White Book

on implementation of Article 8 of the EED in Ukraine
Energy efficiency is a key element in a sustainable economy—leading to an increase in jobs and GDP as well as to the reduction of pollution and securing energy supply. Energy efficiency paves the way to accomplish the greenhouse gas emission reduction target. It improves indoor comfort and provides financial savings on the annual energy bill. Companies can profit from innovative solutions and higher competitiveness as a result of cost savings.

The Energy Efficiency Directive (2012/27/EU) lays the groundwork to fully reach the potential of energy efficiency in the European Union. As a guideline the directive proposes energy efficient measures that each member state transforms into legally binding policies to strengthen its energy efficiency status in all sectors of the economy. With signing the association agreement in 2014, Ukraine, too, needs to transpose the directive in national legislation.

Energy audits and energy management systems represent important pillars in achieving energy efficient results. Article 8 of the EED eventually introduces the obligation of regular energy audits for large companies. Nevertheless the transposition of this article in national law shows a variety of possibilities among the member states.

The aim of this document is to provide an in-depth analysis of Article 8 of the EED, reviewing European best practices in order to draw a comparison and to choose the best available solution for Ukraine. The document suggests a path and proposes further actions. In the end however, decisions need to be taken to strengthen the energy efficient achievements and the further development.

The transposition of the EED in Ukrainian legislation is one side. Though maintaining the momentum in the implementation process requires the right balance between strict legislation and the Ukrainian reality. Dynamic players need to take actions on the pathway of energy efficiency putting forward its full potential in order to secure a stable and safe energy future for Ukraine.

We are here and ready to support this challenge!

George Cristodorescu
Project Director
Energy Efficiency Reforms in Ukraine
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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Definitions

Definitions which are relevant for Articles 8, 16 and 17 of the EED used in the Energy Efficiency Acquis of the Energy Community

1 Central government means all administrative departments whose competence extends over the whole territory of a Contracting Party.

2 Energy means all forms of energy products, combustible fuels, heat, renewable energy, electricity, or any other form of energy, as defined in Article 2(d) of Regulation (EC) No 1099/2008 of the European Parliament and of the Council of 22 October 2008 on energy statistics.

3 Energy audit means a systematic procedure with the purpose of obtaining adequate knowledge of the existing energy consumption profile of a building or group of buildings, an industrial or commercial operation or installation or a private or public service, identifying and quantifying cost-effective energy savings opportunities, and reporting the findings.

4 Energy efficiency means the ratio of output of performance, service, goods or energy, to input of energy.

5 Energy efficiency improvement means an increase in energy efficiency as a result of technological, behavioural and/or economic changes.

6 Energy management system means a set of interrelated or interacting elements of a plan which sets an energy efficiency objective and a strategy to achieve that objective.

7 Energy savings means an amount of saved energy determined by measuring and/or estimating consumption before and after implementation of an energy efficiency improvement measure, whilst ensuring normalisation for external conditions that affect energy consumption.

8 Energy service means the physical benefit, utility or good derived from a combination of energy with energy-efficient technology or with action, which may include the operations, maintenance and control necessary to deliver the service, which is delivered on the basis of a contract and in normal circumstances has proven to result in verifiable and measureable or estimable energy efficiency improvement or primary energy savings.

9 Energy service provider means a natural or legal person who delivers energy services or other energy efficiency improvement measures in a final customer’s facility or premises.

10 European standard means a standard adopted by the European Committee for Standardisation, the European Committee for Electrotechnical Standardisation or the European Telecommunications Standards Institute and made available for public use.

11 Final customer means a natural or legal person who purchases energy for own end use.

12 Final energy consumption means all energy supplied to industry, transport, households, services and agriculture. It excludes deliveries to the energy transformation sector and the energy industries themselves.

13 Implementing public authority means a body governed by public law which is responsible for the carrying out or monitoring of energy or carbon taxation, financial schemes and instruments, fiscal incentives, standards and norms, energy labelling schemes, training or education.

14 International standard means a standard adopted by the International Standardisation Organisation and made available to the public.

15 Policy measure means a regulatory, financial, fiscal, voluntary or information provision instrument formally established and implemented in a Contracting Party to create a supportive framework, requirement or incentive for market actors to provide and purchase energy services and to undertake other energy efficiency improvement measures.


17 Small and medium-sized enterprises or SMEs means enterprises as defined in Title I of the Annex to Commission Recommendation 2005/561/EC of 6 May 2005 concerning the definition of micro, small and medium-sized enterprises, the category of micro, small and medium-sized enterprises is made up of 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.

Other relevant definitions (various sources)

18 Accreditation means third party attestation related to a conformity assessment body conveying a formal demonstration of its competence to carry out specific conformity assessment tasks.

19 Certification means third party attestation related to products, processes, or persons that convey assurance that specified requirements have been demonstrated. Certification of persons has the objective of recognising the competence of individuals to perform specific tasks. It recognises that competence is not solely related to qualification but is based on the individual’s ability to apply knowledge and skills to achieve intended results.

20 Environmental management system means the part of the overall management system that includes the organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy and managing the environmental aspects.

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1 Incorporated by Ministerial Council Decision 2012/02/MC-EnC of 18 October 2012 concerning the implementation of the rules of energy statistics in the Energy Community

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2 For further definitions see Ovdiienko ea, 2018
3 ANSI (2007): National Conformity Assessment Principles for the United States (definition according to ISO/IEC 17000)
4 Idem
Introduction

The Energy Efficiency Directive 2012/27/EU (EED) is – together with the EPBD 2010/31/EU, the Energy Labelling Directive 2010/31/EU and the Ecodesign Directive 2009/125/EC – the main policy instrument to increase energy efficiency in the European Union in order to achieve the objective to 20% increase of energy efficiency by 2020. The Directive defines a common framework for a series of mandatory energy efficiency measures, including measures related to the promotion and implementation of energy audits and energy management systems at final customers, i.e. natural and legal persons who purchase energy for own end use. The stipulations of the EED regarding energy audits and management are defined in Article 8 “Energy audits and management systems” and Annex VI of the EED. Other relevant articles are Articles 16 “Availability of qualification, accreditation and certification schemes” and 17 “Information and training”, as well as Article 13 “Penalties”.

In accordance with the Decision of the Ministerial Council of the Energy Community of 16th October 2015, the signatories of the Energy Community Treaty have committed to transpose the EED in their respective national legislation by 15th October 2017. The deadline for the transposition of Article 8(4) of the EED (mandatory energy audit) is 5th November 2018. Article 8 on energy audits and energy management systems was included as part of the EED in the legal framework of the Energy Community. The Work Programme 2017 – 2018 of the Coordination Group Energy Efficiency of the Energy Community foresees the development of national minimum criteria of energy audits according to Annex VI of the EED.

While the EED is currently under review, no changes to Article 8 are envisaged by the European Commission, despite suggestions for improvement by experts.

1.1 Obligations of Member States / Contractual Parties

1.1.1 OBLIGATIONS DUE TO ARTICLE 8 EED

Article 8 of the Energy Efficiency Directive 2012/27/EU stipulates a series of obligations for Member States, in accordance with the sections (1) – (7) of the Article:

According to Article 8 (1), Member States/Contractual Parties have the duty to promote the availability to all final customers of high quality and cost-effective energy audits, which are:

(a) carried out in an independent manner by qualified and/or accredited experts according to qualification criteria, or

(b) implemented and supervised by independent authorities under national legislation.

The energy audits carried out by qualified and/or accredited experts may be carried out by in-house experts or energy auditors provided that the Member State/Contractual Party has put in place a scheme to assure and check their quality, including, if appropriate, an annual random selection of at least a statistically significant percentage of all the energy audits they carry out. In order to guarantee a high quality of the energy audits (and energy management systems), Member States/Contracting Parties shall establish transparent and non-discriminatory minimum criteria for energy audits based on Annex VI of the EED. Article 8 (1) also includes the stipulation that energy audits should not include 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.

Several stipulations in Article 8 (1) need further explanation, in particular:

(a) the definition of “qualification” and “accreditation” of experts,

(b) the implementation and supervision of energy audits by independent authorities under national legislation,

(c) the scheme to assure and check the quality of the energy auditors and the energy audits carried out, and

(d) the establishment of transparent and non-discriminatory minimum criteria for energy audits.

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19 Final customers are defined in the EED as “a natural or legal person who purchases energy for own end use” (emphasis added). This qualification of “final customers” in the definition suggests that enterprises who are not end users, but generate, transform or distribute energy (like oil refineries, power station, combined heat and power plants, district heating and electricity distribution companies) may not fall under the category of final customers. This view is supported by the fact that Article 8 is part of Chapter II “Efficiency in Energy Use” of the EED, while heating and cooling plants, as well as energy transformation, transmission and distribution are dealt with under Chapter III “Efficiency in Energy Supply”.

Qualification and/or accreditation of experts

Article 8(1) stipulates that energy audits should be:

(a) carried out in an independent manner by qualified and/or accredited experts according to qualification criteria, or

(b) implemented and supervised by independent authorities under the national legislation.

The terms "qualified" and "accredited" are explained in the EC’s Guidance note on Article 8 of the EED. However, the definitions provided for "accreditation" refer to the control by conformity assessment bodies, referring also to Regulation (EC) No. 765/2008 "on a common framework for the marketing of products", and do not provide a direct reference to the Community’s definition of the term "energy audit" in the context of the EED. For the purposes of this note, "accreditation" is used as a synonym for "certification".

The implementation and supervision of energy audits by independent authorities under national legislation

The EC’s Guidance note on Article 8 does not include any specific comments with regard to the implementation and supervision of energy audits by independent authorities. This means that Member States / Contractual Parties are free to design and implement such schemes according to their specific needs and preferences, as long as the basic requirements of the EED are observed.

Scheme to assure and check the quality of the energy auditors and the energy audits carried out

While the EC’s Guidance note on Article 8 mentions the obligation of Member States “to establish in national legislation requirements for energy auditors, and for supervision by national authorities”, it does not provide any specific guidance, further to the comments regarding the qualification and/or accreditation of experts. This means that Member States / Contractual Parties are free to design and implement such schemes according to their specific needs and preferences, as long as the basic requirements of the EED are observed.

Establishment of transparent and non-discriminatory minimum criteria for energy audits

Guidelines for minimum criteria for energy audits are defined in Annex VI of the EED.

Energy audits shall:

(a) be based on up-to-date, measured, traceable operational data on energy consumption and (for electricity) load profiles;

(b) comprise a detailed review of the energy consumption profile of buildings or groups of buildings, industrial operations or installations, including transportation;

(c) build, whenever possible, on life-cycle cost analysis (LCCA) instead of Simple Payback Periods (SPP) in order to take account of long-term savings, residual values of long-term investments and discount rates;

(d) 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.

Energy audits shall allow detailed and validated calculations for the proposed measures so as to provide clear information on potential savings. The data used in energy audits shall be storage for historical analysis and tracking performance. While these guidelines provide the basis for the minimum criteria to be established as requested in Article 8(1), additional explanations are provided in the EC’s Guidance note on Article 8. In particular, the Guidance note encourages to take into consideration European and international standards, like EN 16247-1: Energy audits - Part 1: General requirements and ISO 50002: Energy audits – Requirements with guidance for use, as well as standards from the ISO 50000 and ISO 14000 series. It should be noted that in addition to EN 16247-1 also the other standards of this series are highly relevant as a reference for minimum criteria. The Guidance note explicitly states that, "when developing national minimum criteria for energy audits, European or international standards may [...] provide useful guidance for the definition of the scope and guidance for the definition of the scope and level of detail of an energy audit". According to section E2 of the Guidance note, Member States are free to add elements to the minimum criteria and to “tailor the needs for different segments where they promote energy audits”, this means, for instance, the scope and level of detail required for energy audits in small and medium-sized enterprises (SMEs). Also, the Guidance note explicitly mentions the options to apply additional indicators to determine the economic feasibility of energy efficiency measures, like Discounted Payback, Internal Rate of Return or Return on Investment (in addition to life cycle cost analysis).

Although the issue of "cost-effectiveness" of the energy audits is not explicitly explained in the Guidance note, it should be a point of interest, as it suggests a correlation between the cost of the audit and the resulting benefits in terms of savings of potential or actual energy cost savings the company. While the cost of an energy audit is typically much lower than the energy cost savings achieved by the energy efficiency measures identified, this cannot always be taken for granted, in particular in cases where buildings, industrial processes, and transport systems are already highly efficient.

Article 8(2) requires Member States / Contractual Parties to “develop programmes to encourage implementation of Article 8 of EED in Ukraine”.


21 The Guidance note offers the following definitions: (a) Accreditation is a public authority activity that ensures the continuous control of the technical competence of conformity assessment bodies, and (b) Accreditation is a public authority activity that ensures the continuous control of the technical competence of conformity assessment bodies.

22 ISO/IEC Standards on certification of products, management systems and persons, elaborated by the ISO Committee on Conformity Assessment (CASCO).

23 The following is a literal citation from Annex VI of the EED.

24 ISO 50002 was still under development at the time of publication of the Guidance note.

25 While most of the standards of the ISO 50000 series refer to energy management system, ISO 50002: Energy audits – Requirements with guidance for use refers specifically to energy audits. The ISO 14000 series sets out requirements for environmental management systems.


27 According to the definition of the European Commission, SMEs are enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding € 50 million, and/or an annual balance sheet total not exceeding € 43 million.

SMEs to undergo energy audits and the subsequent implementation of the recommendations from these audits. Member States / Contractual Parties "may set up support schemes for SMEs [..] to cover costs of an energy audit and of the implementation of highly cost-effective recommendations from the energy audits, if the proposed measures are implemented". Also, Member States / Contractual Parties are obliged to inform SMEs about the benefits of energy management systems, by providing examples and supporting the exchange of best practices.

Article 8(5) requires Member States / Contractual Parties to "develop programmes to raise awareness among households about the benefits of energy audits through appropriate advice services". Article 8(5) also includes the stipulation that "Member States shall encourage training programmes for the qualification of energy auditors in order to facilitate sufficient availability of experts".

Article 8(4) requires Member States / Contractual Parties to ensure that enterprises that are not SMEs carry out mandatory energy audits according to the criteria defined in Article 8(3). In the case of Contractual Parties of the Energy Community, the energy audits have to be carried out by 5th November 2019 and subsequently repeated every four years. Provided that the energy audits are carried out in accordance with the minimum criteria mentioned, they may also be implemented under voluntary agreements (Article 8(5)). Enterprises that are not SMEs may be exempted from this obligation if they are implementing an energy or environmental management system (Article 8(6)), provided that the management system is certified by an independent body according to the relevant European or international standards, and includes an energy audit in accordance with the minimum criteria defined in Annex VI of the EED (Article 8(6)).

Taking into consideration that a regular "energy review" is an integral element of an energy management system according to ISO 50001: Energy Management System (and the related standards of this series), the exemption stipulated in Article 8(6) de facto means nothing else than that the "energy review" which is part of an energy management system has to be an energy audit according to the minimum criteria defined in Annex VI of the EED, in order to fulfil the requirements of the Directive.

Finally, Article 8 includes the stipulations that:

(a) "access of market participants offering energy services shall be based on transparent and non-discriminatory criteria (Article 8(5)),

(b) "energy audits may be stand alone or part of a broader environmental audit" and that "an assessment of the technical and economic feasibility of connection to an existing or planned district heating network" may be required by Member States / Contractual Parties as part of the energy audit, and that

(c) Member States / Contractual Parties "may implement incentives and support schemes for the implementation of recommendations form energy audits and similar measures".

It can be concluded from the above that Article 8 of the EED is obviously mainly directed to the promotion of respectively obligation to carry out energy audits, while energy management systems play a less prominent role. In the context of mandatory energy audits, EMS is considered to be a sufficient reason for exemption (under certain conditions), while in the context of promotion of energy audits, EMS is mentioned in the context of awareness raising of SMEs.

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29 Section D2 of the EC’s Guidance note on Article 8 includes rules to establish whether an enterprise in a Member State satisfies the criteria of a SME, in particular in the case of enterprises linked with others due to partnerships and shareholding. The Guidance note also encourages Member States to prepare lists of large enterprises.

1.1.2 RELATED OBLIGATIONS DUE TO ARTICLES 13, 16 AND 17 EED

Article 13 of the EED "Penalties" requires Member States / Contractual Parties to "lay down the rules on penalties applicable in case of non-compliance with the national provisions adopted" pursuant to various Articles, including Article 8 of the EED and take the necessary measures to implement these penalties. The penalties shall be "effective, proportionate and dissuasive".

Article 16 of the EED "Availability of qualification, accreditation and certification schemes" encourages Member States / Contractual Parties to ensure the availability of such schemes ("certification and/or accreditation schemes and/or equivalent qualification schemes"), as well as training programmes for providers of energy services, energy audits, energy managers and installers of energy-related building elements. The schemes have to "provide transparency to consumers, be reliable and contribute to national energy efficiency objectives". The schemes shall be made publicly available and consumers shall be made aware of them.

Article 17 of the EED "Information and training" requires the dissemination of "information on available energy efficiency mechanisms and financial and legal frameworks" and other measures targeted to financial institutions, market operators; the stimulation of dialogue, exchange of information on best practices, stakeholder participation, etc.

Implementation of Article 8 of EED in Ukraine
Article 17 of the EPBD 2010/31/EU requires Member States to "ensure that the energy certificates of buildings and the inspection of heating systems and air-conditioning systems are carried out in an independent manner by qualified and/or accredited experts [...]." The experts "shall be accredited taking into account their competence", and Member States have the duty to make available to the public information on training and accreditation, as well as regularly updated lists of qualified and/or accredited experts and companies who offer the services of such experts.

