be suggested for the evaluation/prioritisation of measures highlighted by energy audits. These indicators are not complex to calculate; however, the provision of appropriate spreadsheets, software tools, etc. should be evaluated.

Audit tools should be evaluated. This should include not only the traditional ones (guidelines, checklists, report templates, etc.), which in many cases already exist, but a wider use of information technology (e.g. electronic report templates uploadable into databases, structured database, etc.). This could be placed under the control of an independent authority to ensure the non-disclosure of sensitive data.

Table 1. Criteria for energy audits of Annex VI and art. 8.7 already present in guidelines/standards (26 answers)

Based on up-to-date, measured, traceable operational data on energy consumption and (for electricity) load profiles	88%
Be proportionate, and sufficiently representative to permit the drawing of a reliable picture of overall energy performance and the reliable identification of the most significant opportunities for improvement	84%
Allow detailed and validated calculations for the proposed measures so as to provide clear information on potential savings	84%
Comprise a detailed review of the energy consumption profile	80%
The data used in energy audits shall be storable for historical analysis and tracking performance	68%
Build, whenever possible, on life-cycle cost analysis (LCCA) instead of Simple Payback Periods	40%
Feasibility of connection to an existing or planned district heating/cooling network (where applicable)	20%

### Good practice example

#### ✓ Finland

Finland gave a presentation on their ongoing energy audit framework and how it deals with the minimum requirements of Annex VI. The guiding principle is that the energy audit must be attractive for clients and cost effective for both the client (thanks in part to subsidies) and to the government (cost effectiveness of the energy audit framework).

There are three guidance levels: guidelines, models for client groups and handbooks. More stringent minimum requirements are set for buildings, while other sectors are left to bilateral negotiation. The audit model contains

requirements for a comprehensive audit and its results, including a spreadsheet template to be filled with data, delivered to the national energy agency and uploaded to a database. This database is used to calculate the average saving potential for different measures, to evaluate the audit programme, to inform users, etc.

The presentation can be downloaded from the following web address: [www.ca-eed.eu/good-practices/member-state-presentations/energy-services/energy-audits-qualification-accreditation-and-certification](http://www.ca-eed.eu/good-practices/member-state-presentations/energy-services/energy-audits-qualification-accreditation-and-certification)

<sup>1</sup> [www.bpd.lbl.gov](http://www.bpd.lbl.gov)

<sup>2</sup> [www.motiva.fi/en/areas\\_of\\_operation/projects\\_and\\_campaigns/save\\_ii\\_-\\_projects/audit\\_ii](http://www.motiva.fi/en/areas_of_operation/projects_and_campaigns/save_ii_-_projects/audit_ii)

### Energy audit obligation for large enterprises

Five existing energy audit obligation schemes were identified through the web questionnaire and four were presented. All of these schemes have some requirement for the qualification of auditors and, in many cases, a periodic re-qualification is required. A monitoring system is always present, and the audit report has to be sent to the national body in charge.

In four of the five schemes, there was a threshold for the obligation. In general, the threshold was annual energy consumption, while in one case it was the power of the heating system or the total surface area of the building. The energy audit periodicity varied from 1 to 10 years. The first obligation started in 2001, the last in 2010.

Beyond this, each obligation has its own characteristics. Looking at some of the obligations in more detail:

- **Czech Republic:** This is one of the older energy audit obligations, having started in 2001. Each year, the national energy agency receives over 1500 energy audits. There are over 350 certified energy auditors. Auditors from other Member States are also recognised. The State Energy Inspectorate may order the public sector to implement measures identified through the energy audit. One of the lessons learned is that the energy audit is a professional and costly document; an easier approach was proposed (known as “energy expert opinion”) and this was defined in the new Energy Management Act (2012).
- **Croatia:** Energy audits and energy performance of building certificates are two separate and different things, but, by law, a building certificate cannot be issued without a prior energy audit.
- **Portugal:** Energy audits are compulsory every six years. After the audit has been carried out, an energy rationalisation plan, including a target and efficiency measures, has to be submitted to the General Directorate of Energy and Geology to be validated. An agreement can then be signed to obtain discounted excise duties on fuels. Every second year, an execution and progress report has to be presented. Another noticeable feature of the scheme is the web platform, which is used to send the audit and progress reports and which gives the managing body the opportunity to easily extract useful information.

