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HiQSTEP PROJECT

ENERGY EFFICIENCY IN INDUSTRIAL SECTORS IN GEORGIA AND AZERBAIJAN

Executive Summary

January 2018

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List of abbreviations

BAT	Best Available Techniques
CDM	Clean Development Mechanism
EE	Energy Efficiency
EED	Energy Efficiency Directive
EnC	Energy Community
EnCT	Energy Community Treaty
EnM	Energy Management
EnMS	Energy Management System
EPC	Energy Performance Contracting
EPEEF	Environment Protection and Energy Efficiency Fund
ESCO	Energy Service Company
ESD	Energy Services Directive
ETS	Emissions Trading System
EU	European Union
GHG	Greenhouse gas
GoA	Government of Azerbaijan
GoG	Government of Georgia
IEEN	Industrial Energy Efficiency Network
IFI	International Financing Institution
IPPC	Integrated Pollution Prevention and Control
M&T	Monitoring and Targeting
M&V	Measurement and Verification
MEPS	Minimum Energy Performance Standard
NEEAP	National Energy Efficiency Action Plan
NGO	Non-Governmental Organisation
PEEREA	Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects
RED	Renewable Energy Directive
RES	Renewable Energy Sources
SME	Small – Medium Enterprise
VSD	Variable Speed Drives

1 Introduction

This **Executive Summary** presents the main findings of the study **"Energy efficiency in industrial sectors in Georgia and Azerbaijan",** implemented under the project "High quality studies to support activities under the Eastern Partnership" (HiQSTEP)".

The overall **aim of the study** was to:

- present EU policies, rules, regulations and tools on energy efficiency (EE) and energy savings, emphasizing on selected industries after consultation with the EC;
- review the overall methodology for conducting energy audits in the countries under consideration;
- map and assess existing policies, rules, regulations and tools towards the implementation of EE measures in specific industrial sectors in Azerbaijan and Georgia; and
- develop pre-feasibility studies for the implementation of EE measures in typical industries following the completion of short energy audits.

The study also produced a set of recommendations on how to further enhance industrial EE in Azerbaijan and Georgia.

The study report is comprised of three Components:

- **Component 1** includes a review of the industrial EE policies, rules, regulations and tools in the EU and the Energy Community (EnC) Contracting Parties and a methodology and procedures to conduct energy audit and to certify energy auditors.
- **Component 2** reviews and assesses the Azerbaijani and Georgian relevant industrial EE framework to identify gaps and elaborate proposals for sustainable EE improvement in industry.
- **Component 3** includes five pre-feasibility studies for the implementation of EE measures in typical industries based on short energy audits. It provides recommendations and proposals for energy saving possibilities in the two beneficiary countries.

2 Component 1: EU policy framework and measures for EE in industry

The **aim of Component 1 report** is to provide information, analyse the effects and present:

- The main legislative EE framework with focus on the industrial sector. It includes an overview of existing policies, rules, regulations and instruments followed in the EU and the EnC as well as the history of the EE policy and legislative development in Europe in the past decades;
- The international standards applicable to EE, energy management and energy auditing and the Best Available Techniques (BAT) as regards EE for the most energy - intensive sectors;
- Successful policy instruments and measures in the EU and EnC towards the realisation of EE potential;
- The responsibilities of EU Member States towards the certification of energy auditors including their qualification criteria, certification / accreditation schemes and relevant support programmes for performing energy audits in industrial SMEs;
- The overall methodology and procedures for conducting energy audits in the industrial sector.

2.1 Policies on EE and energy savings in the industrial sector in EU and EnC Contracting Parties

During the early years (70's – 90's), following the first oil crisis, the EU and individual Member States focused on supporting the EE market opening and development, rather than on legislative and regulatory measures. The focus was on starting-up and creating a critical mass of the EE market. Numerous programmes were launched and significant financial resources were allocated to **capacity building and awareness raising, Research and Development (R&D)** for EE equipment, new materials and technologies, development of **technical standards, calculation methodologies**, **grant/subsidy schemes** for EE investments combined or not with **technical assistance** (e.g. free energy audits). In parallel, **innovative EE financing mechanisms** (e.g. ESCO market development) and other schemes (e.g. voluntary agreements) were developed, tested and promoted.

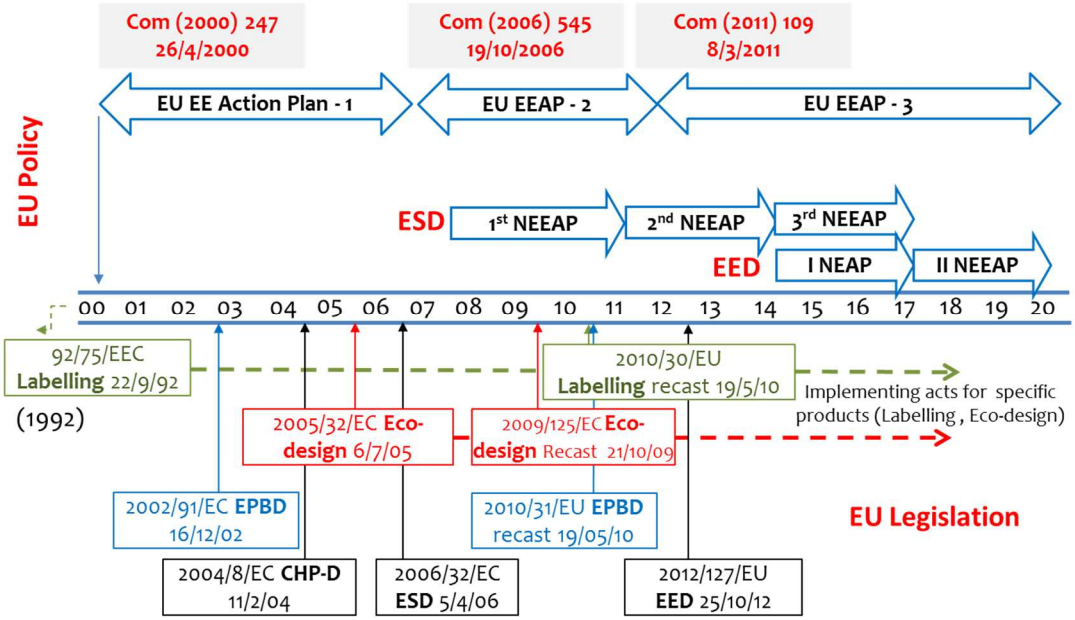
After 2000, with the EE market better prepared in terms of know-how, availability of EE equipment and techniques, the EU started to gradually impose EE legislative – regulatory measures. Their enforcement proved to be difficult in many EU Member States but, even their initial partial enforcement, helped the EE market to mature further. **Well-informed citizens and energy users** started asking for more EE solutions. Manufacturers, construction-engineering companies and energy service providers responded to the market demand by offering such solutions at more affordable prices. This way, several mandatory / regulatory provisions of the EU Directives and Regulations gradually became "standard engineering practices" that are "enforced" by the market itself.

Milestones in this process included the adoption of:

- the 2002 Energy Performance of Buildings Directive (recast in 2010) that for the first time imposes, minimum energy performance requirements for buildings and their main energy systems;
- the 2005 Eco-design Directive that set the grounds for banning from the EU market energy inefficient products;
- the 2006 Energy Services Directive that introduced the obligation for availability of energy services / energy audits and for adoption and implementation of 3-year National EE Action Plans (NEEAPs) with concrete energy savings targets; and
- the 2012 EE Directive that introduced stringent obligations such as the EE obligations scheme, mandatory energy audits for the large industrial facilities, etc.

The basic **EU policy legislative framework for EE** is depicted in Figure 2-1.

Figure 2-1: Basic EU policies and legislation in EE (2000 – 2020)



Despite the very significant progress achieved in many EU Member States, there is still a large unexploited EE potential across the EU. New policies and measures are being developed to achieve increasingly ambitious energy and environmental targets by 2030.