Taking into consideration that the scope of the energy performance certificates of buildings and the inspections of heating and air-conditioning systems (according to Articles 11, 14 and 15 of the EPBD) is more limited, as compared to the scope of an energy audit according to Annex VI of the EED, the assessments required under the EPBD cannot be regarded equivalent with energy audits according to the EED. This view is confirmed in the EC’s Guidance Note on Article 8 of the EED, items 8. and 9. Nevertheless, the Guidance note states "that in specific cases (for instance when auditing office buildings of a larger enterprise) certification and/or inspection under the EPBD in a given Member State may fulfil the requirements of Article 8 and Annex VI of the EED". This implies, however, that the certification and/or inspection has to fulfil all the criteria defined in Annex VI of the EED.

While the Guidance note stresses that the need for Member States to explore synergies between the transposition and implementation of Article 8 of the EED and the implementation of the EPBD (in particular with regard to the qualification and/or accreditation of experts and independent control systems), it also confirms that the "qualification criteria [of experts] may [...] differ substantially given that the scope of energy audits under the EED is wider than the certification of buildings under the EPBD", and concludes that: (i) "qualified energy auditors in the framework of the EED could be recognised as qualified experts to deliver EPCs in buildings", while (ii) "qualified experts to deliver EPCs in buildings could be targeted for training to become qualified energy auditors". This means that the qualification as energy auditor according to Article 8 of the EED may be a sufficient criterion to deliver energy performance certificates according to the EPBD, while an expert qualified for EPCs of buildings is not automatically qualified to perform energy audits in buildings or other areas.

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2. Implementation of Article 8 EED in EU Member States

2.1 Overview

As a European Directive, the EED is a legal instrument that requires the transposition of its requirements into national laws by Member States. Member States have a degree of liberty in respect of national implementation, provided that the national transposition fulfils the Directive’s minimum requirements.

The Energy Efficiency Directive was due to be transposed into national legislation of the EU Member States by 5th June 2014, with specific dates defined to comply with certain specific requirements. The date for transposition by the Contractual Parties of the Energy Community Treaty was 15th October 2017. The date for implementing mandatory energy audits according to Article 8(4) of the EED was 5th December 2015 (5th November 2018 for Contractual Parties of the Energy Community).

A comprehensive overview of the implementation of Article 8 of the EED in Member States can be found in the Report of the European Commission “on the fulfilment of obligations upon large enterprises, the encouragement of small- and medium-sized companies and on good-practice”, published in April 2016, and reflecting the situation in summer 201531.

Table 1 provides a general overview over the status of implementation of Article 8 EED by end of 2017, with regard to:

(a) the transposition of Article 8,
(b) an accreditation scheme for energy auditors,
(c) mandatory training for energy auditors,
(d) a register of energy auditors, and
(e) mutual recognition of energy auditors’ qualification.

Table 1 should follow here.

In the following sub-sections, examples of good practice in several EU Member States are presented.

The examples concern:

(a) internet-platforms for mandatory and voluntary energy audits,
(b) legal procedures regarding the procedures for energy audits,
(c) qualification and registration requirements for energy auditors,
(d) guidelines and forms for energy audit reports, as well as
(e) an example of an industry network for the implementation of environmental management systems.

While the examples are illustrative and reflect the practice in some EU member states, they are not exhaustive, nor do they provide a complete picture regarding these topics across the 28 EU Member States. In addition to cases from EU member states (section 4.2), examples from other Contractual Parties of the Energy Community are included in section 4.3.

Implementation of Article 8 of EED in Ukraine

2.2 Examples from EU Member States

2.2.1 Croatia – Legal Requirements Regarding Energy Audits and Energy Auditors

According to Article 4 No. 69 of the Energy Efficiency Act of 2014, large companies have to meet at least two of the following criteria to fall under the regulation to conduct mandatory energy audits: (a) at least 250 employees during the previous business year; (b) a revenue of at least HRK 260 m (approximately EUR 34 million); (c) total assets of at least HRK 130 m (approximately EUR 17 million)\(^{34}\). The definition of non-SMEs applied in Croatia is therefore different from the definition provided by the European Commission. This leads to an extension of the target group in comparison to the definition of the European Commission.

Croatia applies specific Rules on Energy Audits in large enterprises, which were published in 2015\(^{35}\).

The mandatory content of an energy audit includes (among other elements):

(a) analysis of the existing state of the building and all energy facilities of a large company;
(b) transport analysis, if the company possesses 50 or more registered vehicles or if the performance of all owned vehicles is more than 3,000 kW;
(c) analysis of energy consumption and costs for energy of all production processes;
(d) analysis of energy savings potential;
(e) life-cycle Cost Analysis (LCCA) of economically justified measures;
(f) preparation of action plan of energy measures to improve energy efficiency.

Minimum requirements for energy auditors include (among others):

(a) BSc in architecture, mechanical engineering, civil construction or electro-technical engineering;
(b) minimum five years of previous work experience relevant to the function;
(c) professional liability insurance;

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Table 1: Status of Implementation of Article 8 EED in EU Member States

<table>
<thead>
<tr>
<th>Country</th>
<th>Article 8 transposed</th>
<th>Accreditation scheme</th>
<th>Mandatory training might include an exam</th>
<th>Energy auditors register</th>
<th>Mutual recognition</th>
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<tbody>
<tr>
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* In place  = Does not exist  ...  To be defined

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35 Rules on Energy Audit for large enterprises (Pravilnik o energetskom pregledu za velika poduzeća, november 2015).
Some key topics are (among others):

1. Preparation for energy audit:
   - Introduction: about location overview and brief questionnaire
   - Preparation for measuring, monitoring and setting targets
   - Data collection and measurement system
   - Questionnaire (data collection) and analysis of collected data

2. Analysis of energy consumption and costs of energy;

3. Electric motors and control of motor power (types of motors, performance characteristics, efficiency, possibilities of improving motor efficiency);

4. Boiler plants, efficient boiler operation, exhaust gas recuperation;

5. Compressed air system;

6. Hot water process and consumption;

7. Electrical water pumps and air fan systems;

8. HVAC in industry;

9. Process furnaces and industrial dryers;

10. Cooling systems in industry;

11. Steam supply system (steam and condensate);

12. Heat transfer and industrial insulation;

13. Cogeneration — criteria for selection of a cogeneration plant, connect the CTS;

14. Feasibility study (data collection, comparison with similar facilities);

15. Cost benefit analyses;

16. Financial and investment possibilities, identification of sources for financing energy efficiency projects;

17. Proposed measures to improve energy efficiency, estimate costs and benefits.

2.2.2 France — Internet Platforms for Mandatory and Voluntary Energy Audits

In France, the Agency for the Environment and Energy Conservation (ADEME) has been mandated by the French Ministry of Ecology, Energy, Sustainable Development and Spatial Planning to implement the EED. With regard to the implementation of Article 8, ADEME is in charge of elaborating specifications for energy audits, collecting and monitoring data, and communicating with enterprises, energy auditors and the public. It should be mentioned that ADEME’s activities, like the qualification of energy auditors, the promotion of energy audits and energy management systems, the monitoring of audits, communication with enterprises, etc., are directed both to mandatory and voluntary energy audits, thus allowing pooling of resources and synergies.

Nevertheless, ADEME has created two different internet platforms, for mandatory and for voluntary energy audits.

On the platform for mandatory audits (http://audit-energie.ademe.fr), every mandatory enterprise has to deposit the energy audit report and – if applicable – their ISO 50001 certificate. By December 2017, 3,164 enterprises had deposited their energy audit reports (only) and 435 enterprises had deposited their ISO 50001 certificates (including 142 enterprises who had deposited also an energy audit report). This means that in total almost 3,600 enterprises, i.e. 72% of the approximately 5,000 mandated enterprises had fulfilled their initial obligation. Approximately 52% of the mandated enterprises belong to the commercial and services sector, approximately 30% are manufacturing industries and the rest (18%) to other sectors. An interesting fact is that two thirds of the enterprises have realised their first energy audit due to the obligation.

The second platform, called DIAGADEME (http://www.diagademe.fr/diagademe/) is dedicated to the promotion of voluntary energy audits and energy efficiency advice. Enterprises who profit from a grant of ADEME to carry out an energy audit are obliged to deposit their report on this website. The site also includes documents like specifications and guidelines for energy audits, and a directory of energy experts and offices, as well as summary sheets which have to be submitted along with the energy audit reports. The site serves as a communication platform between the enterprise commissioning an energy audit or study, the consultant carrying out the study and ADEME, who acts as facilitator and advisor in all phases of the study. The enterprise who wishes to carry out an energy audit or a study prepares its terms of reference based on specifications provided on-line by ADEME and requests proposals from registered experts. Following the approval by ADEME, the consultant carries out the audit or study and shares the report and a summary sheet via the platform with the client and with ADEME. The client provides comments on the report, which is validated by ADEME. The exchange of information takes place in a private working space on the platform, which is only accessible for the three parties involved.

Energy audits in the tertiary, industrial and transport sectors have to be carried out in accordance with the European standards EN 16247-1/2/3/4. Energy auditors need to be qualified by specialisation certification or qualification bodies like: OPIQB (Organisme de Qualification de l’Ingénierie), LNE (Laboratoire National de Métrologie et d’Essais), ICERT (Institut de Certification) or AFNOR (Association Française de Normalisation), which are accredited by the French Accreditation Body COFRAC (Comité Français d’Accréditation). ADEME develops together with the certification bodies qualification criteria, which relate to the relevant EN standards.

Monitoring of energy audits is done by ADEME based on the information deposited on the internet platforms, in particular the platform for mandatory audits. Quality assessments of individual audits are carried out with the assistance of independent engineering and consulting firms, on behalf of ADEME.

36 With thanks to B. Christen and L. Magot, EXENCI, France; see also: http://www.inogate.org/documents/Presentation_EnergyAudits_in_France_200316.pdf
37 Agence de l’Environnement et de la Maîtrise de l’Énergie (ADEME)
Implementation of Article 8 of EED in Ukraine

Main sources of information are www.opqibi.com and a personal communication with S. Mouchot, Director General of OPQIBI on 24 August 2018.

Décret no 2014-1393 du 24 novembre 2014 relatif aux modalités d’application de l’audit énergétique prévu par le chapitre III du titre III du livre II du code de l’énergie. This Government Decree transposes Article 8 of the EED.

Arrêté du 24 novembre 2014 2014 relatif aux modalités d’application de l’audit énergétique prévu par le chapitre III du titre III du livre II du code de l’énergie. According to this arrêté (ministerial order), qualification bodies need to comply with the competencies defined in the French standard NF X 50-091: Qualification - Exigences générales relatives aux organismes de qualification de fournisseurs. Furthermore, applicants have to fulfil specific qualification criteria which are defined in Annex II of the Ministerial Order. These criteria are defined separately for auditors of buildings, industrial processes and transport, and comprise requirements regarding initial and continued training, previous professional experience, available technical and methodological means, and references of realised energy audits. The Ministerial Order also defines the elements of the summary of an energy audit report. As stipulated in this Ministerial Order, qualifications are only granted to legal entities, i.e. not to individual persons.

As mentioned in the previous section, in France, energy auditors need to be qualified by an accredited qualification body, which is a requirement defined in Government Decree no 2014–1393 of 24 November 2014 40, and further detailed in Ministerial Order (arrêté) of 24 November 2014 41. According to this ministerial order, qualification bodies need to comply with the competencies defined in the French standard NF X 50-091: Qualification - Exigences générales relatives aux organismes de qualification de fournisseurs. Furthermore, applicants have to fulfil specific qualification criteria which are defined in Annex II of the Ministerial Order. These criteria are defined separately for auditors of buildings, industrial processes and transport, and comprise requirements regarding initial and continued training, previous professional experience, available technical and methodological means, and references of realised energy audits. The Ministerial Order also defines the elements of the summary of an energy audit report. As stipulated in this Ministerial Order, qualifications are only granted to legal entities, i.e. not to individual persons.

The practice of qualification of energy audits will be illustrated by the example of the procedures followed and qualifications awarded by OPQIBI, which is a qualification body for engineering, accredited by the French accreditation body COFRAC. OPQIBI offers qualifications in various fields, including for energy audits in large enterprises, individual apartments and houses.

Qualifications for energy audits in large enterprises are awarded separately for:

(a) energy audits in industry,
(b) energy audits in buildings (tertiary and multi-dwelling),
(c) energy and CO₂-emission audits in the transport of goods and persons 42.

The qualifications refer to the implementation of audits as stipulated by Article 8 EED and in accordance with the European standards EN 16247/1/2/3/4 respectively 43. In accordance with the Government Order of 24 November 2014, OPQIBI awards these qualifications to organisations offering energy audits by their employees (including micro-enterprises), rather than to individuals.

OPQIBI requires certain qualification criteria to be met, in order to be awarded a qualification, both general criteria and criteria specific to energy audits 44. Criteria include such related to the administrative and financial capacities of the organisation, to the availability of competent personnel, technical equipment, and methodologies to realise energy audits and references. As an example, Table 2 shows the qualification criteria for providers of energy audits in industrial enterprises, in accordance to Article 8 EED. The qualification criteria for providers of energy audits in tertiary and multi-dwelling buildings and in transport are analogous 45.

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2.2.3 FRANCE – CERTIFICATION OF ENERGY AUDITORS

As mentioned in the previous section, in France, energy auditors need to be qualified by an accredited qualification body, which is a requirement defined in Government Decree no 2014–1393 of 24 November 2014 40, and further detailed in Ministerial Order (arrêté) of 24 November 2014 41. According to this ministerial order, qualification bodies need to comply with the competencies defined in the French standard NF X 50-091: Qualification - Exigences générales relatives aux organismes de qualification de fournisseurs. Furthermore, applicants have to fulfil specific qualification criteria which are defined in Annex II of the Ministerial Order. These criteria are defined separately for auditors of buildings, industrial processes and transport, and comprise requirements regarding initial and continued training, previous professional experience, available technical and methodological means, and references of realised energy audits. The Ministerial Order also defines the elements of the summary of an energy audit report. As stipulated in this Ministerial Order, qualifications are only granted to legal entities, i.e. not to individual persons.

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Implementation of Article 8 of EED in Ukraine

Criteria Description

Designation of the qualification

Energy audit in industry

Definition of the qualification

1. Analysis of the situation of a set of consumers:
   - Processes: specific processes, technical equipment.
   - Utilities.
   - Buildings.

   With a view on final and efficient use of energy in all its forms.

2. This service includes the following actions:
   - Acquaintance with the facilities with prior analysis report, after exchanges between industry and auditors.
   - Realisation of energy balances from existing data and measurement campaigns.
   - Identification and quantification of potential energy savings.
   - Research of solutions for improvement of installations and energy practices and integration of renewable energies.
   - Definition of technical means and/or behavioural methods to achieve this.
   - Elaboration of a plan for registration and monitoring of energy consumptions.

3. The audit is realised in accordance with the methodology provided by the standards EN 16247-1/2012 and 16247-3/2014

Specific complementary criterion «Resources» *

1. Human resources:
   The applicant designates one or more technical referent(s) having an operational role in the preparation and/or validation of energy audits. Their places of establishment are recorded on the certificate of qualification of the service provider.

   The number of these technical referent(s) is 1 per 20 members of the workforce working in the field of the energy audit concerned. This number must be justified.

   The technical referent(s) is / are (a) specialist(s) with extensive experience in the industry and in the use of different forms of energy and those of their measures:
   - Duration of experience required in energy auditing for technical referents with a Level I degree or diploma in the field of energy management: 3 years.
   - Duration of experience required in energy auditing for technical referents with a Level II degree or diploma in the field of energy management: 4 years.
   - Duration of experience required in energy auditing for technical assistance with another degree or diploma: 7 years.

   In addition, (s)he/they must have followed an energy audit training that addresses the methodology of the audit. Provide for each technical referent an attestation of training.

Material resources:

The applicant presents the technical means used in the performance of energy audits, which allow applying the methodological requirements of standards EN 16247-1 and 16247-3.

The applicant owns and/or specifies the resources of obtaining the measuring equipment and the modeling or simulation tools necessary for the service (for example: energy meter, humidity measurement, heat balance calculation tool, flow measurement, temperature...). The ownership or use of these means is evidenced by purchase and/or rental invoices.

Methodological resources:

The applicant provides a methodological note of intervention; it is based on standards NF EN 16247-1 and 16247-3.

Specific complementary criterion «References» *

Provide 3 references over the last 3 years.

In support of each of these references, the applicant provides the corresponding energy audit reports. These reports allow judging the quality of the work as well as their conformity with the methodology presented. In particular, each report describes all stages of the audit including preliminary contact, kick-off meeting, data collection, on-site work and site visits.

Applicants receive a certificate of qualification, following the analysis of their application dossier by a qualification commission, in accordance with the qualification criteria applied by OPQIBI. Certificates of qualification have usually a validity of four years, with annual controls. Applicants who cannot yet provide references, but satisfy all other criteria, are awarded a certificate for a trial period of one year.

It should be mentioned, that the French legislation does not foresee specific requirements for training institutes (including accreditation), nor for training curricula. Nevertheless, the quality of the training followed will be assessed as part of the appraisal of the applicants by the qualification commissions of accredited qualification bodies, like OPQIBI.