- **Slovakia:** The audit obligation explicitly considers the agriculture sector. Energy audits are also established by law for other sectors (e.g. district heating systems, buildings, public lighting, etc.), but on a voluntary basis.

In the discussion after the presentations, some suggestions arose as to what could be added to these audit obligation schemes (e.g. following up non-compliance before inflicting a fine). The fundamental pillars of setting up and managing an energy audit obligation were discussed. For more information, presentations can be downloaded from the following web address: [www.ca-eed.eu/good-practices/member-state-presentations/energy-services/energy-audits-qualification-accreditation-and-certification](http://www.ca-eed.eu/good-practices/member-state-presentations/energy-services/energy-audits-qualification-accreditation-and-certification)

Schemes from the Czech Republic and Portugal are also described in good practice fact sheets, downloadable from the following web addresses:

CZ: [www.ca-eed.eu/good-practices/good-practice-factsheets/energy-services/energy-audits-czech-republic](http://www.ca-eed.eu/good-practices/good-practice-factsheets/energy-services/energy-audits-czech-republic)

PT: [www.ca-eed.eu/good-practices/good-practice-factsheets/energy-services/energy-audits-portugal](http://www.ca-eed.eu/good-practices/good-practice-factsheets/energy-services/energy-audits-portugal)

### Conclusions

Setting up a sound and cost-effective audit obligation scheme is not a simple task. Of the obligation schemes presented, the ones with higher responses have at some point offered incentives for audits and/or for implementing the measures.

Additional requirements, like planning and periodic reporting in connection with incentives, can enhance the energy/economic saving results of the obligation.

A dedicated web application, to upload audits and other required material and offering other tools and information, is considered very important, not only to inform and help users but also to manage the scheme and provide aggregated data on measures, savings etc.

A list of obligated organisations seems to be very important in order to involve a high proportion of users. Another approach is to check the fulfilment of the obligation through other existing procedures/authorisations.

## 3 After the audit: encourage the implementation of the identified measures

The energy audit assesses the energy use of a building, organisation, service or system and identifies opportunities to improve energy efficiency. The energy audit itself is only a first step: if none of the identified opportunities are taken, the audit turns out to be just a cost, without any positive effect on energy consumption and expenditure. Different approaches to encouraging implementation of the opportunities were identified through a questionnaire to the CA EED participants and in international good practices.

The EED recognises the importance of implementing audit recommendations as the subsequent step after the energy audit; this may be supported by Member States for SMEs (Article 8(2)) and large enterprises (Article 8(7)).

Other provisions considered in this context are the absence of clauses preventing the findings of the audit from being transferred to any qualified/accredited energy service provider, on condition that the customer does not object (Article 8(1)), and the requirement for energy audits to assess the technical and economic feasibility of connection to an existing or planned district heating or cooling network (Article 8(7)).

A questionnaire was sent to the CA EED participants to investigate the existence of support schemes for the implementation of energy audit recommendations and also to identify if energy audit data and real data on savings generated are collected and for what purpose. In over 2/3 of the Member States, the energy audit reports are collected by an appointed organisation. Data is collected in a similar number of Member States on the real savings generated by the implemented measures.

Data from energy audits are used to evaluate the quality of the audits and the effectiveness of the scheme; to create reports based on aggregated data; to create a database of energy saving measures; to report at international level; and for policy planning, management and assessment. Some of these uses of data can also be linked to benefits arising from the implementation of audit recommendations and a database of energy saving measures with statistical data on the savings can help build trust from customers and banks.

In around 2/3 of Member States, there are ongoing schemes to support the implementation of opportunities highlighted by energy audits. In many of these support schemes, the energy audit is part of a broader framework involving, for example, voluntary agreements, energy management systems and eventually some kind of obligation (energy audit obligation, obligation to implement the measures, etc.).