EnC Contracting Parties started to improve EE about 10-15 years ago with the implementation of several EU and internationally funded technical assistance projects. The effort to adopt the European EE acquis started with the Decision of the Ministerial Council (18/12/2009) for the implementation of certain Directives (Energy Services, Energy Labelling, Energy Performance of Buildings). Since then, the transposition work progressed quite well in many EnC Contracting Parties, but implementation and enforcement of the legislation lagged behind.

EE in industry is explicitly addressed only in few articles of the EU/EnC legislation, as most of the provisions refer to cross-sectoral EE measures (addressing also industry) or to specific EE products, as well as to energy performance of buildings. For example, the **Energy Services Directive** – ESD (**2006/32/EC**), repealed by the **EE Directive** – EED (**2012/27/EU**), provides for the availability of energy services, as well as for adoption and implementation of 3-year NEEAPs that include horizontal measures and dedicated EE measures for each energy sector.

Apart from the EE legislation, the **Renewable Energy Directive** – RED (**2009/28/EC),** provides for a favourable environment for energy produced from RES and for the introduction of biofuels in the transport sector. This opens new industrial business opportunities (e.g. biofuels production) as well as optimization of energy resources (e.g. waste to energy) for the industrial sector as well. Transposition and implementation of all the prevailing EU legislation regarding EE and RES (with the exception of the eco-design framework) is among the obligations of the Contracting Parties to the Energy Community Treaty (EnCT). **Georgia has recently joined the EnC and undertook all these commitments**.

Key points of the main Directives relevant to EE in industry are presented below.

Energy Efficiency Directive

Although the direct references of the EED to industry are limited, many of its provisions have an impact on industrial EE. Specifically, the EED provides, for 3 specific quantitative targets:

- **indicative national EE target** (Art. 3) to be achieved through the implementation of the NEEAPs (Art 24.2) and other measures;
- **EE obligation schemes** (Art. 7), that impose on energy distributors and/or retail energy sales companies and obligation to implement measures to achieve annually new energy savings corresponding to 1.5% of the total annual energy sales of energy to final customers. Industry is an ideal target for this scheme, as EE measures applied in selected industrial facilities may lead to considerable energy savings, thus facilitating achievement of the target. Alternatively, each EU Member State or EnC Contracting Party may choose to implement other EE measures to achieve the same energy saving result;
- **energy rehabilitation of buildings** owned and occupied by the Central Government at a rate 3% of floor area per year (Art. 5), as well as establishment a long-term strategy for mobilizing investments in the renovation of the national building stock. It is expected that these provisions will promote the energy services market (e.g. ESCOs), the building materials/energy equipment production industrial sub-sectors, as well as the construction industry.

Regarding industry, the most important Article of the EED is Art.8 "Energy audits and energy management systems", where large enterprises are subject to an energy audit carried out in an independent and cost-effective manner by qualified and/or accredited experts at least every 4 years from the date of the previous energy audit.

In conclusion, the EED streamlines the whole framework on EE including energy auditing, energy management, alternative financing mechanisms, etc., thus **creating a quite favourable environment for promotion of EE in industry** and other economic sectors.

Other relevant directives are the:

- **Energy Labelling Directive**: framework directive that mandates the EC to introduce, by means of delegated acts, details on the label and in the fiche for each type of energy related product;
- **Eco-Design Directive**: framework directive that aims to reduce the environmental impact and improve EE, by providing EU-wide rules for the design of energy related products;
- **Renewable Energy Directive**: establishes an overall policy for the production and use of energy from RES. Although the RED does not directly refer to industry, many industrial facilities across EU, especially the ones that produce biomass by-products and organic wastes, have exploited the incentives provided by the RED provisions (e.g. priority or guaranteed access to the grid for RES-electricity) and Member States support schemes (e.g. favourable feed-in tariffs) to reduce their energy cost and/or to have an extra income from RES electricity/heat sales.
- **IPPC Directive**: requires that the energy used in all installations is used efficiently, and one of the factors to be considered in determining the Best Available Techniques (BAT) for a process, is its EE. As regards BAT and EE, there are a number of key EE opportunities for industries, either related to horizontal technologies such as the use of high efficient motors or energy efficient boilers, the introduction of Energy Management Systems (EnMS), the use of waste as fuel or the introduction of advanced control system

or to process technologies for different types of industry;

- **Industrial Emissions Directive:** aims to reduce harmful industrial emission of air pollutants, discharges of waste water and the generation of waste across the EU, contributing also to EE;
- **Emissions Trading Directives:** it governs the EU Emissions Trading System (ETS).

2.2 Standards applicable to energy efficiency, energy management and energy auditing

The **ISO 50000 series** was created to provide a comprehensive suite of international standards offering **good practice in energy management**. The standards can be used together or independently and are suitable for any size of organisation.

ISO 50001 – Energy Management Systems – Requirements with guidance for use is a normative Management Systems International Standard. ISO 50001 is a proven framework for **organisations including industry,** for implementing an EnMS. ISO 50001, which is **subject to certification**, focuses on processes, introduces concepts, but lacks specificity to Energy Management (EnM) techniques. The relevant ISO committee recognised this and is drawing up **supporting standards** (that are not subject to certification).

Apart from ISO standards, CEN and CENELEC have published a series of EU Standards (the **EN 16247**) that set out requirements and provide guidance to support companies throughout Europe on how to carry out **energy audits**.

2.3 Instruments in selected EU Member States and EnC Contracting Parties towards the realization of EE measures

Despite the EU experience on EE, barriers still exist, and new instruments are being developed to overcome them. These instruments can be categorised as cooperative measures (voluntary agreements), financial measures, informative / educational measures, legislative or market-based instruments. The number of instruments however and their level of adoption differs across the EU and EnC. The cases of Germany, Denmark, Croatia, Romania, Serbia and FYR of Macedonia were selected for review taking into account the following criteria:

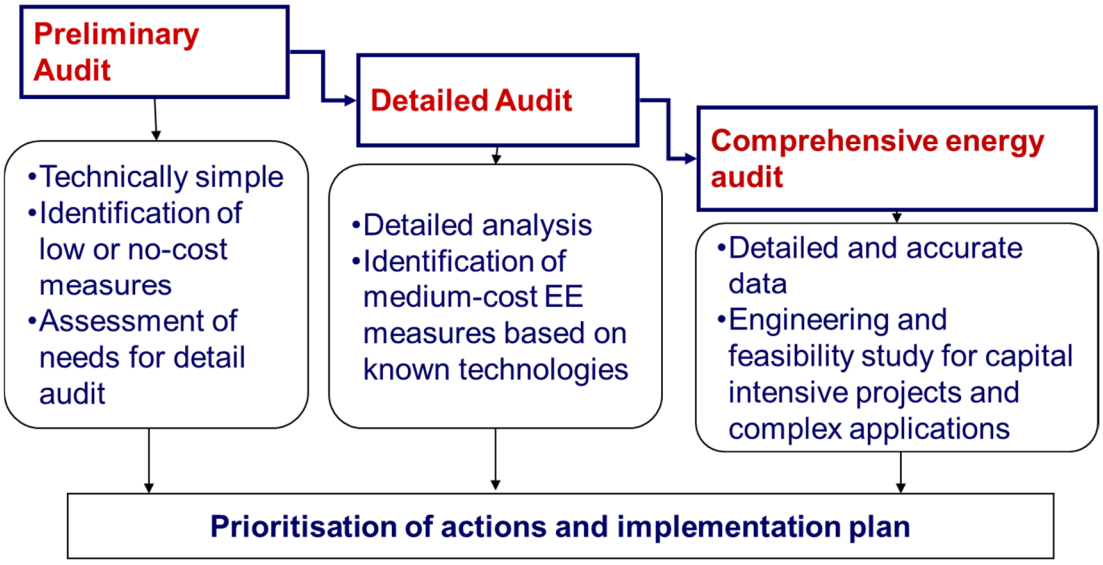
- **Similarities in the level of development** of the legislative/regulatory framework (new EU Member States, e.g. Croatia, Romania or Contracting Parties of the EnC, e.g. Serbia, FYR of Macedonia);
- **Advanced cases** so as to show the medium to long term development path for EE improvement (e.g. Germany, Denmark).