Table 2 Specific qualification criteria for energy audits in industry applied by OPQIBI

<table>
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<tr>
<th>Criteria</th>
<th>Description</th>
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<tr>
<td>Specific complementary criterion «Resources» *</td>
<td>1. Human resources: The applicant designates one or more technical referent(s) having an operational role in the preparation and/or validation of energy audits. Their places of establishment are recorded on the certificate of qualification of the service provider. The number of these technical referent(s) is 1 per 20 members of the workforce working in the field of the energy audit concerned. This number must be justified. The technical referent(s) is / are (a) specialist(s) with extensive experience in the industry and in the use of different forms of energy and those of their measures: Duration of experience required in energy auditing for technical referents with a Level I degree or diploma in the field of energy management: 3 years. Duration of experience required in energy auditing for technical referents with a Level II degree or diploma in the field of energy management: 4 years. Duration of experience required in energy auditing for technical assistance with another degree or diploma: 7 years. In addition, (s)he/they must have followed an energy audit training that addresses the methodology of the audit. Provide for each technical referent an attestation of training.</td>
</tr>
<tr>
<td>Specific complementary criterion «References» *</td>
<td>2. Material resources: The applicant presents the technical means used in the performance of energy audits, which allow applying the methodological requirements of standards EN 16247-1 and 16247-3. The applicant owns and/or specifies the resources of obtaining the measuring equipment and the modeling or simulation tools necessary for the service (for example: energy meter, humidity measurement, heat balance calculation tool, flow measurement, temperature...). The ownership or use of these means is evidenced by purchase and/or rental invoices.</td>
</tr>
<tr>
<td></td>
<td>3. Methodological resources: The applicant provides a methodological note of intervention; it is based on standards NF EN 16247-1 and 16247-3.</td>
</tr>
<tr>
<td>Specific complementary criterion «References» *</td>
<td>Provide 3 references over the last 3 years. In support of each of these references, the applicant provides the corresponding energy audit reports. These reports allow judging the quality of the work as well as their conformity with the methodology presented. In particular, each report describes all stages of the audit including preliminary contact, kick-off meeting, data collection, on-site work and site visits.</td>
</tr>
</tbody>
</table>

* In addition to the general award criteria defined in the OPQIBI qualification reference system. See https://www.opqibi.com/page-criteres-de-qualification.htm
2.2.4 IRELAND — LEGAL REQUIREMENTS AND PROCEDURES REGARDING ENERGY AUDITS AND ENERGY AUDITORS

The Energy Efficiency Directive 2012/27/EU is transposed into Irish law by Statutory Instrument S.I. No. 426 of 2014. Part 3 of the S.I. includes stipulations regarding energy audits in accordance with Article 8 EED. The state agency in charge is the Sustainable Energy Authority of Ireland (SEAI).

Some specific stipulations which build on the minimum requirements defined in the EED are mentioned in the following:

(a) SEAI shall publish on its website transparent and non-discriminatory minimum criteria for energy audits, covering buildings, industrial operations or installations, including transportation, based on the guidelines laid out in Annex VI of the EED;
(b) SEAI shall establish and maintain the operation of a national registration scheme for energy auditors ("energy audit scheme"), and publish on its website a list of energy auditors;
(c) SEAI shall provide for an annual quality assurance testing of a random selection of at least a statistically significant percentage of all energy audits carried out;
(d) energy auditors have to register under the energy audit scheme using the form specified by SEAI and should be sufficiently qualified or have successfully an approved training course in relation to different classes of energy audits.

The energy auditor should be required to renew his or her registration in intervals determined by SEAI. SEAI may provide the energy auditor with a certificate of registration of the designated class of energy audit;

(e) SEAI may suspend or withdraw the registration of an energy auditor if he or she fails to attend and successfully complete a periodic training if required by SEAI, fails to carry out an energy audit in the appropriate manner, or committing an offence under the terms of the Law. The person whose registration has been suspended or withdrawn may appeal against this decision. Expiry, suspension or withdrawal of the registration shall be noted in the register.

Part 3 of the S.I. also requires SEAI:

1. To undertake "an assessment of the national level of technical competence, objectivity and reliability required for the implementation of the measures provided for in these Regulations and if it considers the findings highlight insufficiencies".

2. To "ensure that, by 31 December 2014, certification or accreditation schemes or equivalent qualification schemes, including, where necessary, suitable training programmes, become or are available for providers of energy services, energy audits, energy managers and installers of energy-related building elements as defined in Article 2(9) of Directive 2010/31/EU".

SEAI has published an Energy Audit Handbook46, which provides a step-by-step guide for a typical energy audit process. Also, SEAI has put in place processes for compliance checking and quality assurance47. On the dedicated part of its website48, SEAI provides guidelines for the registration of energy auditors, as well as an application form, a Code of Practice for Energy Auditors and a "competency assessment template" for the use of energy auditors.

To be included on the register, energy auditors need to meet the following minimum requirements:

(a) have a technical qualification, minimum level 7 Ordinary Bachelor Degree, in a relevant discipline such as engineering, architecture, or building services;
(b) have at least 7 years of relevant professional work experience since achieving the above qualification;
(c) must be awarded one of the following titles:
   - energy Institute Chartered Energy Engineer.
   - Energy Institute Chartered Energy Manager.
   - Association of Energy Engineers Certified Energy Manager.
   - Association of Energy Engineers Certified Energy Auditor.
   - Practicing Non Domestic BER Assessor registered with SEAI.
   - ESOS (UK Auditing Scheme) Lead Assessor.

2.2.5 GERMANY — LEGAL REQUIREMENTS REGARDING ENERGY AUDITS AND ENERGY AUDITORS, REGISTRATION OF ENERGY AUDITORS

The Federal Law on Energy Services and other Energy Efficiency Measures (EDL-G)49 transposes several stipulations of the Energy Efficiency Directive 2012/27/EU, including the stipulations of Article 8 EED, which are relevant for the implementation of energy audits (see Table 3).

47 https://www.seai.ie/energy-in-business/energy-auditing/
49 Gesetz über Energiedienstleistungen und andere Energieeffizienzmaßnahmen (EDL-G) of 04.11.2010, amended 17.2.2016
Paragraph Description

§7 List of Energy Service Providers and Energy Auditors
1. Providers of Energy Services and Measures, Energy Auditors may request their inclusion in a public list of the Federal Office for Energy Efficiency. Independent providers have to be indicated.
2. Providers have to be reliable and qualified. Presumption of qualification if provided relevant services for 10 final consumers over a period of 3 years. Requirement of independent advice by providers of energy audits.
3. Individual energy auditors who fulfil the requirements may request their inclusion in the public list of energy auditors published by BAFA.
4. Federal Government empowered to define the requirements for providers regarding reliability, qualifications and skills regarding independent advice, including proofs.

§8 Obligation to implement energy audits, exemptions
1. Equivalent to Article 8, section (4) – (6)

§8a Requirements for energy audits, availability of energy audits
1. Requirements for energy audits:
   - Energy audit has to comply with the requirements of DIN EN 16247-1 (Energy Audits – Part 1: General requirements).
   - Company has to assign a responsible / contact person for the energy audit.
   - To be based on up-to-date, measured and traceable operational data on energy consumption and load profiles. If too costly, energy consumption can also be determined based on extrapolations and estimates.
   - (3) – (5) Equivalent to Annex VI EED, (b) – (d).
2. Equivalent to Annex VI EED.
3. Federal Office for Energy Efficiency shall promote the availability to all final consumers cost-effective high-quality audits which are carried out by providers qualified according to §7(2).

§8b Requirements for energy auditors
1. Energy audit has to be implemented by a person qualified due to vocational qualification and experience:
   - University or polytechnic, state certified technician, master craftsman's certificate (in relevant field).
   - Minimum of 3 years professional experience in energy advice to companies.
2. Energy audit has to be implemented in an independent way (independent of suppliers and manufacturers). In-house energy auditors may not be directly involved in processes to be audited, must report directly to the management of the company and may not be discriminated.

§8c Verification
1. BAFA is obliged to carry out random checks whether the obligation to carry out energy audits has been fulfilled.
2. Self-declaration of company if exempted.
3. Proof of fulfilment of obligation to be provided by energy auditor, whose qualification will be verified, unless already included in BAFA list. BAFA may request submission of energy audit report and documents.
4. Recognition of proofs from other EU/EEA states, recognition of exemptions.

§8d Statutory Ordinance
The Federal Ministry of Economy and Energy is empowered to regulate through an ordinance:
   - the requirements of the energy audit.
   - The requirements of energy auditors with regard to qualification and independence.
   - The conditions for exemptions.

§12 Penalties
Not carrying out an energy audit, not carrying out as required, incompletely or not in a timely manner constitutes an offence which can be sanctioned with a fine up to € 50,000.

The registration process is online51 and is carried out in two steps:
(a) The consultant registers at the internet portal of BAFA;
(b) following the assignment of an ID number, the consultant uploads the proofs of his qualification (diplomas) and a self-declaration regarding the required professional experience.

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50 Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA)
51 The registration form and other pertinent documents can be downloaded at http://www.bafa.de/DE/Energie/Energieeffizienz/Energieaudit/energieaudit_node.html.
Based on the Law on the Implementation of EU Directives regarding Energy Efficiency, the Secretary of State of Infrastructure and Environment has published, on 10 July 2015, the Regulation regarding the implementation of Articles 8(4), (5) and (6) and Article 14(5) and (6) of the Energy Efficiency Directive 2012/27/EU. In Article 2, the Regulation defines the minimum content of an energy audit report, in addition to the stipulations of Annex VI of the EED.

An energy audit report must include:

(a) a schematic overview of all energy flows within the enterprise, the size and distribution according to the function of those energy flows and all conversions to other energy carriers that are based on actual, measured and traceable data concerning energy consumption and electricity load profiles;

(b) a description of the most important internal and external factors that positively and negatively influence energy consumption of the enterprise;

(c) a quantified overview of the energy saving potential of the enterprise over the next four years;

(d) a description of possible cost-effective energy saving measures.

The energy audit report has to be submitted within four weeks after its completion to the competent authority, the Netherlands Enterprise Agency (RVO). On the relevant section of its website, RVO has published – among other documents – a form of the energy audit report, guidelines for the report and the checklist which will be applied by the authority to check compliance of the audit with the requirements.

2.2.6 THE NETHERLANDS — ENERGY AUDIT REPORT

Energy audits have to be carried out in an independent manner, by observing the corresponding stipulations regarding objectivity and transparency of the energy audit as defined in standard EN 16247-1. The person conducting the energy audit has to advise manufacturer- and supplier-neutral and may not receive any commissions or other payments from companies supplying products or installations. In-house experts, who carry out energy audits should not be operationally involved in areas of the enterprises which are subject to the energy audit. On the other hand, energy audits could be conducted by the company’s energy manager.

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33 Rijksdienst voor Ondernemend Nederland (RVO).
2.2.7 SWEDEN – HACKEFORS MODEL

The EED was implemented in Sweden in 2014. The Swedish Energy Agency is responsible for its implementation and follow-up. Regarding energy audits in large enterprises, an intensive work with information and engagement activities has been carried out in 2015. For the promotion of energy efficiency in SMEs, a new programme financed through the European Regional Development Fund (ERDF) was launched in 2015. The programme supports energy audits, network activities and capacity building.

An example for a successful network activity is the so-called “Hackefors model”, which is implemented in Sweden since 1997 on a commercial basis by the private company Altea AB. The model was first applied in the Hackefors industrial district close to the city of Linköping, involving 26 SMEs. There are currently about 40 different networks, with approximately 600 participating firms. The Hackefors Model, which is a trademarked tool for management systems, aims at providing compliance assistance and improving environmental performance of SMEs, through the adoption of international standards such as ISO 14001, ISO 9001 and OHSAS 18001. Most companies require an integrated certification, adding to the environmental management system the quality management system according to ISO 9001. Although certification according to ISO 50001 is not a primary focus of the model, it should be considered as an interesting approach for energy efficiency networks.

While each enterprise which participates in the network develops its own EMS, centralised steering and handling of many of the EMS documents saves the SMEs expenses and time needed to achieve ISO 14001 certification, in particular for consultancy services and administrative work. All participating companies appoint an environmental manager; together these form the EMS group. From this group a steering committee is selected and a central co-ordinator appointed. The co-ordinator, who is assisted by a support group of individuals from the participating companies, is responsible for the network and the common parts of the system, including common documentation. The co-ordinator acts as a hired and shared environmental manager of the group. A motivated and well-trained co-ordinator appears essential for the success of the approach.

The initiative provides support to participating SMEs throughout all the stages of ISO 14001 until certification. The approach involves monthly meetings with homework, training for environmental managers and employees as well as dedicated enterprise visits. The model facilitates both implementation and maintenance of an EMS and provides training to the involved enterprises. The yearly service includes four internal meetings with the coordinator, two internal audits, additional training, legal updates on the website and, optionally, legal compliance checks. Fees for participation in the network depend on the size of the company and the scope of the certification.

Using The Hackefors Model, Altea AB has established more than 1,900 certificates in accordance with international standards. As legal compliance is one of the main requirements of ISO 14001, companies obtaining this certification are guaranteed to be in formal compliance with the applicable environmental regulation. Every company holds a register of environmental legal requirements affecting their activities. In addition, companies adopting the Hackefors model together sign up to a service which provides a database of latest issues of environmental legislation on Altea ABs website. Companies can check for any new regulations, ask for information and, by paying an additional fee, can have their compliance checked by Altea. The central co-ordinator is responsible for the identification of legislation common to many of the companies within the group, while environmental co-ordinators are responsible for individually applicable requirements.

So far, the target audience are mainly clusters of SMEs in some 40 locations in Sweden, including a few branches of Swedish companies in other EU Member states. Denmark, Finland, Germany, Greece and Poland have shown interest in the model.

Potential weaknesses are:
(a) the dependence on the central organisation/coordination, which may result in decreased flexibility of the individual company EMS. The central coordinator is a crucial figure, who must be a good communicator, a capable leader and should have a good understanding of the entire district.

(b) the standardised EMS process could result in too much administrative burden for the smallest firms taking part in the networks. It is also not always easy for some companies to maintain network links after certification is achieved.

Main strengths of the Hackefors model are:
(a) its network approach, which involves a variety of firms from different industrial sectors;
(b) the fact that the network approach makes ISO 14001 more affordable for SMEs, requiring less human and financial resources and leading to significant cost savings, compared to individual certification. It provides an experienced coordinator, offering support throughout the process;
(c) it is delivered through a network of environmental representatives from each company, and coordinated centrally;
(d) it encourages relationships between companies, which may then cooperate in other network activities (such as training, sharing of collective services, waste management and recycling, coordinated transportation, district heating, efficient use of energy, electricity purchase, etc.).
2.3 Examples from Energy Community Contracting Parties

Annex 1 provides an overview of relevant secondary legislation on energy audits, energy management and related topics in Energy Community Contracting Parties. As can be seen from the annex, several countries have implemented secondary legal acts on subjects like: energy audit methodology and reporting; training and examination, certification, authorisation and code of conduct of energy auditors; information systems for monitoring and management of energy consumption.

Although there are differences in scope and level of detail between regulations on the same subject in different countries, it is worthwhile to analyse them with regard to their applicability in Ukraine.

Relevant topics addressed in some of these regulations include:

(a) the establishment of certifying commissions for energy auditors,
(b) requirements and procedures for the qualification and certification of energy auditors,
(c) requirements and procedures for training and examination of energy auditors,
(d) requirements and procedures for the authorisation of training organisations,
(e) guidelines for databases and registers of energy audits and energy auditors.

Regarding energy audit methodology (which is typically included in "rulebooks") there appears to be in some countries a tendency to over-define the scope and elements of the audit, which should be avoided.

2.4 Comparison and conclusions

Although the examples presented in the previous sub-section cannot claim to be exhaustive or complete, a few conclusions can be drawn:

As the examples of several countries show, EU member states have enacted regulations which define requirements for energy audits, energy auditors and their training;

(a) in general, the State agencies in charge of the transposition of the EED have implemented internet portals which are dedicated to energy audits according to Article 8 EED, providing access to pertinent documents, lists of registered energy auditors and – e.g. in the case of ADEME (France) – providing a platform for communication between the enterprise, the energy auditor and the agency;

(b) on the internet portal, guidelines for energy audits are provided. The portals of ADEME and RVO (the Netherlands) also provide specifications of energy audits and a form for energy audit reports, respectively. The legislation of the countries looked at requiring that the energy audits are carried out in accordance with Annex VI of the EED and the European standard series EN 16247;

(c) at least the portals of ADEME and BAFA (Germany) provide the possibility to upload energy audit reports and – at least in the case of ADEME – of a summary sheet of the report;

(d) national agencies are obliged to carry out monitoring tasks and random checks of energy audits, although the volume and degree of detail of these checks may vary according to each national scheme;

(e) there are different approaches regarding the qualification of energy auditors. While Germany requires proofs of qualifications provided by the expert (diplomas and a proof of relevant professional experience which may be provided by self-declaration), France requires a formal certification by accredited qualification bodies, and Ireland requires energy auditors to possess a certificate of a recognised institute or association and to attend periodic training courses. In the Netherlands, energy auditors are not required to register, nor are there any formal requirements regarding their qualification.

(f) Other Energy Community Contracting Parties, like Kosovo, FYR of Macedonia, Moldova, Montenegro and Serbia have already implemented secondary legislation on energy audits and related matters, which provide another relevant reference for the implementation of Article 8 EED in Ukraine.
3. Implementation of Article 8 EED in Ukraine

3.1 Existing standards and activities regarding energy audits in Ukraine

Annex 2 includes a list of existing Ukrainian standards regarding energy audits and energy management systems. As can be seen from the Annex, the international standards of the ISO 50000 series, including ISO 50002 “Energy audits – Requirements with guidance for use”, have been homologated as national DSTU standards. In addition, a series of older DSTU standards regarding energy saving, energy audits, and energy management systems is apparently still effective.

On the other hand, the European standards series EN 16247, which is referenced in the EED and the basis of the energy audit methodologies mandated in the several EU Member States, is apparently not yet homologated as Ukrainian national standards. Taking into consideration that the EN 16247 series provides more specific guidelines for energy audits in buildings, processes and transport, as well as regarding the competence of energy auditors, it is to be discussed if all five standards of this series should be homologated and used as the basis for the energy audit criteria and guidelines. As mentioned above, ISO 50002 is already homologated and since the ISO and EN 16247-1 are almost identical, Ukraine needs to choose if the homologated DSTU (general requirements) are sufficient or if they want to expand on the EN 16247.