It is quite common to subsidise energy audits, though it is less common to link the subsidy to the implementation of recommendations. Requiring an energy audit in order to apply for a grant is more common, but it was noted in the discussion that, in this case, the energy audit may become a mere justification to implement a measure that was already planned.

Energy audits are compulsory for large entities/those over certain thresholds in around 1/5 of the Member States; in a small number of cases, there is also an obligation to implement the audit recommendations.

A number of different schemes/practices from within and outside Europe were discussed:

- Support schemes for implementation of opportunities identified by energy audits, for example, Voluntary Agreements, the Trend project. Some schemes also exploit the exchange of information among neighbours (energy efficiency networks<sup>3</sup> for SMEs) or among brand associations (cooperation within an industrial sector as in the paper industry in NL).
- Other use of data: compulsory data disclosure (e.g. Australian Energy Efficiency Opportunities) or voluntary data disclosure (e.g. Energie Atlas Bavaria)
- The role of technical standards/guidelines in encouraging the implementation of measures (e.g. Australian technical standard on energy audit).

According to the CA EED discussions, the barriers to encouraging the implementation of audit recommendations were often linked to energy being a low business priority, scarce economic and/or human resources and low trust in the quality of the energy audit. The identified solutions can be clustered as information/organisation, finance/funding and qualification/certification of audit, services and technology providers.

The use of data from energy audits was also debated. The data can be useful for internal uses (planning, management, evaluation of results, etc.) and external purposes (sharing in networks or branch associations, creation of sectorial benchmark and guidelines, data disclosure, etc.).

Almost all of these data uses are more or less widespread in various countries and sectors. The public reporting of energy saving opportunities is one of the characteristics of the Australian Energy Efficiency Opportunities programme and has also been considered as an option in the UK public consultation for the transposition of the energy audit obligation of the EED.

At the moment, there does not seem to be any mechanism in place to facilitate the transfer of the findings of the energy audit to (qualified/accredited) energy service providers that can offer technical and financial support (e.g. third party financing) for the implementation of measures. However, there are some attempts to create a public database of waste heat (e.g. Energie Atlas Bayern and other heat mapping initiatives

linked to the transposition of art. 14 of the EED), which can help to connect users with surplus heat to providers of technologies and energy services and/or with neighbouring needs for heating or cooling.

## Good practice examples

### ✓ TREND programme – Regione Lombardia – Italy

The TREND project, financed by the European Regional Development Fund, was aimed at promoting awareness, competencies and tools for energy efficiency in SMEs in Regione Lombardia. It was carried out in three steps:

- Matching demand/supply of Experts in Energy Management to carry out energy audits in 500 SMEs.
- Analysing the energy efficiency measures for improving the energy performance of SMEs by sector and size in terms of energy savings and cost effectiveness.
- Matching demand/supply of clean technologies and energy efficiency services and funding, in 100 of the audited SMEs, the implementation of the most effective measures in terms of innovation, energy saving, environmental benefits, competitiveness and repeatability. The estimated energy saving for the funded measures is 4000 toe. Data showing the results of the efficiency measures is required one and two years post-implementation.

The data from the energy audits (collected via specific electronic templates) are used also for the industrial section of the regional energy balance and for regional energy planning.

### ✓ Energie-Atlas – Bavaria – Germany

Energie-Atlas is a web platform supporting citizens, municipalities and companies with information on how to realise energy savings and increase energy efficiency and the use of renewable energy technologies. The core content is an interactive map integrating and showing on-demand different layers of geo-referenced information such as installed energy plant, potential for new capacity, infrastructure, tools for project delivery, information on efficient techniques, etc.

There is also a stock exchange for surplus heat, an integrated tool to visualise potential surplus heat and demand for additional heat. The database was populated through information from the emission authorisation procedure. Each company can decide whether to authorise the publication of its data by signing an agreement. At present, nearly 300 sources of surplus heat are identified, alongside the additional sources of heat from municipal waste water and waste incineration. Further development is based on presenting good practice examples combined with public relations to motivate industrial and municipal bodies as well as plant operators to integrate additional data and to foster networking to get in touch and create projects for the exchange of surplus heat. The platform is visited on average by 1000 users per day from different groups: citizens, municipalities, politicians, plant installers and operators, energy suppliers, industry etc. The feedback is extremely positive and the users support the improvement and expansion of the platform.