In brief, the obligation to large companies to perform energy audits and/or EnMS, establishment of EE funds, voluntary agreements, development of industrial EE networks and introduction of efficient motors are the most prevailing instruments. Annex I presents further information on the key instruments applicable to the above-mentioned countries.

2.4 Energy audits – methodology, types, qualification criteria for energy auditors and accreditation schemes

There are 3 types / levels of energy audits; the preliminary, the detailed and the comprehensive energy audit, as presented in Figure 2-2.

Figure 2-2: Types of energy audits



The energy audit approach includes the following steps:

- Agreement with the factory;
- Kick-off meeting (presentation of the objectives and the auditing team);
- On site survey;
- Data collection and evaluation;
- Identification / discussion of energy saving opportunities;
- Description / evaluation of measures;
- Audit report presentation;
- Follow-up implementation.

As of June 2015, 17 Member States have adopted **qualification criteria for energy auditors**. Additionally, and according to article 8 of the EED, all Member States should put in place **certification** / **accreditation schemes** for the providers of energy audits to make sure the availability and sufficiency of reliable professionals. As of August 2015, a significant number of countries have in place accreditation schemes and a register of energy auditors. However, these schemes differ among them and depend on the specificities of each Member State. As regards **support programmes**, only a few Member States (as of June 2015) developed programmes to encourage SMEs to undergo energy audits and the subsequent implementation of the recommendations from these audits.

2.5 Conclusions

Europe can demonstrate a substantial progress on EE, even though there is still substantial potential for EE improvement. Despite the experience and the available know-how, some EU and most EnC countries face difficulties to properly and effectively **enforce the regulatory measures**

for EE. On the other hand, awareness among energy users increases and the demand for EE solutions grows.

There are a number of instruments and measures in the EU Member States and EnC Contracting Parties for promoting EE in the industrial sector. However, certain barriers, such as access to financing, lack of information and knowledge, inadequate skills of industry's personnel, still hinder the application of EE investments. **Provision of financial incentives (grants, subsidies) used to be (and still is) the most dominating instrument** in industry. Approximately, half of the policies addressing EE in industry can be attributed to this type of measure. The trend however is **to gradually phase out the grants and subsidies that are not sustainable and entail high social cost and replace them with more market-based instruments and legislative measures**. However, a small grant/subsidy component is usually included in other, market-based instruments. **Easier access to EE financing** is a well-established and growing instrument, through EE Financing facilities, EE Funds and ESCOs. **Voluntary agreements are considered a popular policy instrument** for the industrial sector, especially in developed countries since the 1990s; however only a few countries have solid experience with its implementation.

The current trend for new policy instruments is to promote:

- the **establishment of EnMS**, and certification according to ISO 50001;
- **voluntary agreements** and networking between industry based on commitments to achieve energy savings and/or to establish coordinated EnMS and share resources and knowledge;
- **mandatory energy audits**, EE obligations and other legislative/regulatory measures triggered also by the EED; and
- **"innovative" financing mechanisms** (innovative in the sense that these mechanisms are now widely applied, though they are known since many decades).

EnC Contracting Parties that started the EE effort much later than EU Member States can benefit from the vast EU policy experience, know-how, availability of EE technologies and best practices in the market. However, **enforcement of the EE legislation requires significant institutional strengthening, development of local know-how and awareness raising** that must be done locally in each country. The significant technical and financial assistance provided so far, helped to a certain extent towards this direction, but the key role in EE improvement is with the local authorities and the local market players.

3 Component 2: Critical analysis of the EE framework in Georgia and Azerbaijan / gap analysis

The **aim of Component 2 report** is to:

- conduct an overview of the EE framework in force in Georgia and Azerbaijan, focussing on their industrial sectors;
- carry out an in-depth appraisal of the relevant legal, regulatory, and policy instruments in both countries against the backdrop of the prerogatives set in the EE acquis with the aim to identifying existing gaps that required to be filled in;
- elaborate concrete recommendations for improvements on the existing EE framework in the Georgian and Azeri industrial sector; and
- set in motion the process of cooperation and exchange of best practices between the two

countries through collaborative actions and joint initiatives for EE.

3.1 Review of the current legislation and policies on EE in the industrial sector in Georgia

Georgia has recently joined the EnCT as a **Contracting Party. All EnC Acquis, including this related to EE, must be transposed and implemented**.

Currently Georgia, supported by EBRD Technical Assistance, elaborates the draft **EE Law**, transposing the EED. In addition, the country is currently in the **final stages of adopting a NEEAP**, which has been elaborated in accordance with the provisions of EED. The NEEAP specifies the primary policy measures that can effectively address EE in industry, such as:

- incentivising / mandating EE in industry, which is expected to stimulate interest and improve the financial case for investment even beyond the strong financial parameters present;
- training and education, including energy advisory programmes, which will educate industry's decision-makers on investment options;
- qualification, accreditation and certification schemes, and potentially to EE investment schemes, which are anticipated to increase the level of certified expertise in the industrial sector to better enable investment planning and implementation; and
- mandatory energy audits / EnMS in large industries, and schemes that encourage them in SMEs.

Furthermore, the draft NEEAP includes:

- the improvement of the statistical data on industry production and energy consumption;
- the linking of energy audits to investments in this sector, which has technical assistance requirements; and
- the making of investments from industry – via a credit line, bank financing, or other financing sources of a total EUR 106 million from 2017 to 2020.

However, apart from the draft NEEAP, **Georgia has not yet put in place any particular EE legislative framework,** let alone any legislation specifically targeting EE in industry. However, **references to the need to improve EE are scattered across a number of legislative acts**.

The **primary State central bodies** in charge of drafting, implementing and monitoring compliance with EE related legislation and policies are the Ministry of Energy, the Ministry of Economy and Sustainable Development and the Ministry of Environment and Natural Resources. A **Department of Energy Efficiency and Renewable Energy** within the Ministry of Energy **has been recently set up** with responsibility to design the necessary EE strategic policies and actions plans in line with the relevant EU legislation. The duties of the **Ministry of Economy and Sustainable Development** include the promotion and coordination of EE activities in the industrial, construction and transport sectors and the preparation of any EE policy and standards for these sectors.

3.2 Assessment of compliance of Georgia with EU norms relating to EE in industry

Georgia lacks a sound regulatory framework to support EE investments in industry, since the current legislative regime does not fully address the needs for establishing an effective EE market. In more detail:

- **Georgia has not formulated a comprehensive strategic vision for the medium- to long-term direction of its energy policies and implementing mechanisms** in line with the country's long-term economic outlooks; as a result, EE, especially in industry, is not well integrated into the broader policy framework of economic development;
- **there does not exist at present any primary or secondary legislation on EE**;
- **the EE legislative references are of a very general nature** and do not systematically set out the horizontal national EE policy objectives and instruments;
- **the present framework does not provide for a lucid and coherent institutional structure and responsibilities regarding the implementation of the EE initiatives** envisaged in the NEEAP. This is especially the case of the industrial sector as the relevant competences seem to be divided between the Ministry of Energy and the Ministry of Economy and Sustainable Development;
- there are **no specific EE measures in the NEEAP related to energy labelling, the promotion of ESCOs**, etc.;
- **no proper incentives and support or voluntary mechanisms for EE in industry have been set up**;
- **no concrete scheme for sanctions** exists to penalize any breach of EE obligations;
- there is **not in place any monitoring mechanism** for appraising any progress made with the implementation of EE policies and measures.

As a conclusion, **Georgia has yet to develop a sound EE strategy and pertinent regulatory framework for EE in its national industrial sector that is compatible with the corresponding EU standards**.