3.2 Existing training programmes for energy auditors in Ukraine

Several higher education and private institutes offer master courses or short-term training courses for energy auditors and energy managers, e.g. the Institute of Energy Saving and Management of the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute” and its Training Centre for Energy Managers, similar courses are also offered by other universities, chambers of commerce, NGOs and private institutes. It should be mentioned that only a few educational institutes offer courses for energy audits in industry and in transport, in addition to courses for energy audits in buildings.

Short-term training courses have typically a duration of one or two weeks. It is estimated that there are currently approximately 20 – 30 qualified teachers / trainers for energy audits and management in Ukraine and more than app. 500 students who have completed the courses.

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57 For a complete list, see the report “Review of international standards of ISO 50000 Energy Saving series implemented in Ukraine” by IC Consulenten LLC (prepared for GIZ, 2017).
58 It should be mentioned, that the EN 16247 series was developed according to a mandate of the European Commission to the European Standardisation Organisations, in order to facilitate the application of Energy Services Directive 2006/32/EC (which was the predecessor of repealed by Directive 2012/27/EU).
59 These include the Dnipropetrovsk Chamber of Commerce and the National Metallurgical Academy of Ukraine, the Institute of Innovative Education of the Kyiv National University of Construction and Architecture, the Educational and Scientific Institute of Continuing Education of the National Aviation University, the Educational-Scientific Centre of Post-graduate and Distance Study of the Kremenchuk Mykhaylo Ostrohradsky National University, and the Interindustry Institute of Postgraduate Education of the National Technical University “Kharkiv Polytechnic Institute”.
60 See Annex 3. The numbers mentioned are estimates, as no relevant statistics are available.
3.3 Main elements of a National Energy Audit Scheme

The National Energy Audit Scheme should be based on the following pillars (see figure 1):

(a) criteria and guidelines for energy audits;
(b) a qualification scheme for energy auditors;
(c) the promotion of energy audits and support schemes;
(d) monitoring and quality assurance of energy audits.

**Figure 1** Proposed National Energy Audit Scheme

In the following sub-sections, the main issues regarding these four pillars will be discussed.
### 3.3.1 CRITERIA AND GUIDELINES FOR ENERGY AUDITS

Regarding the criteria for energy audits, it follows from Article 8 of the EED and from the practice of implementation in EU Member States that these criteria should be based on both Annex VI of the EED and on the relevant international and European standards, in particular, the EN 16247 series is mentioned.

While the same basic guidelines should be established both for mandatory and voluntary audits, detailed requirements may be more stringent for mandatory audits.

As mentioned, the standards of the EN 16247 series can provide a main point of reference.

The series consists of the following parts:

(a) EN 16247-1: Energy audits — Part 1: General requirements;
(b) EN 16247-2: Energy audits — Part 2: Buildings;
(c) EN 16247-3: Energy audits — Part 3: Processes;
(d) EN 16247-4: Energy audits — Part 4: Transport;
(e) EN 16247-5: Energy audits — Part 5: Competence of energy auditors.

While part 5 of the standards is of particular relevance for the qualification of energy auditors, the parts 1–4 define the method of carrying out energy audits, including the general requirements for energy audits (part 1) and the specific requirements for energy audits in buildings, processes and transport (parts 2–4).

The major implications of parts 1–4 of EN 16247 for the development of criteria for energy audits in Ukraine are briefly commented as follows:

**General requirements of an energy audit:**

(a) Quality criteria should be defined both for the energy auditor and for the energy audit process. The energy auditor should be competent, treat all information confidentially, and act in an objective and transparent manner. For the energy audit process, criteria such as completeness, representativeness, traceability and verifiability apply;

(b) The guidelines should define the elements of the energy audit process, such as the preliminary contact with the organisation to be audited; the start-up meeting; the method of data collection; field work, including site visits; the method of analysis of the energy performance situation of the audited organisation and its facilities; the content structure of the energy audit report, including quality requirements, and the final meeting.

**Requirements of energy audits in buildings.**

The guidelines for energy audits in buildings should elaborate in more detail the elements of the energy audit as defined in the general requirements, with a specific focus on buildings and their technical systems:

(a) In the framework of the start-up meeting, the auditor should obtain from the organisation building-specific indicators, which are relevant to the building's energy consumption.

(b) Data collected should include data related to the building's energy supply and consumption (to the extent possible metered data), as well as parameters which affect the energy consumption (like climatic conditions) and information regarding the design, physical condition, operation and maintenance of the building, including technical building systems and receptacle loads. Based on the data collected, the auditor should carry out a preliminary data analysis and develop a preliminary list of opportunities for energy efficiency improvements. The data analysis should be complemented by inspections and technical evaluations on site.

(c) The analysis of energy saving potentials should include evaluations of the energy performance of the building envelope and of technical building systems, including their interaction (based on the European standard EN 15605:2008), as well as the impact of internal and external parameters, like rates of occupation and seasonal fluctuation of climatic conditions. Breakdowns of energy carriers, end-uses, and on-site energy production serve to establish energy balances and to identify energy saving potentials and energy efficiency improvement opportunities.

**Requirements for energy audits in the industry (processes).**

The guidelines for energy audits in processes should elaborate in more detail the elements of the energy audit as defined in the general requirements, with a specific focus on industrial and utility processes:

(a) In the framework of the preliminary contact and start-up meeting, processes and utilities to be included in the energy audit should be agreed upon, in the case that buildings and transport, i.e. energy uses not directly related to processes are part of the audit.

(b) Data and information collected should include information on the site, utility and production processes and energy sources. This includes general information on products and production, energy management, detailed descriptions of production processes and technologies, utilities as steam and hot water (production, distribution and recovery), waste heat recovery, metering and control, on site production of thermal and electric energy, energy consuming equipment (like motors, pumps, fans, chillers, compressors, HVAC, lighting, etc.). Based on the data collected, the auditor should carry out a preliminary data analysis and develop a preliminary list of opportunities for energy efficiency improvements. If necessary, the energy auditor shall carry out additional measurements and on-site investigations.

61 Useful guidelines for defining the degree of thoroughness of energy audits can be found in Annex C of EN 16247-2 (“light touch” vs. “detailed”) and e.g. in the US standard ANSI/ASHRAE/IES 100-2015 Energy Efficiency in Existing Buildings, which defines three levels of detail of energy audits.

62 See section 5.3.2 of this report. EN 16247-2, 3 and 4 refer to EN 16247-5 with regard to the required competency of the energy auditor.

63 The EN 16247 standards series “Energy Audits” is protected by copyright, i.e. that also partial reproduction of its content is not allowed. The table of content of the standards can be seen in online pre-purchase previews of the standards, e.g.: https://www.nen.nl/pdfpreview/preview_173995.pdf, https://www.nen.nl/pdfpreview/preview_196011.pdf, https://www.nen.nl/pdfpreview/preview_196012.pdf

64 EN 16247-2 provides methodological guidelines and checklists for energy audits in buildings.

65 It should be mentioned, that – in addition to LCCA and SPP - also various dynamic methods of economic analysis are available, like Discounted Payback Period (DPP), Net Present Value (NPV) and Internal Rate of Return (IRR) – see also Section 2.1.1.

66 EN 16247-3 defines “utility” as “energy carrier necessary for the process and auxiliary” and “utility process” as “set of utility equipment and distribution.”
Implementation of Article 8 of EED in Ukraine

The analysis of energy saving potentials should include evaluations of the actual energy performance of processes and benchmark it with best practices and best available technologies. Based on the analysis, energy performance indicators should be established, as well as energy balances, which should be based on breakdowns of energy consumption by sources and processes.

Energy efficiency improvement opportunities should be identified and classified according to housekeeping measures, retrofitting and replacement of equipment and processes (including utilities and end-use equipment). Examples include the reduction or recovery of energy losses, optimisation of processes, improved maintenance, behavioural change programmes, energy management, etc.

An energy audit report for processes should include a description of the proposed energy efficiency improvement opportunities, their energy saving potentials, and economic feasibility, which should be preferably determined as LCC.

An energy audit report for transport should include recommendations for energy efficiency improvement opportunities, taking into consideration aspects such as: planning, routes and timetables; optimal configuration of vehicle fleet, improvements on maintenance, criteria and specifications for fleet renewal and purchases; as well as training programmes for vehicle operators and criteria for personnel recruitment. The report should include a description of the proposed energy efficiency improvement opportunities, their energy saving potentials, and economic feasibility, which should be preferably determined as LCC.

As mentioned above, minimum criteria and guidelines for energy audits should be in line with Annex VI of the Directive. Furthermore, it is recommended to take advantage of the fact, that EU member states – as well as Energy Community Contracting Parties – have defined such criteria and guidelines in their primary and secondary legislation. In addition to the transposition of these requirements in their respective legislation, several EU member states provide supporting documents to enterprises and energy auditors on dedicated websites, e.g. guidebooks for energy audits, instructions and/or forms for energy audit reports, forms for summary sheets of the energy audit report and in at least one case also a checklist to verify the integrity and completeness for the energy audit report.

Footnotes:
67 See the statement regarding the economic feasibility energy efficiency measures in buildings and the respective footnote.
68 EN 16247-4 defines “transport” as “activity that implies the movement of people or goods from one place to another”, and a “transport service” as “a service provided to a beneficiary for the transport of goods or of a person from a departure point to a destination point”. In addition to common aspects, the standard includes specific guidelines for road transport, rail transport, aviation and marine transport.
69 See the statement regarding the economic feasibility energy efficiency measures in buildings and the respective footnote.
For Ukraine a similar structure can be put in place:

(a) minimum criteria for energy audits based on Annex VI EED, which will be part of secondary legislation (regulation by the Cabinet of Ministers of Ukraine – CMU);

(b) support documents for enterprises and energy auditors which can be downloaded from a website, which can also be used for uploading energy audit reports and summary sheets/data and serves as a communication platform (like the example from ADEME, France presented in section 4.2.1);

(c) the criteria and guidelines for energy audits in buildings, processes and transport should be formalised in the framework of a regulation by the CMU;

(d) in addition to ISO 50002, it should be revised if it is necessary for the EN 16247 series to be homologated as Ukrainian DSTU standards, in order to achieve full compliance with European standards for energy audits;

(e) a standard form for energy audits should be developed and its use should be mandatory.

(f) it should be mandatory to provide a summary sheet of the audit results, according to a mandatory form;

(g) a guidebook on energy audits will be useful, but should be elaborated at a later stage;

(h) it should be examined whether the database for energy audits (and summary sheets) could be linked to the database for energy information on public buildings;

(i) figure 2 illustrates the proposed scheme.

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70 According the Ukrainian law there may be some restrictions regarding the establishment of databases different from the database of the Verkhovna Rada. The legal situation therefore needs to be assessed before designing the database(s), also with regard to the procedures to access the database by different parties. It may be necessary to establish links between a portal and official Government data bases.

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Figure 2  Proposed Criteria and Guidelines for Energy Audits

![Figure 2 Diagram]

Source: own elaboration
### 3.3.2 Qualification and Certification Scheme for Energy Auditors

#### Basic Principles, Stakeholder Consultations and Previous Reports

Regarding the qualification scheme for energy auditors, Article 14 of the Draft EE Law already defines its general guidelines, which imply that attestation commissions will assess the qualification of candidate energy auditors. Taking into consideration that attestations have to be done in a transparent and non-discriminatory way, it is highly important to define objective qualification criteria. These should take into consideration both vocational and professional qualification. Furthermore, diplomas of recognised training courses by higher education or private training institutes should be comparable and reflect an adequate level of knowledge and skills of the candidate. This also implies that the accreditation procedure for energy auditors should be distinct from the procedure for attestation for experts for building certification according to the Law on Energy Performance of Buildings.

The possibility of introducing the requirement for training institutes to be accredited as certification bodies in accordance with ISO 17024 (“Conformity assessment -- General requirements for bodies operating certification of persons”) needs to be reflected. This would mean to consider the qualification of energy auditors as formal certification processes. It was also proposed to introduce in Ukraine the certification of energy auditors by international organisations, like UNIDO, EUREM, AEE, etc.

While a certain plurality of formal requirements will facilitate the training of a sufficient number of energy auditors, it is important to define comparable, transparent and non-discriminatory criteria for training curricula, examinations and certification, which will be binding for all institutes or associations offering training, and for recognised certification bodies. Also, caution should be taken not to overburden the qualification and certification process with too many formal requirements, while not compromising a sufficient level of quality.

The list of registered energy auditors should be publicly accessible on the central authorities’ internet platform. In the register, the specific qualification of each energy auditor (buildings, processes, transport) should be indicated. Taking into consideration the difference in the level of qualification, this register should be kept separate from a register of experts qualified to carry out energy certifications of buildings and inspections of heating and air conditioning systems according to the Law on Energy Performance of Buildings. While the databases of energy auditors and of energy audits should be hosted on the same platform, energy audit reports can be made publicly available in an aggregated form or via key notes.

As has been shown in section 4, EU Member States apply different schemes in order to comply with the requirements laid down in Articles 8(3), 8(3), 16 and 17 of the EED. In particular, there is a rather wide range of interpretation of the optional requirement to make available “certification and/or accreditation schemes and/or equivalent qualification schemes” by Member States.

### Key Comments Regarding the Accreditation and Certification Scheme Should Be Considered:

#### Training of Energy Auditors

Training of energy auditors has as objective to qualify professionals as energy auditors, by developing their knowledge of relevant subjects related to energy audits. Although the qualification which is achieved by training should be among the entry conditions for the certification of energy auditors, it is a separate activity, which should not be carried out by a certification body, unless there is a strict separation between the training and certification functions of organisations which provide both types of services.

As has been mentioned in section 5.2 of this report, there are different kinds of education and training institutes which offer training programmes in energy audits and energy management: higher education institutes (universities and polytechnic institutes of level 5 and 4) offer both regular academic courses in energy efficiency and energy management – on bachelor and master level – and short-term training courses on energy audits and management, with a typical duration of 1–2 weeks. Short-term training courses are also offered by non-academic organisations, like NGOs, industry organisations and chambers of commerce.

It is highly recommended that in both cases (regular academic and short-term courses), minimum criteria for the course curricula should be developed and approved by the Ministry of Education, who should also supervise whether the courses are implemented in accordance to these guidelines.

Qualification as energy auditor will be stated by the respective academic degree or course diploma, following an examination by the education of training institute.

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72 According to stakeholders, the "accreditation" of educational programmes by the Ministry of Education should be better characterised as “licensing”.

73 According to stakeholders, Ukrainian legislation requires self-regulatory organisations to have at least 200 members. See also the presentation by O. Ovdiienko: Що таке саморегулювальна організація у сфері енергоефективності (What is a self-regulatory organization in the field of energy efficiency) of 23-24 January 2018.

74 According to stakeholders, the “accreditation” of educational programmes by the Ministry of Education should be better characterised as “licensing”.

75 The approval of the course curricula and supervision by the Ministry of Education are considered essential, in order to avoid that low-quality courses will be offered by education institutes and other market players.
I. Certification of Energy Auditors

- NAAU
  - Accreditation ISO 17024
- Central executive body
  - Auto-declaration of conformity with ISO 17024
- Self-regulatory organisation
- Higher education institute
  - Certification by certification commissions
  - Certification as energy auditor (certificate)
- Certified energy auditor

II. Training of Energy Auditors

- Higher education institutes
  - universities, polytechnic institutes – level 3 and 4
  - Course curricula should be approved by Ministry of Education
  - Regular academic courses bachelor/master level
  - Examination degree/diploma
  - Attestation of conformity with ISO 17024
- Training institutes
  - NGOs, industry associations, chambers of commerce, etc.
  - Short-term courses

- Training institutes
  - Examination by higher education/training institute
- Qualification as energy auditor
Certification of energy auditors

While training is an essential element for the qualification of energy auditors, the certification of energy auditors should also establish the competence of auditors. In order to apply transparent and objective criteria for the certification of energy auditors, it is recommended to be in line with ISO 16247 or base the certification on standard EN 16247. The standard defines personal attributes (including professional skills), knowledge and skills (general and specific), as well as requirements regarding the acquisition, maintenance and improvement of competence. These include the specific requirement that the energy auditor shall demonstrate suitable education, work experience, and training to allow him or her to carry out an energy audit.

Usually, certification bodies are accredited by accreditation bodies for a certain scope of certification. This means in the case of certification of energy auditors, that the certification body has to be accredited for certification of persons (according to ISO/IEC 17024) and – more specifically – should be accredited for certification of energy auditors, that the certification body has to establish the competence of energy auditors.

While accreditation by the national accreditation authority NAAU – or an accreditation authority of another country which is part of the Multilateral Accreditation Forum (IAF) of the International Accreditation Forum (IAF) – would be the usual, internationally recognised accreditation scheme, it is understood that in Ukraine also a less stringent scheme is under consideration, which would include the auto-declaration of conformity with ISO 17024 of an organisation which is interested in certifying energy auditors, and its recognition by the authority, in accordance with criteria established by a resolution of the CMU. While internationally operating certification bodies are likely accredited by a national accreditation body which is part of the MLA of IAF, formal accreditation by NAAU of national self-regulatory organisations and higher education institute may imply a certain burden for these organisations.

In accordance with Article 14 of the Draft EE Law, the attestation committee of each organisation decides on the award of the certificate to the candidate.

Energy auditors shall maintain and improve their competence by updating and improving the necessary technical knowledge and skills from professional training, conferences, seminars, energy auditing practice, etc. In order to make sure that their knowledge and competence remain up-to-date, energy auditors should undergo a re-certification at regular intervals, e.g. every three years.