### ✓ “Friendly energy audit” – The Netherlands

The Dutch Paper Makers started an energy transition programme in 2004. The paper sector as a whole decided to work together to survive in the highly competitive international environment. Their 2020 vision is to become “world champion”, halving their consumption. Many paper mills were eager to implement an energy management structure and ISO 50001 was chosen to become the standard for the paper industry. However, no experienced consultants were available or trained for the paper industry. To ensure that ISO 50001 would not become red tape, but really would raise awareness, a working group was formed. One of the activities was the organisation of friendly energy audits. Eight companies participated in this pilot. The eight mills were each visited for one day. A presentation/report was made at the end of each visit and shared in the working group meeting afterwards. This included, for example, the vision (target) of every mill. Many ideas on ways of communicating with mill personnel were also shared. After this first experience, the mills asked to repeat the friendly audit again next year.

Good practice factsheets for these projects can be downloaded from the following web address: [www.ca-eed.eu/good-practices/good-practice-factsheets/energy-services](http://www.ca-eed.eu/good-practices/good-practice-factsheets/energy-services)

A presentation about the TREND programme is also available: [www.ca-eed.eu/good-practices/member-state-presentations/energy-services/after-the-audit-encourage-the-implementation-of-the-identified-measures/support-for-energy-audit-in-smes-and-implementation-of-identified-energy-efficiency-measures-italy2](http://www.ca-eed.eu/good-practices/member-state-presentations/energy-services/after-the-audit-encourage-the-implementation-of-the-identified-measures/support-for-energy-audit-in-smes-and-implementation-of-identified-energy-efficiency-measures-italy2)

<sup>3</sup> Claudia CANEVARI, DG ENER.C.3, Athens, PM CA ESD, 27 March 2014, provided the following information on the latest state on implementation of art. 5 as on 31 December 2013 “Article 5, notification of alternative approach (17) or publication of inventory (4)”.

## Conclusions

More or less structured frameworks for energy audits exist in most of the Member States. The presentations showed examples of qualification and accreditation/certification of auditors, audit tools such as guidelines, handbooks, energy audit templates (in some cases, in electronic format to enable upload to a database and the extraction of useful anonymous information such as sectorial consumptions, savings, benchmarks, etc.). The weakest element of ongoing energy audit frameworks, compared to the provisions of Annex VI, seems to be economic evaluation.

Five Member States already have an energy audit obligation. There are also obligations to implement the measures highlighted by the energy audit: in the Czech Republic, for public authorities, on decision of the

State Energy Inspectorate; and in Brussels Capital Region, for non-residential buildings if payback is under five years.

In many cases, energy audits are part of other measures (e.g. incentives, voluntary agreements, etc.). Controls on implementation and the savings of the opportunities highlighted only exist in some cases. Few frameworks are comprehensive. More structured frameworks can be beneficial but require more resources and the cost/benefit ratio has to be carefully evaluated. For a small number of Member States, energy audits are something completely new. Audits are, however, used in different ways and harmonisation of their contents according to the EED could be beneficial.

## 4 Transposition of energy audit obligation for large enterprises

All the Member States have to introduce new provisions in their legislation to transpose article 8 and annex VI of the EED. There are similarities with the Energy Performance of Buildings Directive and many elements (e.g. energy management systems, voluntary agreements) are already widely diffused across MS. This meant that, in the early stages, the transposition of article 8 was underestimated in some cases.

At the beginning of 2014, a questionnaire circulated to the CA EED participants investigated the state of the play on the transposition of the energy audit obligation, the accompanying measures and the interactions with existing supporting schemes and obligations.

The majority of MS have made some progress towards implementation of Article 8 and some have published consultation or draft transposition documents. Analysis of these documents indicates that a range of different approaches are proposed, reflecting national circumstances.