3.3 Recommended policy initiatives for further uptake of EE in the Georgian industrial sector

Potential policy initiatives recommended by the Study Team that could be undertaken by the Government of Georgia (GoG) are:

- the improvement of the **existing legislative framework**;
- the refinement of the **present institutional framework** for industrial EE;
- the introduction of **certain key policy initiatives**, which will motivate or even oblige, industrial enterprises to initiate the installation of EE measures;
- the formulation of **fiscal and financial EE instruments**;
- the formulation of **information and capacity building policies**; and
- the **monitoring and evaluation** of the policies / initiatives to be implemented.

Each initiative is analysed in brief below.

3.3.1 Improvement of the existing legislative framework

The Study Team recommends that one of the necessary actions is the **preparation by the GoG of the primary EE legislation** so that the country can meet its commitments under the EnCT and the EU Association Agreement and achieve the goals set out in the NEEAP. In this respect, the first step is the **adoption of an EE Law**, which will transpose the EED. As aforementioned, **Georgia is in the process of drafting - with EBRD's assistance - an EE Law**, which will be compliant with the requirements of the EED. However, this Law should be complemented with the adoption of all the necessary secondary acts, which will further elaborate the legal, regulatory and financial mechanisms, and specify clear and enforceable technical rules for the implementation of EE investments in industry. In addition, it will be necessary that the GoG commences the process of gradually transposing a number of pieces of EU legislation (i.e. the Industrial Emissions Directive, the Eco-design Directive and the Energy Labelling Directive and the IPPC Directive 2008/1/EC), whose implementation is expected to have a very favourable impact in the area of industrial EE.

Last but not least, the Study Team deems it imperative that the gradual transposition of the EU legislation should be accompanied by their **effective and transparent enforcement by the competent State bodies**.

3.3.2 Refinement of the present institutional framework

At present, aspects of the EE policies relating to the Georgian industry are **split between the Ministry of Energy,** which has overall charge of the national EE framework**, and the Ministry of Economy and Sustainable Development**, which is, *inter alia*, responsible for matters relating to sustainable development and green economic growth of the country and the promotion and coordination of EE activities in the industrial sector. However, the Study Team recommends **designating a single authority** in charge of industrial EE policies and measures.

Another topic that will need to be investigated concerns the potential **designation of a dedicated national Energy Efficiency Agency**, which - as an autonomous public body - will be in charge of stimulating EE investments in all sectors of the domestic economy (including in industry) and push forward the implementation of EE improvements.

3.3.3 Introduction of other key policy initiatives

Other policy initiatives recommended by the Study Team to be implemented are:

- the improvement of the collection and processing system of industrial data;
- the carrying-out of energy audits by industrial operators;
- the establishment of an accreditation and certification system for energy auditors;
- the adoption and implementation of internationally accepted standards on energy auditing and energy management;
- the introduction of sub-metering requirements for industrial facilities;
- the imposition of minimum energy performance standards (MEPS); and
- the development of industry-wide EE groupings and networks.

3.3.4 Formulation and implementation of fiscal and financial EE instruments

The policy initiatives outlined above are unlikely on their own to increase the flow of EE investments in the Georgian industry. Therefore, the Study Team recommends to the GoG that these initiatives should be accompanied by Government-supported central targeted programmes of **fiscal and financial nature,** such as:

- **subsidies** or **grants** provided by programmes that are to be developed by the competent State authorities to carry out energy audits, to use other energy services and/or the purchase of EE related equipment and products;
- provision of long-term low or free-interest **loans** provided by local financial institutions, preferably with the financial assistance of international financial institutions;
- investment **credits** or State-backed **guarantees**, supporting the implementation of EE upgrades or for adopting proven EE technologies by industrial operators; etc.

Financial support will also be needed in order to provide technical training and capacity building to various stakeholders' groups, support the research, development, demonstration and deployment of EE technologies, including the carrying-out of pilot projects, improving information dissemination and raising general awareness on the benefits of EE investments in industry. On the other hand, **fiscal policy initiatives** provided by the GoG could include the granting of **tax refunds, deductions, rebates or profit-tax credits** to industry and/or original equipment manufacturers.

However, since State-backed support schemes are unlikely on their own to sustain the long-term viability of EE investments, the GoG will eventually need to promote the use of specific market-based energy policy initiatives, like **the gradual development of the energy service sector through the promotion of ESCOs** and **energy performance contracting (EPC)**.

3.3.5 Formulation of information and capacity building policies

The Study Team considers vital to **improve the know-how and capabilities of the Georgian industrial companies** so as to develop and implement effective EE programmes, as well as to increase the capacity of energy auditors, original EE equipment manufactures and technology vendors as well as of the banking and financial sectors. Such capacity building activities in the form of **training activities, workshops, discussion platforms, working groups, etc. will need to be formulated and implemented** not only by the competent State authorities, but also through international agencies and donors, IFIs and international partnerships.

More importantly, the Study Team strongly suggests to the GoG that their implementation is supplemented with the execution of well-focused **small demonstration projects**, so that industrial companies can gain tangible practical experience on energy auditing and energy management.

3.3.6 Monitoring and evaluation of the policies and initiatives to be implemented

In order to accurately screen and appraise progress, **it would be useful** that the State authorities responsible for EE industrial policies (the Ministry of Energy and the Ministry of Economy and Sustainable Development) **adopt a measurement mechanism** that will weigh up the implementation success of each specific implemented initiative in specific time horizon (for instance, in a 5-year lifecycle up to 2023).

3.4 Review of the current legislation and policies on EE in the industrial sector in Azerbaijan

The Republic of Azerbaijan - like Georgia - is still **lacking any specific national law regulating EE investments**, but EE considerations are included in several pieces of legislation.

The most important piece of primary legislation is the **Law on the Use of Energy Resources**

(adopted in 1996). This Law enumerates a series of guiding principles governing State policy on the use of energy resources, which are required to be premised on the:

- implementation of financial and administrative regulatory measures aimed at reducing energy consumption;
- establishment of mechanisms to improve EE in energy production, transmission, supply and use;
- adoption of energy savings' and EE norms and standards;
- conduct of mandatory energy audits for new and rehabilitated buildings;
- imposition of economic sanctions in the event of any breach of obligations;
- raising of public awareness on the benefits of energy savings;
- provision of education and training in energy conservation matters;
- promotion of international cooperation in the field of energy savings; and
- introduction of incentives for the application of new energy saving technologies.

It also **requires the carrying-out of State energy audits** and the implementation of monitoring and control mechanisms[1]. In addition, the Law advocates the establishment of an **EE Fund**, which is proposed to be financed by non-State budget, with the aim to funding research and development, to promoting new EE technologies and to subsidizing EE programmes implementation.

Another major legislative act is the **Law on Energy (adopted in 1998)** that stipulates that one of the principal State policies relating to the functioning of the national energy market involves the efficient extraction, production, transport, distribution, storage, use and security of energy as well as the conservation of energy resources and the efficient use of energy and the use of RES. It needs to be noted that Azerbaijan has **prepared a draft Law on Energy Efficiency** that was developed with EU budget support in 2012, but it has not yet been incorporated into the national legal order.

The Cabinet of Ministers is the central and highest executive authority responsible for directing and co-ordinating the activities of all competent State bodies and institutions, including the design and implementation of the energy policy, together with matters pertaining to EE issues. The **Ministry of Energy** constitutes the main State body that is in charge of ensuring the implementation of the State policies related to the national energy sector. As regards the development and implementation of the State EE policies, the **Department of Energy Efficiency, Alternative and Renewable Energy Sources of the Ministry of Energy,** is in charge.

3.5 Assessment of compliance of Azerbaijan with EU norms relating to EE in industry

Azerbaijan is a country with an energy intensive economy that is fuelled by its oil and gas deposits and in which **EE technologies have not at present any momentous market penetration**.