3.3.3 PROMOTION OF ENERGY AUDITS AND SUPPORT SCHEMES

In the area of promoting energy audits and support schemes, key observations drawn from thematic workshops and the comprehensive analysis on the transposition of Article 8 of the EED into the national legislative framework of EU member states indicate, that much of the prioritising policies defined in projects and studies implemented in the past, for e.g. by the International Energy Agency in 2012 have already been considered by the main stakeholders involved in the present development process. Essentially, in order to develop a robust and effective system for promoting energy audits and support schemes, the focus should be put on cost-effectiveness in terms of added value, whereby a reliable assessment of energy (and cost) savings is derived from potential investment in energy efficiency, enabling a higher-level engagement of (private) financial resources. The promotion of energy audits and support schemes is closely intertwined with the quality and reliability of acquired energy consumption data assured through the qualification, training and certification schemes as well as clearly defined criteria for carrying out energy audits as stipulated within the other three pillars of the National Energy Audit Scheme. The promotion of carrying out energy audits as principally defined by Article 8 to a notable extent included in the proposed draft of the draft law on Energy Efficiency prepared by the State Agency on Energy Efficiency and Energy Saving of Ukraine. This sections will provide a concise overview of the provisions from Article 8, comprehensively defined within the Guidance note on Directive 2012/27/EU (in relation to the proposed content of the draft legislation on Energy Efficiency) which outlines 6 main general obligations, of which the most relevant are the:

(a) promotion of the availability of high quality and cost-effective energy audits to all final customers, [...];
(b) guarantee of mandatory and regular audits for large enterprises fulfilling minimum criteria;
(c) make certain of transparent and non-discriminatory minimum criteria for energy audits (define criteria), based on Annex VI of the Directive;
(d) development of programmes to encourage small and medium enterprises (SMEs) to undergo energy audits and to implement the recommendations from these audits and
(e) the development of programmes to raise awareness among households about the benefits of energy audits.

Specifically, the Guidance note elaborates the main aspects of promoting energy audits and support schemes in sections C. Obligation to promote the general availability of energy audits, D. Specific obligation for large enterprises to carry out regular energy audits, H. Obligations to develop programmes to encourage SMEs to undergo energy audits and to raise awareness among households and finally section H. National support schemes.
Obligation to promote the general availability of energy audits

Member states are obligated to promote the availability and accessibility of high quality and cost-effective energy audits adhering to defined criteria to all final customers, whereby ‘final customer’ is defined as any natural or legal person who purchases energy for own end use (Article 2(231)). Besides establishing a system for qualification, training and certification as well as quality assurance, as defined in pillars of the National Energy Audit scheme (i), (ii) and (iv), this implies several considerations, for e.g. that the network of experts and independent qualification and monitoring bodies has to have sufficient capacity to carry out the large number of energy audits in the preliminary stage of implementation and that the tariffs for carrying out energy audits must take into account cost-benefit factors, meaning that the overall price for implementing energy modelling activities should be well below the projected cost savings resulted from investment into energy efficiency (particularly problematic in buildings with high overall energy efficiency). Both points further indicate that to successfully carry out the large scope of work (especially in the preliminary stages), for a reasonable price which the citizens and the economy can easily bare and support from a political perspective (whereby the ratio between energy costs and purchasing power of the citizens/economy is a key determinate) special focus should be put on establishing EMIS (Energy Management Information Systems) from the onset in order to simplify the process and gather the means for a continuous gathering of energy data.

Specific obligation for large enterprises to carry out regular energy audits

Section 7 of Article 10 of the SAEES draft proposal of the law on Energy Efficiency adequately promotes this position by exempting large business entities from mandatory energy audits in the case of introducing energy and/or environmental management systems in accordance with European and international standards. In addition, the implementation of all stages of energy efficiency investment, starting with energy modelling and project development, should be built around exiting donor funding programmes and credit facilities (such as the Ukraine Energy Efficiency Programme (UKEEP) developed by the European Bank for Reconstruction and Development, which targets Ukrainian private companies in all sectors looking to invest in energy efficiency or renewable energy projects). Additionally, simply supporting investment into energy monitoring systems through an increased tax deduction/credit allowance, as would be the case for any other type of investment into the enterprise operation should be considered, communicated and promoted. With reference to point b) of the Guidance note on EED implementation, the threshold that separates large enterprises to SMEs, in terms of obligations and responsibilities of conducting energy audits, is set to 1000 tons of standard fuel (1 ktoe ≈11.65 GWh) as defined in section 7 of Article 8 of the draft law on Energy Efficiency.

Obligations to develop programmes to encourage SMEs to undergo energy audits and to raise awareness among households

SMES and households are particular in the context of the availability of funds/energy/time each category is able/willing to invest in carrying out energy audits. For companies which are not large business entities and fall below the 1ktoe threshold, there is no mandatory provision for carrying out energy audits. For SMES whereby the categorization identifies micro, small and medium-sized enterprises, as those 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 45 million, carrying out energy audits should be promoted and supported from the point of view of providing investment value, in the sense that energy modelling should serve as a de-risking tool for energy efficiency project financing.

In this respect, the development of support programmes should focus on the establishment of a favourable framework aimed to provide SMES with:

(a) technical and project development assistance;
(b) targeted information campaigns and platforms;
(c) exchange of best practices and knowledge transfer.

The main goals of these programmes would be to attract SMES by providing added value which could support their core business, thus an outset of a programme that would increase the chances of a predictable and favourable outcome, should be in a large part carried out by a third party (either from the local authority, NGO or private contractor). The acquisition of basic energy performance indicators and categorizing the potential for energy savings/cost reduction would be essential. The participation by interested companies (non-managerial) could be carried out for e.g. by designing and distributing a simple preliminary questionnaire/checklist which would invite the owner to share some basic information relative to energy use with the company (used energy according to invoices, estimated heated/conditioned surface of building, year of production/installation of energy supply, productions and distribution systems, etc.) which would serve as a simplified categorization of energy saving potential. The companies for which the investment projects should demonstrate highest technical, economic and environmental feasibility would be offered a subsidised energy audit, on the basis of which an investment project could be developed, either through own funds or an ESCO.

The promotion of energy efficiency and raising awareness amongst households should be provided on several levels, as is adequately described in Article 15: Promoting and encouraging the energy efficiency level increase among consumers of the draft law on Energy Efficiency. Primarily, the communication on relevant energy efficiency support and awareness raising activities should be carried out extensively and continually through all forms of public media (TV, magazines, social media, public consultations, etc.). In addition, the legislation on energy efficiency should emphasize the role of energy suppliers in the area of notifying energy consumers about their energy use. Furthermore, the suppliers of energy saving, renewable energy or other relevant products or services should be actively supported to promote the co-financing to their clients through their own channels and also frequently offer consultation and assistance with the application procedure to their clients. Lastly, direct support for potential investors (applicants) should be made available through establishing free-of-charge energy efficiency counselling for residents, which should be managed by the municipality.

National support schemes

In terms of national support schemes, the priority should be put on developing a national fund to provide incentives for energy efficiency investment, which would ideally address the broader context of energy supply and environmental protection, thus also covering the areas associated to renewable energy, sustainable mobility as well as some additional incentives in the field of fresh water conservation and even waste management, either through non-refundable incentives (grants) or affordable loans.

The investment eligibility should cover various measures in the areas of energy efficiency, renewable energy, water resource protection, sustainable waste management and sustainable mobility. The public fund should operate a transparent web-platform where all information about available tenders along with necessary tender documentation would be made available. The establishment of a fund for supporting investment into energy efficiency is briefly presented in Article 6 of the draft law proposal.
3.3.4 MONITORING AND QUALITY ASSURANCE OF ENERGY AUDITS

A successful implementation of energy audits depends highly on a functioning monitoring and quality assurance of the audits. One proposal to ensure the quality is the “System of Energy Audit Quality Management” that includes various stages and organisational levels.

The stages include:

1. Before performing energy audits.
2. Conclusion of the contract.
3. Performance of work.
4. Implementation of recommendations.
5. Monitoring of the actual quality of the energy audit.

Key actions related to the quality management system proposed include:

(a) the verification of conformity of registered energy auditors with the qualification criteria established;
(b) the verification of the compliance of the energy audit with the minimum criteria and guidelines defined;
(c) the verification of the correctness of key parameters and indicators used in the energy audit, including the plausibility of energy savings identified and the appropriateness of the energy efficiency measures proposed.

This means that the following elements should be in place, in order to verify compliance and quality and to monitor the results of mandatory and voluntary energy audits:

(a) a register of energy auditors;
(b) a database which includes energy audit reports, summary reports and/or key parameters and indicators of the audits;
(c) procedures and algorithms for monitoring the quality and results of energy audits.

See Ovdiienko ea (2018), Section 4.5 System of Energy Audit Quality Management.
In order to enable such a system of monitoring and quality assurance, the elements proposed in sections 5.3.1 and 5.3.2 of this report should be in place, viz. 82:

(a) criteria and guidelines for energy audits in buildings, processes and transport;
(b) guidebooks to assist energy auditors and companies in carrying out the audits;
(c) instructions and/or forms for energy audit reports and summary reports;
(d) checklists to verify the completeness and integrity of the reports;
(e) a dedicated website to provide information and facilitate communication and exchange of information between energy auditors, companies and the authority;
(f) qualification criteria for energy auditors;
(g) criteria for the examination of energy auditors;
(h) procedures to be followed by attestation commissions;
(i) criteria for the recognition of entities providing training for energy auditors for buildings, processes and/or transport (accreditation or self-declaration of conformity with ISO 17024);
(j) minimum criteria for training courses.

Formal procedures for monitoring the compliance with the mandatory energy audit obligations are provided hereafter. These include the establishment of an annual monitoring schedule, the establishment of a working group to carry out monitoring assignments issued by the central authority, written requests for the submission of documents (signed and on paper), issue of a monitoring act, rights and obligations of the working group and of the organisation monitored, etc83.

While this kind of formalities may be required, the proposals made in this Whitebook focus on a web-based system for monitoring and quality assurance of energy audits, which would facilitate the work of the authority, while safeguarding the integrity of the verification of audit reports. Taking into consideration that approximately 400 companies in Ukraine will be subject of mandatory energy audits, the monitoring and quality assurance system should be conceived in a way to allow for the processing of several hundred energy audit reports per year84.

The proposed system includes the following elements (see figure 4):

(a) an electronic register of certified energy auditors;
(b) an electronic database which includes completed forms of summary reports of the energy audits submitted, as well as uploads of the complete energy audit reports;
(c) procedures and algorithms which allow the authority to verify the quality of the audit report and summary and to monitor the energy savings and related environmental gains identified in the audits.

82 See also section 5.4 Outlook and next steps.
84 See section 3. In addition to mandatory audits, which have to be carried out and submitted by non-SMEs every four years, also the results of voluntary audits carried out by SMEs should be subject of monitoring and quality control.
Register of energy auditors

Energy auditors who have received a certificate from an attestation commission, may register in an electronic database provided by the authority. In addition to data which allow their identification, as well as the numbers and/or copies of their certificates, the database should indicate the field of qualification of the energy auditor: energy audits in buildings, processes and/or transport. The database could be merged with a corresponding database for experts which are qualified to certify the energy performance of buildings.

Energy audit data base

Companies who are mandated to carry out an energy audit shall be obliged to submit the report and its key parameters and findings to a dedicated electronic database. In order to safeguard confidentiality, the company, the energy auditor contracted by the company and the authority will receive a unique electronic key to upload and access this information. In principle, the same database could be used to receive voluntary energy audits carried out by SMEs.

In addition to the complete energy audit report, which should be uploaded, the company submitting the report will be required to provide a summary of the energy audit report by completing an online form. The summary should include brief narratives and key parameters and data, like key operational data on the building, process or transport service; total and specific energy consumptions; parameters affecting the energy consumption; energy efficiency measures identified, as well as potential energy savings and related environmental benefits identified.

The database should be used as a communication platform between companies, energy auditors and the authorities, in order to address information needs and any issues which may arise before or after the submission of the energy audit report and the summary.

Verification of energy audit reports

The verification of energy audit reports should include two main spheres: (i) verification of formal requirements, like the identification of the company, the observance of the criteria and guidelines for realising the audit and for the submission of reports, and (ii) plausibility checks of the key parameters and data provided in the summary report.

The key parameters and data provided in the summary report of each energy audit should allow for easy verifications and cross checks, which could be realised either by algorithms or by experts of the authority. Examples are: benchmarking specific energy consumptions of buildings, processes and transport services with reference values; benchmarking energy saving potentials of energy efficiency measures identified with international best practice; checking the economic parameters of the energy efficiency measures identified by assessing the correctness of the indicators calculated (SPP, DPP, NPV, IRR, LCC, etc.).

Following the verification of both formal requirements and of key parameters and data, the authority will either accept the energy audit report, or – in the case of non-compliance with criteria or inconsistencies detected – proceed with a detailed review of the full report submitted, which could lead to the request to the company to either improve the audit report or its rejection.

Monitoring of energy audit results

Key parameters and data of all individual energy audit reports received and accepted by the authority should be used to monitor the results achieved, in terms of number of audits realised, the total energy consumption covered by the audits, the type of energy saving measures proposed and the energy saving potentials and related environmental benefits identified. While the data of individual energy audits should be treated as confidential, aggregate data should be published and communicated to the public and the relevant national and international governmental and non-governmental organisations.

In addition to continuously monitoring the results, these data will also provide the basis for periodic evaluations of the implementation of Article 8 EED (Article 14 of the draft Energy Efficiency Law) in Ukraine.

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85 It is important to clearly distinguish in the database between qualifications to carry out energy audits according to Article 8 and energy performance assessments and inspections according to Article 5 EED (for the reasons mentioned in sections 2.2. and 5.3.5 of this report).
86 See the example of the communication platforms for mandatory and voluntary energy audits in France (section 4.2.1 of this report).
87 It should be noted that Article 8 EED and Article 14 of the draft Energy Efficiency Law of Ukraine do not require the implementation of the energy efficiency measures identified in the energy audit. It should therefore be considered to include to the monitoring task of the authority also a follow-up with regard to the energy efficiency measures actually implemented by the companies due to the recommendations of the energy audit report.
As mentioned in section 2.2, the certification of the energy performance of buildings and the inspection of heating and air conditioning systems according to the EPBD cannot be regarded equivalent to energy audits according to the EED, unless the audits carried out fully comply with the criteria established for energy audits carried out under Article 8. On the other hand, the EC’s Guidance Note on Article 8 encourages Member States to explore synergies between the transposition and implementation of Article 8 of the EED and the implementation of the EPBD.

While a strict separation should be maintained between the criteria for energy audits and for energy auditors under both schemes, various interfaces and synergies can be perceived, e.g.:

(a) entities providing training could provide (separate) training courses for energy auditors under Article 8 and for experts certifying the energy performance of buildings and inspecting their heating and air conditioning systems.

(b) attestation commissions could provide certifications for both energy auditors and for building certification experts, according to separate procedures. Due to the higher level of requirements, certified energy auditors for buildings should also be entitled to deliver EPCs in buildings (but not vice versa).

(c) a unified database of energy auditors and for experts who are qualified to certify the energy performance of buildings and to inspect heating and air conditioning systems (with indication of the respective qualifications of the auditors/experts).

Furthermore, synergies between the administrative procedures related to the registration of energy auditors and experts, and probably to the processing of energy audit reports and building energy certificates for buildings, should be explored.
3.4 Outlook and next steps

In the previous section 5.3, a National Energy Audit Scheme was proposed, which is based on four pillars:

(a) criteria and guidelines for energy audits;
(b) a qualification scheme for energy auditors;
(c) the promotion of energy audits and support schemes;
(d) monitoring and quality assurance of energy audits.

and an outline for each pillar has been provided. In order to implement the National Energy Audit Scheme accordingly, a series of guidelines, forms and related documents need to be developed, which should be part of or at least referenced by the secondary legislation to implement Article 8 EED in Ukraine.

Criteria and guidelines for energy audits

In order to provide quality energy audits as outlined in section 5.3.1, the following documents should be prepared:

(a) guidelines for energy audits in buildings, processes and transport, which are in line with Annex VI EED. In the elaboration of these guidelines, examples of similar guidelines from EU Member states and from Energy Community Contracting Parties should be taken into consideration. The guidelines should include forms to facilitate data collection and the presentation of results.

(b) guidebooks for energy audits in buildings, processes and transport, in order to assist energy auditors and companies in carrying out energy audits. Several Member states have developed such guidebooks, which should serve as examples and inputs. Furthermore, energy audit and energy management handbooks, which serve as standard references, may be consulted.

(c) an online form for energy audit summary reports, including instructions for completing the form. Optionally, a checklist may be prepared, which will serve both the company/auditor and the authority to verify the completeness and integrity of the energy audit report.

(d) algorithms which allow the authority to verify the completeness and integrity of the energy audit summary report and to carry out plausibility checks of key audit parameters and data.

Qualification and certification of energy auditors

In order to implement the qualification and certification scheme outlined in section 5.3.2, the following documents need to be developed:

(a) qualification criteria for energy auditors in the fields of buildings, processes and transport.
(b) criteria and procedures for the examination and certification of energy auditors by attestation commissions.
(c) internal rules of attestation commissions.
(d) criteria and procedures for the recognition of entities providing training for energy auditors for buildings, processes and/or transport. According to the scheme proposed in figure 3, entities providing training should be either accredited by NAAU, or recognised by the authority following a self-declaration of conformity with ISO 17024: Conformity assessment – General requirements for bodies operating certification of persons.
(e) minimum criteria for training courses for energy auditors, which should be approved by the Ministry of Education.

Monitoring and quality assurance of energy audits

In order to allow for effective monitoring and quality assurance of energy audits, the authority should implement a dedicated website, which should include:

(a) a publicly accessible section consisting of:
- A register of certified energy auditors, including search functions;
- Information for companies and energy auditors, including supporting documents (audit guidelines, forms and checklists; guidebook).

(b) protected interactive work spaces for companies, energy auditors and the authority, which include the following functions:
- Registration of companies before starting the energy audit;
- Upload of the energy audit report and submission of the summary report in an online form;
- Facilitate communication between companies, energy auditors and the authority.