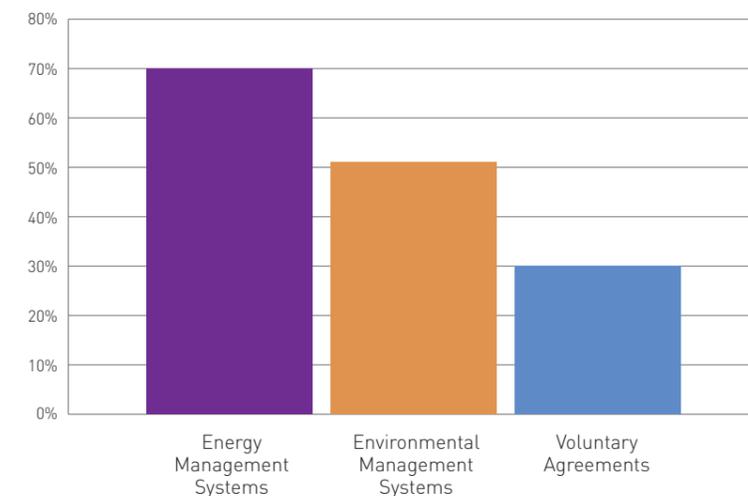
The majority of MS (Table 2) intend to allow large enterprises to comply via certified energy management systems. Around half of MS intend to

allow environmental management systems as a route to compliance, while less than one third will consider voluntary agreements

There is a similar trend when looking at incentives (Table 3), with energy management systems currently supported by incentive schemes in around half of the MS. With the transposition, this number will increase. The pattern is similar for environmental management systems and voluntary agreements but again with a lower share of MS.

It is worth remembering that it will not be possible to subsidise large enterprises for mandatory energy audits.

Figure 1. Options alternative to energy audit to comply with the obligation for large enterprises



Consumption data and the results of energy audits are, at the moment, considered sensitive in most of the MS, but there are some proposals to disclose them partially for specific subjects or for management of the energy audit framework. In some schemes (e.g. UK), this would be linked to the involvement of the management and the diffusion of information to stakeholders.

The creation of a comprehensive list of companies that will be required to comply with the energy audits obligation is a challenging task, but over 90% of respondents considered that this list is useful or necessary and a number of respondents had identified ways in which such a list could be created. Statistical data are useful to evaluate the number of obliged subjects, but in many cases it is not possible to access other essential information for creation of the list such as names and addresses of the enterprises.

To ensure that large enterprises carry out energy audits on a regular basis, the majority of MS considered that penalties are a necessary backstop. Some MS indicated that they would check compliance with the obligation through other processes – such as voluntary agreements, incentives, permissions, etc.

As regards the minimum criteria for high quality energy audits, the majority of MS set out that they do not intend to go beyond the requirements of Annex VI, but some

MS indicated their intention to include in legislative acts or audit guidelines more details of the requirements set in Annex VI and to outline good practice in energy auditing.

Several MS intend to require energy audits to meet the standard set by EN 16247 – 1, the European standard for energy auditing. There are some uncertainties regarding other parts of the standards, in part due to the ongoing work on the international standard for energy audits (ISO 50002). An example of a concrete approach to Annex VI is the Austrian draft document on minimum requirements .

A suitable qualification for audit providers is fundamental to ensuring high quality energy audits, but there is also a concern about the availability of a sufficient number of skilled providers to meet the need of obliged enterprises. There are different approaches: authorisation/certification (see Romania presentation) vs. market.

Multinational enterprises express their concerns on the possible difficulties if internal energy auditors have to be recognised/certified in different MS. Some MS (e.g. Czech Republic) already have mutual recognition of audit providers, but it seems difficult to extend to all MS, since in some cases audit providers can be only a physical person, whilst in others they can be

companies. Moreover, the qualification criteria are different, so it would be difficult to ensure mutual recognition and safeguard audit quality.

In some of the draft transpositions or draft guidelines, there are specific provisions for energy audits in transport. During the discussion, Finland shared some information on air, ship and rail transport, where there are already international reporting schemes in place, some of them compulsory requirements, in line with the provisions of the Directive.

The boundaries of energy audits were also discussed. An identified minimum threshold of consumption is considered beneficial to help focus energy audits on the most significant aspects of energy consumption, but a fixed threshold or fixed share limits the field of action of the energy auditor. In the latter case, the auditor has more freedom, though this creates the risk of poor quality audits; therefore, a thorough quality check must be in place.