Despite that the current legislation sets out a general system for promoting energy conservation, **a coherent and concrete EE strategy at both policy and regulatory levels is still missing**. More specifically, the following weaknesses have been identified:

[1]There is not any time framework during which such audits would be undertaken. It seems that such audits are not in practice carried out.

- **there is not yet in place any law that lays down a fully adequate set of common rules in the field of EE**;
- **references to EE obligations are diffused in a number of different and disparate legal acts** and State programmes and have failed to establish an effective regulatory structure for the implementation of EE investments;
- the **enforcement of the legislation currently in place remains challenging**, largely due to the lack of well-elaborated secondary legislation on EE projects. **More vitally, even enacted legislative provisions are not implemented**;
- unlike in Georgia, **no consolidated national EE Action Plan has been prepared**;
- **there is not a clear and sound institutional EE framework** that specifies in detail the respective mandate and duties of the competent State bodies;
- **the EE measures** contemplated in the present legislation are **characterised by weaknesses in terms of the degree of their implementation details**: for instance, little guidance is provided respecting the metering of the energy consumption in industry. More importantly, monitoring of compliance with existing EE obligations and standards is at the best sketchy, especially as regards State inspections related to the energy use in industry;
- the **system of accounting energy consumption is inaccurate**, which makes it difficult to assess the need for EE improvements; and
- **no verification and reporting regime exists** that allows for monitoring progress made with the implementation of envisaged EE policies / measures.

The conclusion is that Azerbaijan's regulatory legislative framework governing EE investments in industry is not compatible with the relevant EU norms. There exist **limited and inadequate enforcement of the relevant EE obligations** and, allied to that, **the lack of a coherent national EE strategy** coupled with the largely obsolete legislation, which is at present in force, necessitates the adoption of more integrated approach in the area of industrial EE at both the regulatory and policy implementation levels.

3.6 Recommended policy initiatives for further uptake of EE in the Azerbaijan's industrial sector

Potential policy initiatives recommended by the Study Team that could be undertaken by the Government of Azerbaijan (GoA) are:

- the carrying-out of an **industry-wide review on energy end-use**;
- the enactment of specific **EE legislation**;
- the improvement of the present **institutional set-up**;
- the development of a **State Programme** for the promotion of EE in industry;
- the imposition of **EE obligations on industrial operators**;
- the introduction of **specific EE measures**;
- the facilitation of the establishment of **industrial clusters to enhance EE**;
- the **design of incentives' packages** for implementing identified energy savings opportunities in industry;
- the **development of capacity building and training activities** on industrial EE; and
- the **management and monitoring** of the planned EE policies.

Brief analysis for each initiative is provided below.

3.6.1 Carrying-out of an industry-wide review on energy end-use

Since there are no accurate data and information on industrial energy consumption, an initial step towards the design of an EE policy in industry could involve the undertaking of a **scoping study** by the Government, which will provide a broad overview of how the various segments of the national industry currently operate and perform. The study is recommended to include benchmarking against both in-country and international examples and should aim to identify those sub-industries that will most benefit from the implementation of EE measures. In this connection, a **number of energy audits could be undertaken** by State-owned industrial operators so as to gain a preliminary understanding of the benefits for implementing EE improvements. The **scoping study should also specifically consider certain vital financial issues**, such as the actual availability of State-backed funding for EE investments in industry, the relevant taxation regime and the ability of industry to finance on their own EE investments.

3.6.2 Enactment of specific energy efficiency legislation

The Study Team recommends that the present regulatory framework should be strengthened through the **consolidation of the existing and disparate laws that affect EE investments into a single legislative act**. This act could be based on the current draft EE Law or be an entirely new legal act. It **must also serve as legal basis for drafting and adopting any secondary legislation, operational instructions, tools, standards and procedures** that are necessary to implement the Law's provisions.

3.6.3 Improvement of the institutional set-up

The proposed EE Law should define and organize the institutional structure within the Government by designating the State bodies and authorities, which will be in charge of planning, executing and monitoring EE policies and programmes. The Study Team recommends that **the leading responsibility for EE issues should be the Department of Energy Efficiency, Alternative and Renewable Energy Sources** of the Ministry of Energy.

In the longer-term, though, the GoA may consider to eventually setting up **a dedicated agency**, which will be responsible for the implementation of EE policies and national and local EE State programmes and action plans.

3.6.4 Development of a State Programme for the promotion of EE in industry

The Study Team recommends that the GoA prepares a national programme for the uptake of EE measures by the local industry. The programme is recommended to **initially target key industries** that need to reduce energy consumption, concentrating particularly on **energy intensive industrial operators** with large capital investment requirements for machinery and change of outdated equipment.

3.6.5 Imposition of EE obligations on industrial operators

The Study Team recommends that the GoA should consider the **placement of specific requirements on industrial operators** that will compel them to improve the efficiency levels of their respective facilities. Such compulsory obligations may be the following:

- Implementation of **EnMSs** by large industrial companies; a widely acceptable national standard to put in force is **ISO 50001**. In parallel, a **certification body** will need to be designated by the Government, which will formulate and implement the process that will assess the compliance of industrial operators against the minimum requirements of the adopted EnMS standard;
- Mandatory **engagement of energy managers** by large energy intensive enterprises. However, it is also crucial that the Government puts in place a corresponding certification,

accreditation and/or equivalent qualification scheme for engineering professionals wishing to become energy managers, since **currently there are not available competent human resources** experienced to handle the energy manager's functions.

3.6.6 Introduction of specific EE measures

The previously described obligations that are proposed to be imposed on industrial operators will need to be strengthened with the implementation of additional requirements, which could involve:

- the carrying-out of energy audits by industrial operators on a voluntary basis at least with this measure gradually becoming mandatory for large industrial companies;
- the designation by the Ministry of Energy of the basic principles and quality requirements guiding the process of energy auditing in industrial facilities;
- the design of support measures for industrial SMEs to cover costs of an energy audit;
- the establishment by the GoA of an accreditation scheme for energy auditors;
- the development by the Ministry of Energy of streamlined methodologies for energy savings calculations;
- the adoption by the Ministry of Energy of internationally recognized procedures for the ex-ante monitoring and verification of such savings;
- the adoption by the local industry of standardized full cost accounting systems for industrial EE investments;
- the introduction by the GoA of mandatory minimum performance standards for a range of industrial energy consuming equipment; and
- the design and implementation by the Ministry of Energy of a labelling scheme for the products produced by each industry in terms of their efficient use of energy and their energy footprints.

3.6.7 Facilitation of the establishment of industrial clusters to enhance EE

Another possibility that might be explored by the GoA involves the assessment of the formation of **industrial clusters**. From international experience, a cluster structure can effectively incite the participating organisations to adopt more efficient technologies and implement energy savings' interventions that can jointly be acted upon so as to minimize production costs and achieve higher productivity and greater competitiveness.

3.6.8 Designing of suitable incentive package(s)

The aforementioned policy priorities should be synergized with **fiscal and tax benefits**, which would be elaborated by the GoA and competent State bodies (e.g. the Ministry of Energy and the Ministry of Finance) to render more financially attractive any proposed EE investments. **Taxation measures**, on the other hand, could be applied to a wide variety of taxes and duties and may take the form of some indirect subsidy, a tax relief, deduction, rebate or investment tax credit.

It would also be pertinent for the GoA to **consider setting up an EE Fund** with appropriate guidelines and governance structure to focus entirely on the financing of EE investments. In addition, like in Georgia, suitable market-oriented instruments (e.g. ESCOs) should be gradually developed under the guidance of the Ministry of Energy that will help self-finance EE measures.

3.6.9 Development of capacity building and training activities on industrial EE

The capacity building measures selected to be implemented by the Ministry of Energy should be geared at improving both internal capabilities (the abilities and know-how of the staff of the national industrial operators regarding, especially, the quality of energy management within the relevant enterprise) as well as external ones (involving outside stakeholders, such as energy

auditors and EE specialist consultants, equipment providers and installers as well as local banks and financial institutions).