(c) algorithms which allow the authority to verify the completeness and integrity of the energy audit summary report and to carry out plausibility checks of key audit parameters and data.

(d) algorithms which allow for the monitoring of audit results and for the aggregation of data for the purpose of public communication and periodic evaluation of the implementation of mandatory and voluntary energy audits.

89 See Ovdiienko ea (2018) for some concrete proposals.
4. Methodological recommendations for encouraging SMEs to implement energy-efficient measures within the framework of the implementation of Article 8 of Directive 2012/27/EU

4.1 Implementation by the Member States of certain provisions of Article 8 of Directive 2012/27/EU on support of SME motivation

One of the key provisions of Article 8 of Directive 2012/27/EU on energy efficiency is an obligation to implement energy audits, which is considered an important tool for improving energy efficiency ranging from large enterprises to households.

For large enterprises, the only alternative of mandatory energy audit is more comprehensive control systems, in which energy audits play a central role (for example, according to ISO 50001).

Article 8, paragraph 2, of the Directive requires EU Member States to “develop programs to encourage SMEs to perform energy audits and further implement their recommendations”, “establish support schemes for SMEs to cover energy audit costs and implement highly efficient measures on the basis of economic recommendations” and “attract attention of small and medium-sized enterprises to concrete examples of how energy management systems can help their business”.

Although for large enterprises an energy management system allows continuous improvement of energy efficiency, it is still debatable for SMEs, whether a complete energy management system can be cost-effective.

Most EU Member States already have schemes for motivating SMEs to conduct energy audits and schemes to promote implementation of recommendations on the results of such audits.

Most of these initiatives are only applied at the national level, probably due to limited time and financial resources of local administrations. The initiatives to implement the recommendations are practically the same, both at the national and local levels.

Despite the fact that mandatory energy audits are foreseen only for large enterprises, some EU member states have made energy audits obligatory for SMEs, in most cases, only for those meeting certain criteria.

In particular, in Bulgaria, energy audits are also mandatory for industrial systems with annual energy consumption of more than 3,000 MW, and street lighting systems located in cities with a population of more than 20,000 people.

Also, in Sweden, after conducting a national discussion specifically on the inclusion of municipalities in fulfilling the obligations imposed on large enterprises, it was decided that the relevant legislation would also apply to organizations and companies controlled by government and municipalities that provide goods and services.

In Ireland, organizations that provide public services and meet the definition of a large enterprise or have a separate building with an area of more than 500 square meters or have energy costs in excess of 35,000 euros per year, must comply with the obligation to carry out energy audits.

In Slovakia, the obligation to carry out energy audits is imposed on all organizations applying for budget financing for energy projects.
The Energy Efficiency Directive contains several measures aimed at supporting the energy saving of SMEs. According to them, Member States are required to:

(a) develop programs to encourage SMEs to perform energy audits and further implement the recommendations of these audits;

(b) create support systems for SMEs including coverage of energy audit costs and implementation of cost-effective energy audit recommendations if SMEs enter into voluntary agreements and implement proposed measures;

(c) inform SMEs including through their respective representative organizations of concrete examples of how energy management systems can help their business;

(d) encourage conducting training programs for certification of energy auditors in order to facilitate provision of a sufficient number of experts.

All these measures are commendable, however, it is mainly uncertain as to how their design and implementation, as well as the scale of implementation. Since the nature and scope of the requirements remain nonconcrete, Member States have considerable freedom to do much less in this area and, at the same time, to formally comply with legal obligations, that is, to show that they have done something, no matter how insignificant those measures are. Verification of the measures outlined in the national energy efficiency action plans shows that many countries enjoy this freedom.

In general, few programs were specifically designed to assist SMEs in conducting energy audits, although some countries included such legal commitments on their own to their transposition laws (for example, Bulgaria and Slovakia). These countries should implement such specific SME support schemes in accordance with the law, but no definite deadlines have been set for this.

On the other hand, the state support for energy efficiency measures and even energy audits for SMEs exists, and although it has not been initiated in connection with the requirements of the Directive, it has received a new impetus from it.

Operational programs funded by European funds in Bulgaria, Slovakia, and the Czech Republic are structured in such a way as to provide grants, preferential loans or guarantees for SME energy efficiency projects.

The Bulgarian Energy Efficiency and Renewable Energy Fund proved to be a successful mechanism for financing energy efficiency projects at enterprises and in municipalities.

A good example of SME subsidy support is the German Energy Consultation for SMEs Program, which provides funding for energy advisory services for SMEs that meet the energy audit requirements of the Directive.

In Sweden, the scheme for supporting energy audits for SMEs has existed since 2010 and has been amended to provide support for the implementation of Article 8 of the Directive. This support is provided in the form of so-called “energy audit reviews”.

Information tools are aimed at providing information on energy consumption of entities and the possibility of improving their energy efficiency. Examples of this type of tools are the energy efficiency networks that are used in Germany and Sweden, through which companies exchange their experience on energy efficiency. Educational, information and communication activities are the tools used in the SME Initiative for energy reforms and climate protection undertaken by the Federal Government of Germany and some business associations.

It can be noted that the success of SME support programs is the involvement by national governments of representative intermediary organizations in conducting awareness and information campaigns to promote energy audits and energy management systems in the EU.

Positive experience of most EU member states is mainly in conducting energy audits that include facilitators, industry organizations or local assistance. The problems encountered are mostly due to the differences between SMEs (for example, resources that are inaccessible and scarce for SMEs). This situation calls to simplify as much as possible the reporting obligations and bureaucracy regarding the access to the support system.

SMEs are very diverse and fragmented, and it is difficult to find the right way to segment them. Given the size, it is best to divide them into medium (<250 employees), small (<50 employees) and micro enterprises (<10 employees). Different approaches are used, ranging from general communication (newspapers, magazines, web sites, etc.), directing phone calls or even personal contact with specialists / energy auditors trying to sell their services. The latter approach can be very efficient and may be an independent initiative but requires presence of a certain number of energy auditors / experts on the market.

The main problem for small SMEs is resources, especially finance, time and experience. Obviously, subsidies, tax benefits, low interest loans are welcome and constitute one of the main incentives for action, but there is a need for assistance and support, usually through industry organizations, local institutions, chambers of commerce, engineering associations, etc.

The experience of the EU Member States has shown that energy management systems are demonstrating a much higher pace of energy efficiency. However, this does not apply to small and medium-sized enterprises that use less energy or have a lower energy efficiency potential (as a rule, these are small enterprises, although it also depends on the industry, etc.).

EU member states combine different measures to reach and support SMEs, from energy audit subsidies and energy efficiency measures, simplified guidance on energy audits, voluntary agreements and qualification/certification of energy management experts.

Because of the diversity of SMEs, it is impossible to establish a single approach to support that meets all the requirements of the Directive. Considering the above, it can be concluded that only a certain number of SMEs can be involved in various initiatives.
4.2 Experience of EU Member States in supporting SMEs in implementing energy audits and energy efficiency measures

Taking into account the experience of the majority of EU member states, it can be concluded that the key factors affecting the demand for energy-efficient investments in SMEs are:

(a) return on investment for energy efficiency;
(b) availability of state subsidies for energy efficiency projects;
(c) financial support for technical assistance.

Considering the initiatives aimed at ensuring energy efficiency investments for SMEs, it is important to focus on:

(a) availability of state subsidies for energy efficiency projects;
(b) regulatory stability;
(c) development of simple standards for all stages of energy efficiency investment projects.

It is important to focus on the following EU member states with regard to their support of SMEs in conducting energy audits and implementing measures according to their recommendations.

GERMANY

The German government has introduced a number of policy tools to improve the progress of energy efficiency in industry, which has received widespread support from various governmental and non-governmental organizations and industry associations. These tools include subsidies and incentives, as well as information tools.

For example, the Energy Consulting for SMEs Program and the Energy Transition and Climate Protection Initiative supported by the Federal Government together with German Association of Chambers of Commerce and German Confederation of Qualified Workers are specifically targeted at enterprises. In addition, the Federal Government finances comprehensive energy efficiency campaigns of German Energy Agency (DENA), which provide additional information for various target groups.

The requirements of the Directive have influenced modification of some of the tools used.

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Since launching the initiative in December 2014, 50 of the Federal Government for creation of 30 so-
improving energy efficiency. Participation in the energy efficiency network enables companies to plan and implement energy efficiency investments based on reliable data.

The results of the project funded by the Federal Government showed that the participating companies demonstrate significantly higher energy efficiency indicators in 3-4 years compared to the average for their industry. The initiative of Energy Efficiency Networks aims at implementing energy audits support programs for SMEs in order to objectively determine the energy saving potential, which will be the basis for energy efficiency and renewable energy measures. Equally important is the support in the implementation of measures based on the results of energy audits. Priority is given to the projects aimed at energy saving at small and medium-sized enterprises.

**SLOVAKIA**

In Slovakia, additional funding for energy audits for SMEs was provided by the Environmental Quality program. This program was approved by the EU in 2014 with a total available funds of EUR 3.13 billion. The program has 4 main areas, one of which is Energy Efficient, Low Carbon Economy in All Sectors. This priority includes the specific goal of reducing energy intensity and increasing the use of RES at enterprises. This specific objective is aimed at implementing energy audits support programs for SMEs in order to objectively determine the energy saving potential, which will be the basis for energy efficiency and renewable energy measures. Equally important is the support in the implementation of measures based on the results of energy audits. Priority is given to the projects aimed at energy saving at small and medium-sized enterprises.

**Small and medium-sized enterprises that conducted energy audits with co-financing from public funds or assistance programs funded by international financial institutions are required to:**

(a) keep a report on energy audits and related documents until the next audit;
(b) submit a report on the energy audit to the Monitoring System operator within 30 days after the completion of the report preparation or at the request of the operator.

Individual applications for project financing are evaluated by technical evaluators. They are experts who submit their applications in response to the announcement of an evaluator selection process that is published on the program web page and should meet the minimum criteria.

Within the framework of the Environmental Quality Program, 4 national programs are being prepared:

(a) free energy advisory service;
(b) support of compact equipment for the use of renewable energy sources in households;
(c) information platform for energy-efficient low carbon economy and public buildings audits;
(d) expansion of the Monitoring System.
In accordance with the provisions of the Law on Energy Efficiency, effective from 15.05.2015, small and medium enterprises are obliged to carry out mandatory energy audits in two cases:

(a) when they have industrial systems with an energy consumption above 5,000 MW, they are subject to the requirements for large enterprises;
(b) if they are owners of buildings that provide public services and have the surface area exceeding 250 square meters, these buildings should be subject to mandatory audit and certification.

The Law on Energy Efficiency does not specify concrete programs aimed at SMEs to encourage them to undergo energy audits and implement the recommendations of these audits. In accordance with the provisions of Article 8 of the Directive, the Minister of Economy is obliged to propose incentive schemes for energy audits at small and medium-sized enterprises, as well as the implementation of measures recommended by these audits.

The Law on Energy Efficiency also contains provisions on schemes and mechanisms that can be used to promote energy efficiency for end-users of energy.

These schemes and mechanisms include:

(a) energy performance contracts for buildings, enterprises, industrial systems and lighting systems that can be concluded after an energy audit;
(b) energy saving certificates - for energy market traders that have individual energy saving targets;
(c) funding from the Energy Efficiency and Renewable Energy Fund or other financial intermediaries;
(d) other national or European schemes and mechanisms of support.

These schemes and mechanisms for promoting energy efficiency should be developed and applied in accordance with the requirements of the state aid provisions.

The energy performance contracting scheme, although well known, is not widespread in Bulgaria. ESCO market of services is limited and most ESCO projects are mostly implemented in the public sector, although several international projects have provided assistance to the development of the ESCO market in the country by providing financial support and capacity building (EU-funded projects).

The Energy Efficiency and Renewable Energy Fund also applies ESCO support schemes, but its main objective is to finance energy efficiency investment projects.

The Energy Efficiency and Renewable Energy Fund is an automatically replenishable mechanism for the development and financing of commercially viable projects and capacity building. The fund combines the functions of a credit institution, a loan guarantee fund and a consulting company. It provides technical assistance to Bulgarian businesses, municipalities and individuals in developing energy efficiency investment projects, and then helps them with financing, co-financing, or acting as a guarantor to other financial institutions.

A prerequisite for a successful application to the Bulgarian Energy Efficiency Fund is the availability of a detailed energy audit that allows for energy analysis and selection of energy efficiency measures.

The Fund provides three main categories of financial products to Bulgarian companies, municipalities and individuals:

(a) loans below market rates for energy efficiency projects in the amounts from 30,000 leva to 3 million leva;
(b) partial credit guarantees: up to 80% of the amount approved by the bank for a loan for project
(c) portfolio guarantees (portfolio guarantee for ESCO and residential sector): up to 5% of the portfolio.

The financial resources of the Energy Efficiency and Renewable Energy Fund are used to finance the following types of investment:

(a) investments in energy efficiency improvement of industrial processes;
(b) rehabilitation of buildings in all sectors;
(c) improvement of heating sources and heat distribution system;
(d) other applications in the area of end-use including management systems;
(e) energy management.

The Bulgarian Energy Efficiency and Renewable Energy Fund is considered one of the most successful funds and provides a range of funding sources including the private sector.

The financial support of SMEs for the implementation of energy-saving technologies and RES was provided within the operational program Development of Competitiveness of the Bulgarian Economy in 2007-2013. This Operational Competitiveness Program is co-funded by the European Union from the European Regional Development Fund.

In the framework of the Grant Scheme "Energy Efficiency and Green Economy", launched in mid-2012, 456 grant agreements were concluded for the total amount of approximately 286.4 million leva.

The main objective of this Grant Scheme was to provide comprehensive investment and advisory assistance to micro, small and medium-sized enterprises in Bulgaria in order to enable the transition to green economy by encouraging the implementation of projects directly related to the use of energy-saving technologies aimed at reducing the energy intensity of production, and implementation of renewable energy sources, as well as measures to improve processes and energy management, thereby supporting sustainable energy development and reducing the negative environmental impact.

The current Operational Program "Innovation and Competitiveness" for 2014-2020 includes the Grant Scheme "Energy Efficiency of SMEs" launched in 2016 with the budget of EUR 90 million. This scheme provides grant support for the introduction of energy saving technologies, increasing energy efficiency of industrial buildings and use of renewable energy sources for own needs.

Eligible activities are energy audits, as well as implementation and certification of energy management systems in accordance with the requirements of BDS EN ISO 50001. An information campaign has been organized throughout the country to promote this grant scheme, present procedures and encourage SME participation.

**SWEDEN**

The Swedish Energy Agency is helping companies improve their energy efficiency in various ways, for example through financial support, demonstration projects, networking activities, seminars and information. In accordance with the National Energy Efficiency Action Plan, the existing scheme for supporting energy audits for SMEs in Sweden provides support for the implementation of Article 8, paragraph 2, of the Directive.

Such support is provided in the form of so-called “energy audit checks”. This aid may be granted to enterprises whose energy consumption exceeds 500 MW per year or to farms with at least 100 livestock heads, even if their energy consumption is lower. This scheme was implemented by the relevant Decree, effective from January 1, 2010, and the assistance was equal to the cost of energy audit. According to the assessment, the main impact of energy audit checks was on better awareness of enterprises on specific issues related to energy efficiency, which, in turn, provides the basis for measures. The audit data were collected and verified by the Swedish Energy Agency. Analysis of past support for energy audits (2010-2014) has been conducted.

As a result of the Government’s revision of the State Aid for Energy Audit Decree, which came into force on January 1, 2015, the Swedish Energy Agency has reviewed the rules for assisting small and medium-sized enterprises. This includes companies with energy consumption of 300 MW per year and agricultural enterprises with more than 100 heads of livestock. The aid compensates 50% of the cost of energy audit, but no more than 50,000 Swedish kronor.

The Swedish Energy Agency also decided on new rules that apply from June 18, 2015. They contain provisions on the content of energy audits, information to be provided in the application for the aid and in connection with the request for payment of assistance, and information to be provided for monitoring and assistance assessment.

Information tools are designed to provide information about energy consumption by the entities and opportunities for improving their energy efficiency. Examples of this type of tools are Sweden’s energy efficiency networks, whereby companies exchange experiences on energy efficiency.

National, regional and local networks have been established to improve energy efficiency of SMEs, develop methodologies and energy efficient technologies, and promote the dissemination of best practices. There are national networks for energy-intensive SMEs, while regional and local networks cover all enterprises. These networks have regional energy agencies and local energy advisers.

In 2006, several municipalities in Sweden joined forces within Project Highland to offer energy audits to small and medium-sized enterprises. As a result, 540 two-day energy audits were conducted in 6 municipalities.

The measures were focused on auxiliary functions, such as lighting and heating, rather than on the main production processes. In addition, energy audits of the companies under examination have led to the transfer of district heating and locally installed biofuel boilers.

Today there are examples of active networks in various industries. One example is the Energy Efficiency Network in Sweden’s Woodworking Industry launched in 2010. Its purpose is to demonstrate that the specific energy consumption in the wood industry of Sweden can be reduced by 20% by 2020. Such a reduction in energy consumption in the wood industry of Sweden by 20% means saving energy at the level of 1200 GW plus 300 GW of electricity saving. This result must be achieved through an energy efficiency improvement program, which primarily involves energy consumption audits (using energy audit checks) to enable energy modeling and demonstration plans at selected woodworking enterprises.

Another network is the Swedish Energy Efficiency Network targeting SMEs in the manufacturing industry. It was created in 2009 and managed by the Swedish Research Institute for Industrial Rehabilitation and Sustainable Growth. The Swedish Energy Agency is a partner and financier. This network creates, collects and distributes information about energy-efficient technologies, practices and methods.