Finally, some CA participants observed that environmental management systems would not always be implemented in a way which meets the minimum requirements of Annex VI to the Directive.

## Good practice examples

### ✓ Document on energy audits minimum requirements – Austria

The document on quality criteria for energy audits (Qualitätskriterien für Energieaudits) was prepared by the Austrian energy agency and contains concrete details on how to fulfil the requirements of Annex VI. The document is still a draft, thus the specific details are indicative at the moment.

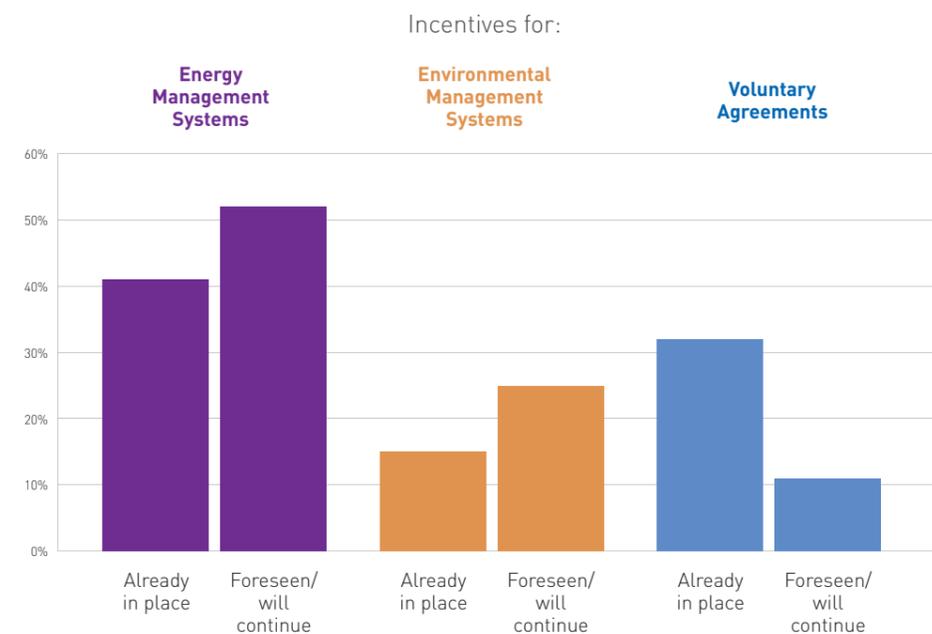
Key points include:

- Using latest available real data (from energy bills or consumption records), referring to the same period, for all the fuels used by the organisation.
- For the first audit, data of a minimum period (e.g. the latest 3 years) are required. With regard to proportionality and representativeness, there is a minimum consumption (e.g. 10%) for the essential energy uses to be identified.
- For large enterprises, there are specific requirements additional to EN 16247-1 for buildings, industrial processes and transport
- Evaluation of investments has to consider the interest rate, and a justification is required if it is not possible to use the life cycle costing. The suggested reference is the national technical standard ÖNORM M7140.
- Regarding data storage, the data of the last two energy audits has to be available.

The most detailed part of the document is the energy consumption profile (point b of Annex VI). There are two different sections, one for large enterprises and a shorter one for SMEs.

For more information, presentations can be downloaded from the following web address: [www.ca-eed.eu/good-practices/member-state-presentations/energy-services/transposition-of-energy-audit-obligation-for-large-industries](http://www.ca-eed.eu/good-practices/member-state-presentations/energy-services/transposition-of-energy-audit-obligation-for-large-industries)

Figure 2. Incentives for energy or environmental management systems or voluntary agreements





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The Concerted Action for the Energy Efficiency Directive (CA EED) was launched by Intelligent Energy Europe (IEE) in spring 2013 to provide a structured framework for the exchange of information between the 28 Member States and Norway during their implementation of the Energy Efficiency Directive (EED).

For further information please visit [www.ca-eed.eu](http://www.ca-eed.eu) or email [caeed@ca-eed.eu](mailto:caeed@ca-eed.eu)



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