On top of that, the Study team recommends that the Ministry of Energy **combines** all these capacity building and training activities **with high-profile information dissemination and educational campaigns**, which will scale up public awareness of the benefits of EE gains.

3.6.10 Management and monitoring of the planned EE policies

The proposed policies, initiatives and programmes to be developed, should be regularly monitored and evaluated in order to ensure their efficient and effective carrying-out. In this respect, the Study Team recommends putting in place a scheme to assess the level of implementation of the various policies and measures, which should be constantly updated and revised, as the need arises. It is anticipated that the Department of Energy Efficiency, Alternative and Renewable Energy Sources of the Ministry of Energy will be the key State body to manage and supervise the proposed scheme's implementation and coordinate activities with all other competent State bodies and authorities.

3.7 Recommendations on collaborative initiatives that can be undertaken by Georgia and Azerbaijan in the field of industrial EE

Even if Georgia and Azerbaijan are neighbouring countries, **their EE sector is at a different level of development**. Georgia is a Contracting Party to the EnCT and all EnC *acquis* related to EE must be transposed and implemented, while Azerbaijan is not a Contracting Party and at the moment does not plan to accede to the EnCT. On top of that, Georgia is an importer of energy, while Azerbaijan is fully supplied from locally available energy sources and is a net exporter of oil and natural gas, particularly to European markets.

On the other hand, both countries are members of the Energy Charter Treaty and the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA) that support cooperation in the area of EE. Additionally, both countries are members of the Eastern Europe Energy Efficiency and Environment Partnership (E5P) and are participating in the EU4Energy initiative, which supports the elaboration and implementation of energy policies that reduce their energy dependence and intensity. Furthermore, a number of donors such as the EBRD, the World Bank and USAID are active in both countries, offering technical assistance in the energy sector.

Taking the above aspects into consideration, the **development of a joint EE centre is not proposed** due the different state of development in the EE sector between both countries. On the contrary, the Study Team considers **more rational and effective the development of:**

- either a **mutually agreed high-level coordination structure** to promote EE in their respective national industrial sectors, or
- a looser type of collaboration, such as a **joint international platform**, which will primarily aim at improving knowledge, developing exchanges of information, sharing best practices and evaluating experiences.

The **mutually agreed high-level coordination structure** will need to be implemented by means of an **Inter-Governmental Agreement** that will enumerate in detail the framework for cooperation through the selected formalized structure. A structure of this type is envisaged to encompass a

single dedicated inter-governmental body (e.g. in the form of a **Steering Committee**), which will be in charge of direct bilateral policy dialog on EE topics with the aim to reinforcing institutional and regulatory capacity of the competent State authorities in both countries.

The **joint international platform** could be based on a **Memorandum of Understanding** that will be signed by the Governments of both countries and which will be mainly directed at facilitating the mutual sharing of information, expertise and good practices on a variety of EE matters.

Independently of the form of cooperation between Georgia and Azerbaijan, the scope of activities and initiatives undertaken could be extremely wide and diverse; such initiatives could include:

- identifying priorities of cooperation between the two countries in the domain of EE and considering proposals for further development of the cooperation;
- introducing new legislative and policy initiatives in enhancing EE, especially in the industrial sector, at the national level;
- improving knowledge on EE matters, particularly in industry, by means of common measurement tools and methodologies coupled with the promotion of joint comparative analysis and related relevant indicators;
- establishing tools, for instance a knowledge bank of different EE measures and practices, to enhance energy conservation and to reduce energy intensity;
- examining ways to jointly promote data sharing in the area of EE;
- organizing peer reviews to follow progress in the implementation of EE measures;
- encouraging consumers' EE by supporting the use of energy-efficient products through the implementation of internationally recognized energy labelling and eco-design requirements.

Other initiatives that could be implemented are the organisation and conduction of **common promotional and awareness raising activities**, such as high-level workshops, seminars and business to business meetings. Stakeholders that could participate may be government agencies, universities, research centres and technological organisations with the scope to exchange information on EE issues and share best practices from both countries. In addition, design and organisation of **common training activities** could also be undertaken.

Last but not least, another important joint initiative that could be organised is the **implementation of energy audits and EnMSs according to ISO 50001**, especially in the industrial sector of both countries. This initiative could be organised in a framework of a common programme and include the development of common non-binding guidelines and/or streamlined principles and even handbooks of good practice and trainings for energy audits and the development of EnMS.

Especially, the Study Team recommends that **the EnMS concept, according to ISO 50001 could also be disseminated to the other countries of the Eastern Partnership** through common trainings, exchange of guidelines and good practice handbooks.

4 Component 3: Review of the energy use of the industrial sector in Georgia and Azerbaijan and implementation of "walk-through" energy audits in typical industries

The **aim of Component 3 report** is to:

- Present data on energy consumption in the industrial sub-sectors of both countries and identify the most energy consuming sub-sectors;
- Conduct five walk-through energy audits in SMEs in both countries and propose targeted EE measures based on the respective findings;
- Propose a catalogue of energy saving possibilities of horizontal nature, applicable to the industrial sector of both countries;
- Elaborate concrete recommendations / proposals to promote the EE concept, focusing mainly to SMEs.

4.1 Energy consumption in industry

4.1.1 Georgia

The industry sector plays an important role in the development of country's economy. Georgian industry however is not a large energy consumer; the industry consumed 22% (i.e. 10.5 TWh) of total energy consumed in Georgia in 2014. The most energy consuming sectors are:

- **Non-metallic minerals**, representing almost 39% of total energy consumption;
- **Iron and steel**, representing almost 37%;
- **Food, beverages and tobacco**, representing 8.5%[2]; and
- **Construction,** representing 6.6%.

These sub-sectors altogether stand for approximately 90% of the total energy used.

4.1.2 Azerbaijan

The country is almost fully supplied from locally available energy sources emphasizing on hydrocarbons. The industry is one of the most developed sectors in Azerbaijan. The most energy consuming sector is the household sector (40.5% of the final consumption) followed by the industry and construction (24.9%) and transport (23.6%) sectors. In 2016, the final energy consumption reached 1,563.5 ktoe or 18,184 GWh. The most energy consuming industrial sectors are:

- **Food and tobacco**, representing almost 26% of total energy consumption;
- **Chemical and petrochemical**, representing approximately 25.5% of total energy consumption;
- **Non-metallic minerals**, representing approximately 22%; and
- **Construction**, with a share of almost 11% in the total energy consumption.

4.2 Energy audits in SMEs in Georgia and Azerbaijan

The Study Team performed walk-through energy audits in 5 industries, taking into consideration

[2] According to the NEEAP report, the Food, Beverages and Tobacco sector is considered under-reported in the official energy balance.

criteria such as **replicability of the EE measures proposed, effectiveness of the audits** (more effective to audit an SME rather than a large industry) **and acceptance** / **data availability.** In **Georgia**, the industries that were selected belong to the sectors of food & beverage (2 industries) and paper manufacturing (1 industry). In **Azerbaijan**, the 2 industries were energy audits performed belong to the sectors of manufacturing of wood products and manufacture of plastics.

4.2.1 Energy audit findings

The main findings identified were: lack of financing, limited policies and enforcement, limited information (in some cases limited knowledge), low level of management awareness on EE and obsolete and inefficient equipment.

4.3 Energy efficiency measures applicable to industries in Georgia and Azerbaijan

The EE measures proposed for the industrial sectors in Georgia and Azerbaijan refer to cross-cutting / horizontal EE technologies instead of EE technologies in each industrial process, since each industrial sector has specific process lines and the EE measures that can be applied are sector-specific, more complex in nature and require major investments.

The EE measures proposed are presented in Annex II and refer to the following fields / technologies:

- Electricity supply and consumption;
- Steam generation and distribution;
- Compressed air;
- Electric motors;
- Pumps;
- Lighting systems;
- Industrial refrigeration and cooling;
- Furnaces, kilns and ovens;
- Monitoring & Targeting and EnMS.