**CZECH REPUBLIC**

The main instrument is the Operational Program Entrepreneurship and Innovation for Competitiveness for 2014-2020” prepared by the Ministry of Industry and Trade and funded by the European Regional Development Fund. This Program is a continuation of the successful Entrepreneurship and Innovation Program for the period of 2007-2013. The Ministry acts as the controlling authority and the CzechInvest Agency implements program activities.

The Program prioritizes the support of SMEs, which make up a large share of business in the Czech Republic. The Program will finance projects through grants, preferential loans or guarantees, or a combination of them. The total amount to be distributed is EUR 4331 million, which should be distributed as follows: 45% for small enterprises, 35% for medium-sized enterprises and 25% for large enterprises.

The Program’s priorities are:

(a) increasing the number of enterprises able to expand the technological boundaries of their industry, with the emphasis on the development and interconnection between corporate research, the ability to develop and innovate and their environment;

(b) development of entrepreneurship and innovations at a lower level, i.e., modernization and development projects, which are specifically aimed at supporting the implementation of new business plans including the development of services that lead to strengthening the competitive advantage of enterprises in the international environment;

(c) the transition to an energy-efficient low-carbon economy, which mainly consists in increasing energy efficiency in the business sector, using renewable energy sources, modernizing the energy infrastructure and introducing new technologies to energy and secondary raw materials management;

(d) facilitating the development of entrepreneurship, services and access to government services through high-speed Internet access and a wider range of information and communication technology services, as the competitiveness of the information society is based on the effective use of advanced services of these technologies.

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94 http://www.mpo.cz/dokument169167.html
Article 8 of the Directive provides for exemption from the obligation to conduct regular energy audits for large enterprises when these enterprises implement a system of energy management or environmental management "certified by an independent body in accordance with applicable European or international standards". Exemption from the obligation to perform audits for large enterprises refers specifically to official energy management systems that are in line with current European and international standards.

Some EU member states additionally provided in their legislation obligations to conduct mandatory energy audits not only for large enterprises.

Thus, Bulgaria has obliged industrial systems with an annual energy consumption of more than 3,000 MW, and the Czech Republic - natural and legal persons with an annual energy consumption of more than 35000 GJ (9722 MW), as well as state, district administrative units and municipalities with total energy consumption of more than 1,500 GJ 417 MW) per year.

The above approach is appropriate for Ukraine: in particular, it is necessary to foresee in the legislation intended to implement the Directive obligations on mandatory energy audits not only for large enterprises, but also for all economic entities including SMEs with annual consumption of energy resources above 10,000 MW.

In turn, a relevant legislative act should also provide exemption from the obligation to conduct regular energy audits for the SMEs implementing a system of energy management or environmental management.

The energy management system provides a structured and systematic approach for integrating the concept of energy efficiency into the continuous operation of enterprises and the culture of business management.

The energy management system creates appropriate linkages between business processes as to energy use and the main industrial indicators, such as: reducing production costs, increasing production, compliance with environmental norms and improving competitiveness. Practical experience shows that enterprises that recently introduce a system of energy management obtain an energy efficiency increase of 10–20% with minimal investment in the first years.

In the context of energy management, the approach is based on the use of the Deming Cycle (PDCA), which can be described as follows:

(a) plan: energy analysis and setting baseline, energy efficiency indicators, targets, benchmarks and action plans needed to obtain the results that will improve energy performance in line with the organization's energy policy;
(b) do: Implementation of energy management action plans;
(c) check: monitoring and measuring the processes and key characteristics of operations that determine energy efficiency for compliance with energy policy and objectives, and reporting on results;
(d) act: carrying out measures for the continuous improvement of energy characteristics and the energy management system.
The advantages of the system approach used are as follows:

(a) analysis of all aspects affecting energy efficiency, as well as continuous improvement;
(b) business processes related to energy management are clearly identified and may be checked both by internal and external auditors including the possibility of certification;
(c) continuous and scheduled process of energy management, which has certain comparison parameters (baseline) for the achieved results and documented energy targets;
(d) an approach based on best international practice.

The main innovation goal of energy management is to achieve high energy efficiency at a specific facility, while simultaneously making the best use of all other available resources.

Comprehensive systematic management of the use of fuel and energy resources at a facility, which is necessary to achieve this goal, is carried out through building a system of energy management, which is an ordered set of interconnected and interacting elements designed to perform relevant managerial functions.

The direct object of management in any energy management system is a set of technological and energy equipment, energy sources, energy networks, as well as the modes and conditions of their operation. The subject of management is the staff of the business entity: managers, specialists, maintenance and repair personnel. This results in ensuring managerial transparency and improving the manageability of the organization.

The degree of acceptance of this approach to energy management by companies varies considerably in the 28 EU member states. In 2014, the International Organization for Standardization registered the total of 5,267 valid certificates in the EU.

In Ukraine, since 2014, the national standard DSTU ISO 50001: 2014 Energy Saving. Energy management systems. Requirements and usage guidelines (ISO 50001: 2011, IDT) has been introduced.

Also, the following standards have been applied in Ukraine since 2016:

(a) DSTU ISO 50002: 2016 (ISO 50002: 2014, IDT) Energy audits. Requirements and guidance on their conduct;
(b) DSTU ISO 50003: 2016 (ISO 50003: 2014, IDT) Energy management systems. Requirements for bodies conducting audit and certification of energy management systems;
(c) DSTU ISO 50004: 2016 (ISO 50004: 2014, IDT) Energy management systems. Implementation, maintenance and improvement of the energy management system;

In the middle of 2018, a new version (the second) of the international standard ISO 50001. “Energy Management Systems. Requirements and usage guidelines” was published.

The upgraded ISO 50001 is based on the Continuous Improvement Management System model, which is also used to develop other well-known standards such as ISO 9001 or ISO 14001. This mechanism simplifies the integration of energy efficiency measures into quality management as well as environmental monitoring.

ISO 50001:2018 contains a number of requirements to organizations:

(a) the need for policy development relating to more efficient use of energy;
(b) adjustment of goals and objectives in accordance with the policy developed;
(c) application of data for more effective decision making on energy use;
(d) determination of results;
(e) revision of the political concept;
(f) constant promotion of energy efficiency.

National standards for energy management are designed to help SMEs introduce, implement and continuously improve their energy management systems.

Also, existence of certified specialists on the market is an important factor for the success of SMEs achieving positive results in the implementation of energy-efficient measures, in particular the introduction of energy management systems.

At the moment, this market is not widely developed in Ukraine. On the SAEE website95 there is the list of companies that carry out energy efficiency services as well as the list of certified energy managers and energy auditors.

It is worthwhile to highlight a number of training programs and centers that train and certify specialists in the implementation of energy management and energy auditing systems.

I. EUREM

EUREM is a standardized training program and an effective network of European energy managers, which has already been implemented in more than 28 countries of the world. More than 5,000 European energy managers operate in these countries and act as guarantors of energy efficiency at the enterprises.

II. Training program

(creation of expert potential) of the UKR IEE UNIDO project.

The program has the following main components:

(a) an expert capacity building program for energy management systems including:
   - Introductory seminar (1/2 days);
   - Two-day training for users;
   - Training for experts (up to six months of lectures and practical work at the enterprises);
(b) courses on a series of ISO 50000 standards for creating expertise among the national audit community (including certification processes and further accreditation);
(c) expert capacity building program for major energy consumers, including:
   - Workshop for equipment manufacturers (1/2 days);
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(e) revision of the political concept;
(f) constant promotion of energy efficiency.
4.4 Other mechanisms for encouraging SMEs to implement energy-efficient measures

In European countries, there are quite different mechanisms for motivating SMEs to improve energy efficiency, which can also be implemented into national legislation.

Among the main incentive mechanisms, the following can be pointed out:

(a) tax and customs privileges;
(b) taxation of energy consumption and emissions trading system;
(c) voluntary agreements;
(d) specialized securities ("white" certificates, "green" bonds);
(e) state programs of preferential loans.
Instead, in parallel with the introduction of the mandatory energy audit for some categories of industrial enterprises, the restoration of such privileges for SMEs is possible taking into account the following:

(a) a mandatory condition for obtaining a privilege is the achievement by SMEs of a certain percentage of energy efficiency improvements (depending on the size of the privilege);

(b) achievement of the relevant indicator is based on energy audits carried out before and after the implementation of energy efficiency measures (replacement of equipment);

(c) in case of failure to reach the specified indicators, the enterprise pays taxes for the period of the benefits in the double amount.

The main disadvantage of the described system of tax and customs privileges in the field of energy efficiency was a complicated and non-transparent procedure for their receipt.
4.4.2 TAXATION OF ENERGY CONSUMPTION AND EMISSIONS TRADING SYSTEM

Intensive use of fossil fuels in the world leads to the decrease of their reserves and rising prices. A number of countries of the world started imposing carbon taxes at different times and use funds for energy-efficient measures.

In this way, the cost of fossil fuels for enterprises were artificially overstated, which has already motivated them to reduce consumption. In addition, opportunities were provided to compensate for the cost of new technologies and equipment at the expense of carbon taxes.

Many countries in the world, including the European Union, for example, Finland, Denmark, UK, Sweden, have introduced a carbon tax (fossil fuel tax based on greenhouse gas emissions) with the simultaneous introduction of mechanisms for targeted use of funds.

For industrial enterprises, this has become an incentive both for the rational use of energy and for the optimization of technological processes in production, introduction of energy efficient measures and renewable energy.

Thus, according to the OECD expert survey energy taxes are:

(a) an effective tool for influencing the level of energy use, and hence climate change, air pollution, losses from massive use of cars.

(b) the source for covering many explicit and implicit costs of fossil fuel taxation.

(c) an important source of government revenues — an average of 69% of environmental tax revenues consist of energy taxes.

Consequently, according to international practice, taxes and other payments levied on business entities are an instrument for regulating their activities. Thus, the payment for the use of energy resources, in addition to their actual price (cost), may serve as an additional instrument of the state’s influence on the behavior of economic entities in terms of energy use.

Taking this into account, the taxation of energy use can be an effective instrument of state policy in the field of energy efficiency improvement in industry.

In addition, the issue of the introduction of taxation on energy use is also considered in the context of the introduction of effective economic and political instruments for Ukraine’s more determined actions in the field of reducing greenhouse gas emissions within the framework of the policy of preventing climate change. Experts and specialists working in the environmental field have repeatedly pointed out the expediency of raising the rates of environmental tax.

Introduction of the carbon tax in a number of countries is an effective tool for motivating SMEs to modernize energy-consuming equipment.

At different times, Ukrainian legislation defined certain taxes related to the use of energy resources, in particular:

(a) Targeted increment to the current tariff for electric and thermal energy (Chapter 3 of Section XIV of the Tax Code №2755-VI of 02.12.2010). The object of the tax is the cost of released electricity.

The tax rate was 3% of the cost actually paid by the payer for electricity consumption excluding value added tax.

Until the adoption of the Tax Code, the tax was collected in the form of a target increment to the current tariff for electricity and heat, except electricity produced by qualified cogeneration units (Article 14 of the Law of Ukraine “On the Taxation System” No. 1251-XII of June 25, 1991).

(b) Target increment to the approved tariff for natural gas for consumers of all forms of ownership (Chapter 4 of Section XIV of the Tax Code № 2755-VI dated 02.12.2010).

The object of taxation is the cost of natural gas. The tax rate was 4% for the households and 2% for other consumers. Prior to the adoption of the Tax Code, a fee was collected in the form of a target increment to the approved tariff for natural gas for consumers of all forms of ownership (Article 14 of the Law of Ukraine “On the Taxation System” No. 1251-XII of June 25, 1991);

(c) Ecological tax (Section VIII of the Tax Code) The object and base of taxation, in terms of regulating the energy use, are the volumes and types of pollutants emitted into the atmosphere by stationary sources (primarily from combustion of energy resources). The rate of carbon dioxide emission tax for stationary sources is set at UAH 0.24 per ton. According to expert estimates, this level of taxation is extremely low and does not motivate business entities to increase the efficiency of energy use and, accordingly, a significant increase in rates is recommended.

It should be noted that all of the above payments ultimately motivate business entities to reduce the volumes of energy use, that is, they have the same target orientation.

However, the funds collected are allocated for the measures that are not combined by the same goal (reducing energy use and increasing energy efficiency). The introduction of certain forms of payment over time has lost its relevance, but fees continue to be levied and used for other purposes. Moreover, recent amendments in legislation fundamentally change the mechanisms for collecting and distributing the funds.

This situation was fixed by the Budget Code and the Tax Code of Ukraine adopted in 2010. In particular, Article 29 of the Budget Code of Ukraine specifies that the collection in the form of a target increment to the current tariff for electric and thermal energy, except electricity produced by qualified cogeneration units (Clause 14), and collection in the form of a target increment to the current tariff for natural gas for consumers of all forms property (Clause 15) belong to the revenues of the general fund of the State Budget of Ukraine.

The expediency of the return to the review of the issue of introduction of a tax on the use of energy resources (energy or environmental tax) is also due to changes in legislation, in particular regarding the adoption of the Budget Code and the Tax Codes of Ukraine, as well as a number of laws regulating the country’s energy sector and foresee changes in the principles of their functioning.

Figure 5  World experience of low carbon development support through taxation tools

<table>
<thead>
<tr>
<th>Country</th>
<th>Rate (Euro/tCO₂)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>118</td>
<td>1991</td>
</tr>
<tr>
<td>Switzerland</td>
<td>77+</td>
<td>2008</td>
</tr>
<tr>
<td>Finland</td>
<td>54–58</td>
<td>1990</td>
</tr>
<tr>
<td>Norway</td>
<td>3–47</td>
<td>1991</td>
</tr>
<tr>
<td>Denmark</td>
<td>23</td>
<td>1992</td>
</tr>
<tr>
<td>France</td>
<td>22+</td>
<td>2009</td>
</tr>
<tr>
<td>UK</td>
<td>22</td>
<td>2013</td>
</tr>
<tr>
<td>Ireland</td>
<td>20</td>
<td>2010</td>
</tr>
<tr>
<td>Slovenia</td>
<td>17</td>
<td>1996</td>
</tr>
<tr>
<td>Iceland</td>
<td>9</td>
<td>2010</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.4–7</td>
<td>2015</td>
</tr>
<tr>
<td>Portugal</td>
<td>6</td>
<td>2014</td>
</tr>
<tr>
<td>Chile</td>
<td>4</td>
<td>2014</td>
</tr>
<tr>
<td>Latvia</td>
<td>4</td>
<td>1995</td>
</tr>
<tr>
<td>Japan</td>
<td>3</td>
<td>2012</td>
</tr>
<tr>
<td>Mexico</td>
<td>1–3</td>
<td>2014</td>
</tr>
<tr>
<td>Estonia</td>
<td>2</td>
<td>2000</td>
</tr>
<tr>
<td>Poland</td>
<td>1</td>
<td>1990</td>
</tr>
</tbody>
</table>
In particular, the recent laws of Ukraine "On the Principles of Functioning of the Natural Gas Market" and "On the Principles of Functioning of the Electricity Market of Ukraine" envisage fundamentally changing the rules of functioning of the electricity and natural gas markets. It is supposed to liberalize relations and rules of trade in these markets through the rejection of the model of the 'wholesale' supplier, which will necessitate a revision of the subject of payment of the fee in the form of a targeted increment.

Proceeding from the above, it is advisable to consider the issue of merging the fee in the form of the target increment to the current tariff for electricity, thermal energy and natural gas, and the environmental tax (in terms of emissions of combustion plants) into a single tax on energy use.

At the same time, in order to limit the growth of the tax burden on consumers when considering the object of taxation, it is expedient to expand the tax base due to the expansion of types of energy resources, the use of which will be taxed.

The main question should be the definition of an unbiased targeted direction of tax revenues, namely, for the state support for increasing the efficiency of using energy resources or replacing them with renewable energy sources. Such a tool would be one of the most understandable, transparent, easy to implement and economical in administration.

The energy tax will also be a direct tool for implementing energy efficiency policies and preventing climate change, as it will motivate energy efficiency in the national economy and stimulate investment in long-payback projects.

The European Emission Trading System (ETS) is the main instrument for achieving the EU’s targets of greenhouse gas (GHG) reductions, which are declared internationally and reflected in EU legislation. EETS works on the principle of limiting GHG emissions and trading quotas of GHG emissions.

Proceeds derived from the sale of GHG quotas provide the Member States with revenues that can be used, inter alia, for the programs aimed at implementing energy efficiency measures. On the one hand, the cost of emissions increases the costs associated with pollution-causing activities.

On the other hand, EETS encourages emission reductions on those enterprises where it is most financially profitable.

EETS is the world’s first carbon market, which remains the largest. Establishing carbon prices and goals for reducing GHG emissions within the framework of the EETS contributes to the environmental and economic efficiency and strengthening the competitiveness of the European economy, as it stimulates investment into energy saving measures, reducing energy costs and financial risks associated with rising energy prices as well as investments into renewable energy technologies, reducing energy dependence on imported fossil fuels and increasing energy security.

EETS started operating in 2005 in accordance with the European Parliament and Council Directive 2003/87/EU, which defines the targets for the reduction of GHG emissions by 2020. EETS operates in 31 countries (all 28 EU countries, as well as Iceland, Liechtenstein and Norway) and limits emissions from more than 11,000 energy installations (power plants and industrial enterprises) and airlines operating in these countries. In this way, EETS covers about 45% of GHG emissions in the EU. EETS also contribute to the development of emissions trading in other countries and regions.


In December 2016, the Government of Ukraine approved the Concept of State Policy on Climate Change for the period up to 2030.