4.4 Recommendations

The proposed recommendations by the Study Team are in line with the proposals developed in Component 2 report. These are the following:

Development of capacity building and training activities on industrial EE

The lack of knowledge and information on the benefits of EE investments was one of the major problems identified from the discussions with the management of the SMEs. In this respect, the Study Team recommends the **implementation of capacity building activities** to increase the awareness on the benefits of EE investments.

Such capacity building activities can be in the form of training activities, workshops, discussion platforms, working groups, etc. Topics may include technical as well as financial aspects such as energy auditing procedures, M&V techniques, EE technologies, financial appraisal tools, and will need to be formulated and implemented not only by the competent State authorities, but also through the international agencies and donors, IFIs, etc. Capacity building activities will create a

number of highly skilled experts that can provide the necessary technical assistance for industrial facilities to identify and develop EE improvement projects.

Improvement of the existing legislative framework and introduction of key policy initiatives

The lack of effective EE policies targeting the industrial sector is noted in both countries; therefore, it is proposed for **Georgia** to develop the primary EE legislation so as to achieve the goals set out in the first NEEAP. The first step is the adoption of the EE Law, which will transpose the EED. On the other hand, in **Azerbaijan,** the State authorities should focus on the consolidation of the existing laws that affect EE investments into a single legislative act. This act can serve as legal basis for drafting and adopting any secondary legislation in relation to EE. Other key policy initiatives that can be applied in both countries are:

- adoption and implementation of internationally accepted standards on energy auditing and energy management;
- implementation of EnMS by large industries based on widely acceptable standards, such as the ISO 50001;
- conducting energy audits by industrial operators;
- establishment of an accreditation and certification body for energy auditors;
- imposition of MEPS on industrial operators;
- development of industrial clusters / networks on EE.

Formulation of fiscal and financial EE instruments

All stakeholders who have been interviewed mentioned that the **lack of financial resources** and **access to financing** is the most common barrier for EE investments. In this respect, the Study Team recommends for both countries to support industries with targeted programmes of fiscal and financial nature, such as:

- **subsidies** or **grants** to carry out energy audits;
- the provision of **loans** to cover part of the capital cost of some EE interventions;
- investment **credits** or State-backed **guarantees** for the implementation of EE upgrades;
- **tax refunds, deductions, rebates or profit-tax credits**.

Financial support from State authorities and international financial institutions **will also be needed in order to provide technical training and capacity building to various stakeholders' groups** (EE consultants, local financial institutions, industry, etc.), support the research, development, demonstration and deployment of EE technologies, including the realisation of pilot projects, improving information dissemination and raising general awareness on the benefits of EE investments in industry.

Monitoring of the implementation of policies and measures

The Governments of Georgia and Azerbaijan should develop policies, initiatives and programmes with specific time horizons in order to support the implementation of EE measures in industry and especially in SMEs. However, **monitoring of these policies and programmes is an important aspect** so as to accurately assess and track the progress on the level of their implementation. The Governments of both countries will play a decisive role in this respect. They should allocate responsibilities to authorized state institutions involving in parallel relevant state institutions, local self-governments, EE centres, industry associations and other stakeholders. The Study Team recommends making the monitoring system obligatory in Georgia since Georgia has joined the

EnCT in 2017 as a Contracting Party and all EnC Acquis, including the EED (which contains obligations to monitoring and reporting requirements), must be transposed and implemented. The monitoring system is also proposed to be established in Azerbaijan, even if the country has no obligations yet to adopt the EU EE acquis.

Annex I – Key instruments in selected countries for promoting EE in industry

Key policy / instrument	Policy type	Main points
Germany		
Energy Efficiency Fund	Financial (grants, subsidies)	> Two programmes are included in the Fund that refer to the promotion of energy efficient horizontal and process technologies > Provision of investment grants up to 30% of the investment costs if the energy savings achieved are at least 25% compared to the old system
Promotion of EnMSs	Financial (grants, subsidies) & Legislative	> Support of the initial certification of either an EnMS (fulfilling EN ISO 50001) or an energy monitoring system > The funding is in the form of grants providing up to 20,000 EUR per industrial company
Obligation of energy audit for large companies	Legislative	> The scheme obliges **large enterprises** to undertake energy audits until 5th of December 2015 and after that, at least every 4 years, in accordance with the energy audit standard EN 16247-1 > Companies already implementing, in accordance with the ISO 50001, an EnMS or an Environmental Management System are excluded from the obligation
Energy audit funding scheme	Financial (grants)	> The program, operated by KfW, supports initial and detailed energy audits in industry > The funding is in the form of grants providing 60-80% depending on the type of the energy audit
Energy tax	Financial (subsidies)	This tax can be avoided by energy intensive industries in case they follow a voluntary agreement and/or introduce a certified EnMS
Energy Efficiency Networks Initiative	Voluntary agreement / Networking	> The initiative is a concept targeting EE in companies from different sectors with common horizontal technologies > The procedure is to establish a network of companies, identify profitable EE measures (through data collection and energy review), make an agreement on the energy and CO_2 targets to be achieved, perform network meetings with the other participants and exchange experience (which is a central success factor)
Denmark		
Voluntary Agreement Scheme for EE	Voluntary agreement & Financial (tax relief)	> Applicable to energy intensive industries > The immediate benefit is an energy tax relief to the participating industries > Obligations are to implement a certified EnMS according to ISO 50001, carry out special investigations and projects focusing on their primary production processes and implement all EE projects with a simple payback period of up to 4 years
Energy Efficiency obligation scheme for utility companies	Market based	> Utility companies should support energy savings efforts in all sectors and recover the costs of the savings through the tariffs imposed on the energy bills of the consumers

Key policy / instrument	Policy type	Main points
		>Launched in 2006 (long time before the adoption of the EED) with an annual target to implement energy savings of 12.2 PJ per year from 2015 until 2020
Energy audit and management system	Legislative	The scheme obliges large enterprises to undertake energy audits every 4 years
Renewable energy for production processes	Financial (grants, subsidies)	Set up of a subsidy scheme to industries so as to convert to RES or District Heating by replacing fossil fuels and investing in EE measures
Centre for energy savings in industry	Informative / educational	Set up of a centre to identify and exploit the EE potential already existing within primarily SMEs
International cooperation on EE in industry	Voluntary agreement & Informative / educational	Cooperation agreement with China and set up of a Low Carbon Transition Unit (allocating a total of DKK 20 million to the Unit) to assist the Chinese industrial sector in achieving lower emissions
Romania		
Grant-supported credit lines (EE Financing Facilities)	Financial (access to financing, grants)	>3 credit lines operated in the country (with a grant component) >Provision of support to industrial companies to implement EE investments in the form of free technical consultancy, loans and grants
Romanian Energy Efficiency Fund	Financial (access to financing, loans)	>The Fund, which is a financing institution, assist industrial companies and other energy consumers to adopt modern EE technologies >The assistance is provided in the form of loans
Energy audit and energy management	Financial (grants) & Legislative	>Obligation to economic operators whose annual consumption exceeds 1,000 toe to appoint an energy manager, carry out an energy audit every year and develop EE programs including measures on short, medium and long term >Financing of EE projects is performed through the Romanian Energy Efficiency Fund
RO 05 “Energy Efficiency” Program	Financial (grants, subsidies)	>Financed by the Financial Mechanism of the European Economic Area (EEA, 2009-2014) >The program financed EE investments in industrial SMEs >The total value of the subsidy/grant amounts to 8 million EUR plus a share of 15% co-financed from national funds
Croatia		
Industrial Energy Efficiency Network (IEEN)	Voluntary agreement	>Active in Croatia since 1997 >Link of energy consumers, experts, state institutions and other interested parties >The basic objective is to increase the awareness and knowledge of the management and employees of the industries towards EE >Activities include: recording consumption, development of tools, demonstration projects, establishment of energy management, etc.
Environment Protection and Energy Efficiency Fund (EPEEF)	Financial (grants, subsidies)	>Established in 2003 as a non-budgetary institution >EPEEF finances the preparation, development and implementation of programmes, projects in the fields of environmental protection, waste management, EE and use of RES. For industry, co-financing is provided for performing energy audits, as well as introduction and certification of EN ISO 50001