Among the main areas of the Concept’s implementation, there is the prevention of climate change through reduction of anthropogenic emissions and increase of absorption of greenhouse gases, as well as ensuring gradual transition to a low carbon development of the state, which is being implemented, inter alia, through the establishment and implementation of an internal trading system for emissions of greenhouse gases in accordance with the provisions of Directive 2003/87/EU; appointment of the specialized authorized body on trade in quotas for greenhouse gas emissions; creation and maintenance of the system of monitoring, reporting and verification of greenhouse gas emissions.

In 2017, the Energy Strategy of Ukraine for the period up to 2035 “Security, Energy Efficiency, Competitiveness” was approved, which is a document outlining strategic guidelines for the development of the fuel and energy complex of Ukraine for the period up to 2035. In the field of energy efficiency and environmental protection, it is envisaged to introduce a system for trade in quotas for greenhouse gas emissions; fulfillment of prospective requirements (after 2020) for GHG emissions is considered possible through the implementation of the GHG emission trading system, establishment of specific indicators for the largest sources of emissions and introduction of other market and non-market instruments for reducing GHG emissions.

A necessary prerequisite for the development and implementation of ETS is the development of procedures and requirements for monitoring, reporting, and verification (MRV) of GHG emissions.

In January 2018, the Ministry of Environmental Protection presented the Concept of the National Legislative Package on monitoring, reporting and verification of GHG emissions in Ukraine. Among the principles of this national legislative package, the closest possible approximation to the EU legislation was announced. This concept provides for a multi-level structure of GHG emission reduction measures.

Structure of the legislation package on MRV of GHG emissions in accordance with the concept:

(a) Law of Ukraine "On the Basics of Monitoring, Reporting and Verification of Greenhouse Gas Emissions";
(b) resolution of the Cabinet of Ministers of Ukraine "On Approval of the Procedure for Monitoring and Reporting of Greenhouse Gas Emissions";
(c) CMU Resolution "On Approval of the Procedure for Verification of GHG Reports";
(d) act "On Certain Accreditation Issues of GHG Verification Reporters".

Changes to the Ukrainian legislation on MRV. The concept also identified gaps in MRV of GHG regulation in Ukraine, among them: the lack of a single mandatory methodology for calculating GHG emissions, absence of an authorized body in the MRV area, lack of verification procedures for MRV purposes, uncertainty about the legal status of GHG report verifiers, accreditation legislation does not apply to verifiers of GHG reports.

The draft Law of Ukraine "On the Basics of Monitoring, Reporting and Verification of Greenhouse Gas Emissions", which was published for public discussion, defines the principles of MRV, authorities of state bodies in the field of MRV, monitoring and reporting entities and their responsibilities, verifiers of GHG reports and their responsibilities, organization and conduct of MRV, activities and greenhouse gases covered by the MRV.

Also, the Ministry of Environment has formed a list of activities subject to monitoring, reporting and verification of greenhouse gas emissions. Thus, it can be argued that the process of drafting legislation, which is the basis for the introduction of ETS in the future and GHG emission reductions in Ukraine, has begun. However, this process is long and requires the development of standards in various areas that are still absent in Ukraine. Among the public in Ukraine, there is an opinion that basic reforms in Ukraine should first be completed and after their completion and positive results such reforms may introduce more complex mechanisms, such as ETS, as Ukraine is currently undergoing basic energy reforms.
4.4.3 SPECIALIZED SECURITIES AS AN INSTRUMENT FOR IMPROVING ENERGY EFFICIENCY OF SMES

Experience of the EU countries demonstrates effectiveness of using specialized markets of securities, in particular, so-called white certificates and green bonds, to motivate energy efficiency.

**White certificates**

White certificate is a document confirming the achievement of a certain reduction in energy consumption. The basic principle of white certificates is to set performance targets and impose obligations to achieve these indicators (Energy Efficiency Obligations). Countries that practice white certificates have different scenarios in cases where targets are not met. Assuming a direct obligation to increase energy efficiency to a certain level, an actor allows the market to develop by artificially creating an offer. White certificates are a very flexible tool and have a significant impact on overcoming the financial barrier.

To stimulate energy saving, the state introduces an obligation to save energy. Obligations are imposed on energy companies. They represent some target savings targets that companies must achieve by the end of a certain period. In order to achieve the targets, the energy company is pursuing some energy efficiency measures. In the event that the company is unable to achieve its own savings targets, it may resort to the purchase of white certificates that cover the missing amount of savings.

A white certificate is a document confirming some fixed energy savings. Savings are fixed, and certificates are issued by a special authorized body (Regulator). A white certificate may be obtained by a company subject to the Liability if it has reached the target savings level and exceeded it. In this case, the white certificate only records excessive savings (Figure 1). In addition, white certificates may also be issued in some countries to companies that are not under the Liabilities but have reached a certain level of energy efficiency improvement.

A white certificate offer appears after the introduction of the Energy Efficiency Obligations and establishment of the “rules of the game”. The rules determine the parameters of trade certificates. The fact is that free trade of white certificates is not possible in all countries. In this case, white certificates are redeemed by the state.

**Algorithm for launching the white certificate scheme:**

- (a) introduction of energy efficiency commitments;
- (b) establishment of target saving indicators and timing for their achievement;
- (c) appointment of the certification body;
- (d) clear definition of certificates: size, technology, criteria, timing, etc;
- (e) definition of trading rules (if allowed);
- (f) creating a system for implementation, monitoring and verification of certificates;
- (g) determination of penalties for non-fulfilment of obligations;
- (h) organization of repayment (redemption) of certificates.

Based on the experience of the EU countries, one can distinguish the following conditions for the successful application of obligations:

- (a) energy-efficiency obligations can work both under a monopoly and in a fully liberalized market; besides, obligations can be imposed both on producers (suppliers) and distributors of energy;
- (b) energy savings will not be achieved until there is a regulator responsible for the operation of the white certificates scheme;
- (c) in many countries, energy efficiency obligations work without white certificates directly traded. The governments of these countries are convinced that the trade of white certificates contributes to increasing the
complexity of the obligation scheme and the occurrence of additional costs. The lack of the possibility of trade in white certificates, in their opinion, is advantageous in terms of increasing competition and transparency;

(d) introduction of energy efficiency obligations has encouraged companies to find new approaches to energy saving.

It is not possible simply to apply in Ukraine the international experience of obligations on energy efficiency and schemes of white certificates in particular.

**Green bonds**

One more interesting tool is green bonds — a debt financial instrument, the proceeds from sales of which are directed exclusively to financing or refinancing of green projects.

These may be renewable energy projects or transition to alternative fuels, energy efficiency and insulation of residential buildings, environmentally friendly transport, etc.

At the same time, the main buyers of this type of securities are targeted institutional investors, for whom the financing of environmental projects is a demonstration of their socially responsible investment policy.

Green bonds have gained popularity since the signing of the Paris Agreement. However, the history of these securities began in 2007 as for the first time they were issued by the World Bank and the European Investment Bank. Subsequently, the EBRD and the International Finance Corporation also became key issuers on the world market.

While in most countries under analysis energy efficiency was associated with the use of electricity, the main interest in Ukraine is the increase in the efficiency of use of the natural gas.

In planning the introduction of Obligations, the Government should first of all negotiate with companies on their readiness to implement the Obligations, ability to achieve target savings, etc. Next, several steps are needed to create conditions for the successful functioning of the Energy Efficiency Obligations.

**In particular, there are principles for using funds:**

(a) green projects should be environmentally friendly and comply with established guidelines;

(b) the benefits of the project should be evaluated by the issuer in terms of qualitative and quantitative indicators;

(c) an assessment should be made of the ratio of funds aimed at financing and refinancing of green projects.

**Project evaluation and selection process:**

(a) establishment of the procedure of compliance with the permissible directions;

(b) establishment of specific criteria to identify and manage potential environmental and social risks;

(c) transparency of the project selection process (independent evaluation in the selection of projects).

**Management of funds:**

(a) funds from the placement of green bonds are credited to a separate account;

(b) control and adjustment of the balance of funds during the reporting period and information for investors about temporal non-use of funds;

(c) transparency in the management of funds with the involvement of an auditor or a third party to verify the use of proceeds from the issue of green bonds.

**Reporting:**

(a) informing the investor about the projects using the funds from green bonds;

(b) voluntary application of standards aimed at establishing uniform reporting principles in areas such as energy efficiency and renewable energy sources.

At the same time, there are factors in Ukraine that restrain the use of this financial instrument within the current legislative framework (low sovereign rating, weakness of the domestic stock market and mechanisms for securitization of securities, absence of provisions in the national legislation on the need to apply the principles of green bonds).

In planning the introduction of Obligations, the Government should first of all negotiate with companies on their readiness to implement the Obligations, ability to achieve target savings, etc. Next, several steps are needed to create conditions for the successful functioning of the Energy Efficiency Obligations.

Today, green bonds are also placed by banks, private companies, funds, governments, local authorities. In many developed countries, however, the market of green bonds is still only in the process of formation.

According to the Climate Bonds Initiative, the world green bonds market in 2017 was valued at 895 billion dollars. At the same time, this market will reach 1 trillion dollars in 2020 according to estimates.

In general, most green bonds in European countries are focused on climate change mitigation projects. Most certified green bonds are formed in sectors such as energy, buildings and industry.

In order for these securities to become demanded by investors, they must meet emission standards, monitoring and reporting rules - the so-called "green bond principles" that Ukraine has to introduce in the legislation.

Reporting:

(a) informing the investor about the projects using the funds from green bonds;

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4.4.4 STATE PROGRAMS OF PREFERENTIAL LOANS

In Ukraine, from 2008 to 2012, there was a budget program aimed at motivating the implementation of energy-efficient measures through the mechanism of cheapened loans.

The idea of this program was as follows:

(a) budget funds were used to compensate for the actual costs associated with payment in the current budget period of interest for using loans attracted by business entities in national currency for the implementation of investment projects aimed at increasing the efficiency of use of fuel and energy resources and strengthening competitiveness of business entities from various economic sectors (hereinafter - investment project), in particular, those related to the reduction of natural gas consumption (hereinafter - compensation);

(b) the compensation was granted in the amount of the discount rate of the National Bank, which was effective as of the date of payment of the above interest, but not more than the interest rate on the loans borrowed by such entities;

(c) to participate in the competition, borrowers submitted an application to SAEE in two copies: a notarized copy of the loan agreement; certificates of a financial institution about granting loans to the borrower; calculation by the financial institution of the amount and term of payment of the interest rate for the use of loans; investment project, and a list of activities for which the loan is taken; copies of the extract from the State Register of investment projects and project (investment) proposals; copy of the expert opinion on the assessment of the economic efficiency of the investment project;

(d) the Competition Commission reviewed and evaluated the submitted investment projects according to the criteria, which are distributed according to the categories of investment projects, namely:

1. Projects for the production of energy-efficient equipment - according to the following criteria:
   - reduction of consumption of fuel and energy resources in comparison with corresponding indicators of similar equipment of the established quality;
   - reduction of pollutant emissions into the environment;
   - observance of the initial period of project implementation.

2. Projects to reduce the energy intensity of production - according to the following criteria:
   - reduction of energy intensity of the production unit (services) of the established quality;
   - reduction of pollutant emissions into the environment;
   - observance of the initial period of project implementation.

3. Projects using alternative fuels and alternative (renewable) energy sources - according to the following criteria:
   - the share of substitution of combustible minerals of national significance, except for peat and gas (methane) of coal deposits used to produce a unit of output (provision of services) of established quality, alternative fuels and alternative (renewable) energy sources;
   - reduction of pollutant emissions into the environment;
   - observance of the initial period of project implementation.

The submitted projects were evaluated based on the following principles:

(a) For energy efficient equipment projects - according to the following criteria:
   - reduction of consumption of fuel and energy resources in comparison with corresponding indicators of similar equipment of the established quality is (0–5 points):
     - 5 – 20% and more;
     - 4 – 5 to 20%;
     - 3 – 10 to 15%;
     - 2 – 5 to 10%;
     - 1 – to 5%;
   - the use of equipment does not reduce the consumption of fuel and energy resources.
   - The reduction of pollutant emissions into the environment is (0–3 points):
     - 3 – 20% and more;
     - 2 – 5 to 20%;
     - 1 – 10 to 15%;
     - 0 – 10% or less.
   - Observance of the initial period of project implementation (0 or 3 points):
     - 3 – terms are observed;
     - 0 – the terms are not observed; therefore, loan agreements are prolonged.

(b) For the projects on reduction of energy intensity of production - in accordance with the following criteria:
   - reduction of energy intensity of the production unit (services) of the established quality is (0–5 points):
     - 5 – 20% and more;
     - 4 – 5 to 20%;
     - 3 – 10 to 15%;
     - 2 – 5 to 10%;
     - 1 – to 5%;
   - the reduction of energy intensity of the production (provision of services) of the established quality.
   - The reduction of pollutant emissions into the environment is (0–3 points):
     - 3 – 20% and more;
     - 2 – 5 to 20%;
     - 1 – 10 to 15%;
     - 0 – 10% or less.
   - Observance of the initial period of project implementation (0 or 3 points):
     - 3 – terms are observed;
     - 0 – the terms are not observed; therefore, loan agreements are prolonged.

In the case investment projects receive the same number of points, the advantage is given to the project that gained more points by the first criterion.
According to the results of the evaluation of investment projects, the competition commission submitted SAEE proposals and recommendations on the appropriateness of providing compensation for the projects that won the competition indicating its volume.

It should be noted that, provided high cost of credit resources, the compensation for loan interest rates is a very effective mechanism for stimulating SMEs to implement energy-efficient measures.

Instead, the effectiveness of this mechanism was virtually eliminated due to the complexity of providing this type of state support and unjustifiably extensive list of documents, as the receipt of some of them was regulated by separate procedures.

Given the application of such mechanisms, while preserving their attractiveness for SMEs, there is a need for maximum simplification. For example, the amount of compensation and the fact of its provision can depend on the achieved reduction of energy consumption confirmed by the conclusions of the energy audit before and after the project implementation (energy-efficient measures).

References

Annex to Whitebook

Learnings from quality assurance of energy audits conducted in Ukrainian hospitals

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During spring 2018, as part of the project „Modernization Partnership for Energy Efficiency in Hospitals“, seventeen energy audits were carried out in hospitals and polyclinics in the cities of Chernihiv and Sumy. The audits were publicly tendered in March 2018 and conducted by various Ukrainian companies. In partnership with energy audit experts from the EU, Ukrainian experts analyzed and evaluated these audits.

The aim of these activities was not only to open the market for audits in Ukraine, but also to actively shape the process of these audits. As a result of each audit, recommendations for remedial measures have been prepared for each hospital. A distinction was made between larger investment and low and no cost recommendations. In addition, in each of the two cities at least one hospital was prioritized for the further implementation of measures so that they act as a model for successful energy efficiency refurbishment.

Based on the experience gained from the audits, a guidebook on the implementation of energy audits was prepared covering the point of view of the auditors as well as the perspective of the ordering hospitals. In addition, a close cooperation with the energy audit experts from the EU, Ukrainian experts analyzed and evaluated these audits.

The audits have been successful in collecting a lot of data from different sources. Energy consumption data have been gathered, partly supported by additional measured data. In addition, comfort parameters such as CO₂ content, temperature, air humidity or brightness (lux) have been measured. Nevertheless, the depth of interpretation of these information sources was frequently quite weak. Similarly, only very limited conclusions were drawn from the recorded comfort parameters.

The following section summarizes some of the main observations and learnings from accompanying the conduction of the energy audits in Ukrainian hospitals.

Concept of energy audit still unclear among market players

While the preparation of energy certificates (according to the EU Performance of Building Directives) is slowly becoming established in Ukraine, until now energy audits lack technical quality and cover only a small market volume. Regarding terminology, many stakeholders do not make linguistic distinction between energy audit and building certification. As a result, many properties in Ukraine have reputedly undergone an energy audit or auditors claim to have carried out energy audits. In reality, this usually stands for issuing a building certificate.

Energy audits consist of lots of technical information, but lack oversight and conclusions

The audits have been successful in collecting a lot of data from different sources. Energy consumption data have been gathered, partly supported by additional measured data. In addition, comfort parameters such as CO₂ content, temperature, air humidity or brightness (lux) have been measured. Nevertheless, the depth of interpretation of these information sources was frequently quite weak. Similarly, only very limited conclusions were drawn from the recorded comfort parameters.
Crucial importance of the comfort issue

From the data gathered in the energy audits it is obvious that many comfort parameters (standards) are not fulfilled. We estimate that energy consumption would be 20 to 30% higher if operation would be fully in line with all comfort prescription. Therefore, we assume that the implementation of many measures recommended in the energy audits would be absorbed to a huge extend by a rise of comfort parameters, albeit without mayor savings of energy consumption. However, the savings of energy demand are huge. Therefore, this has to be seen as large improvement for the health sector.

Ranking of important energy efficiency improvement measures

Different from the situation most EU countries, the renovation of the building envelopes and building system (mainly heat distribution) is the indispensable first step. Therefore, the focus of building renovation now and in the near future, will primarily be on thermal renovation and heating control.

Despite this clear first recommendation, it is important head for a holistic energy strategy.

Energy audits as awareness raising tool

Ukrainian auditors see energy audits exclusively as a technical process. Therefore, the reports are bulky and difficult to read. If however all the employees of a hospital are regarded as potential target group for the audits results, the main results need to be summarized – e.g. in short brochure – which is highly readable and understandable and which highlights the importance and opportunities of user involvement. This also applies for the case of a limited target group e.g. only of energy managers and decision makers.

Detection of regulatory shortcomings

In addition, through the energy audits also regulatory problems became visible. This most important example is related to heat recovery in ventilation systems: Hospitals need very clean air in some areas (e.g.: surgery room). So, in the surgery room the air is completely renewed several times in the hours. This process becomes very energy-intensive if the Ukrainian regulation prohibits the use of heat exchangers in hospitals. Therefore, one policy target that can be directly derived from the energy audit results is that this regulation needs to be adapted to the state of the art as soon as possible.