Key policy / instrument	Policy type	Main points
		> Financing is secured through environmental charges and is allocated to legal and natural persons through loans, subsidies, financial aid and grants
High-efficiency cogeneration	Financial (grants, subsidies) & Legislative	In addition, to the system of incentives for the production of electricity from high-efficiency cogeneration, this measure also includes the adoption of appropriate regulations for stimulating the production of heat from cogeneration
Introduction of efficient electric motor drives	Financial (grants, subsidies) & Legislative	> This measure can achieve electricity savings exceeding 16% and financial savings exceeding 10% > The source of financing is expected to be included in the detailed work programme of the IEEN
Energy audits for SMEs	Financial (grants, subsidies) & Informative / educational	Provision of financial support to SMEs to introduce and implement EE measures, and primarily for conducting energy audits and introducing EnMSs
Serbia		
EnMS for large energy consumers in the industry sector	Financial (grants, subsidies) & Legislative	> Requirement to organisations to conduct energy audits at least every 5 years > Funds for the implementation of the EE measures are provided by: > a designated organisation from its own funds > favourable credits disbursed by International Financing Institutions (IFIs) > the Budget Fund for EE and > loans extended by commercial banks or other sources
Incentive rates for the use of highly efficient Combined Heat & Power (CHP) generation in the industrial facilities	Financial (incentives)	Industries are entitled as privileged electricity producers and have an incentive purchase price for electricity delivered
Mandatory regular control of the combustion process of boilers and other combustion chambers with capacity over 20 kW, and air conditioning systems with capacity over 12 kW	Legislative	> The Law stipulates the obligation of the owners to perform regular control of the combustion process of boilers / air conditioning systems > The Mining and Energy will establish the procedure of authorisation of persons eligible to perform these activities
FYR of Macedonia		
Project INDEF: Energy Management	Informative / educational & Voluntary agreement	> The aim is to develop a structure which liaise large groups of energy consumers from industrial, public and commercial service sectors and connects them with expert and national organisations for the realization of EE measures > It provides support to industries through implementation of an energy audit scheme
Introduction of efficient electric motors	Financial (access to financing, subsidies)	Support is provided through the provision of access to soft loans for the purchase of EE equipment of this type
Waste heat utilization/ Clean Development Mechanism (CDM)	Financial (grants, subsidies) & Legislative	> The aim is to support the waste heat utilization in industrial SMEs > Supporting actions are: > launch of a programme for small scale projects

Key policy / instrument	Policy type	Main points
		(not qualifying for CDM) and creation of a mechanism for control of projects' implementation > provision of financial incentives
Project COGENPRO: Cogeneration	Financial (access to financing, subsidies) & Legislative	The objective is to provide the necessary preconditions to obtain soft loans for the distributed production of heat and electricity for small and micro energy consumers in the industrial sector

Annex II – Energy efficiency measures applicable to industries in Georgia and Azerbaijan industry

Electricity supply and consumption

Potential energy saving opportunities are:

- Shut-off sections which do not require electricity when in operation;
- Shifting loads to the off-peak times;
- Load management;
- Installation of soft starters in large motors to avoid peaks at start-up times;
- Replacement of excessively oversized transformers;
- Cogeneration; a precondition is the coincidence of electricity and the relatively high demand for steam.

Steam generation and distribution

Steam and high temperature hot water boilers offer many energy savings opportunities which can make significant cost savings to industries. The most appropriate option depends on the type of boiler and heating system, the requirements of the process or other heating demands and budget. Table 0-1 presents energy saving measures in terms of their effectiveness in reducing energy consumption.

Table 0-1: Energy saving measures in steam generation and distribution

Measure	Energy Savings
Improve combustion efficiency by reducing excess air to minimum ratio, cleaning boiler heat surfaces as soon as flue gas temperature tends to increase[3]	Up to 5% (efficiency increase by about 0.5% for every 1% decrease in O_2)
Boiler and burner management, digital combustion controls and oxygen trim[4]	Up to 5%
Locate and repair steam leaks in fittings, equipment and steam traps[5]	10% - 15%
Insulate pipelines and equipment[6]	3% - 13%
Increase condensate return rate. In case there is no condensate return line at all, consider retrofitting of condensate return line in the whole system or in parts of it where it is financially viable[7]	Up to 10%
Retrofit the boiler with economizer and recover flue gas heat, if flue gas temperature remains high, after cleaning (economizers are usually viable for boilers with a capacity of over 3 MW)[8]	5%, up to 15% for condensing boilers
Install Variable Speed Drives (VSDs) for fans, blowers and pumps[9]	Up to 50% of energy use are achievable by reducing the fan or pump motor speed by 20%
Boiler and burner management, digital combustion controls and	Up to 5%

[3] http://www.ecoen.co.in/boiler.html
[4] https://www.carbontrust.com/media/13332/ctv052_steam_and_high_temperature_hot_water_boilers.pdf
[5] Spirax Sarco, Optimising steam system Part I
[6] Spirax Sarco, Optimising steam system Part I
[7] https://energy.gov/sites/prod/files/2014/05/f16/steam8_boiler.pdf
[8] https://www.carbontrust.com/media/31715/ctg057_heat_recovery.pdf
[9] Carbon Trust, Motors and Drivers, CTV048

Measure	Energy Savings
oxygen trim[10]	
Make use of waste heat from production processes to preheat combustion air	Case specific
Boiler replacement if the existing boiler is excessively oversized and outdated	Case specific
Use of alternative fuels such as biomass	Case specific
Improve housekeeping and maintenance	Case specific

Compressed air

Energy saving opportunities in compressed air systems are presented in Table 0-2.

Table 0-2: Energy saving measures in compressed air systems

Measure	Energy Savings
Turn off the back-up compressor until it is needed and during non-working time	Case specific
Conduct leakages test periodically and repair leakages[11]	~ 20%
Consider alternatives to compressed air such as hydraulic rather than air cylinders, electric rather than air actuators and electronic rather than pneumatic controls	Case specific
Identify real pressure requirements of users, set user pressure as low as possible and reduce air compressor discharge pressure to the lowest acceptable setting	Reduction of the operating pressure from 7 to 6 bar for example, will result in electricity cost savings of about 6% to 10%
Identify branches of the distribution system with users of lower pressure requirements and consider retrofitting throttle valves	Case specific
Consider installation of a control system to optimize operation of unit station[12]	~ 12-15%
Consider VSDs for variable load on positive displacement compressors[13]	~ 2%
Consider cooling intake air	4°C lower inlet temperature results in 1% increase in efficiency
Consider heat recovery at very large compressors[14]	~ 20-80%
Keep air treatment to the minimum possible	Case specific
Eliminate bottlenecks causing excessive pressure drop in the distribution system	Case specific

Electric motors

Table 0-3 presents energy saving opportunities in electric motors.

[10] https://www.carbontrust.com/media/13332/ctv052_steam_and_high_temperature_hot_water_boilers.pdf
[11] Reference document on best available techniques for energy efficiency, February 2009
[12] Reference document on best available techniques for energy efficiency, February 2009
[13] Reference document on best available techniques for energy efficiency, February 2009
[14] Reference document on best available techniques for energy efficiency, February 2009

Table 0-3: Energy saving measures in electric motors

Measure	Energy Savings
Make use of gravity instead of pumping wherever possible	Case specific
Operate pumps, fans and blowers near the best efficiency point	Case specific
Consider replacement of impellers or turning-down of the diameter of impellers to reduce throttling and power input	Case specific
Consider use of smaller motors after optimizing devices	Case specific
Consider sequence control of smaller and VSD for large unit whenever there is wide load variation	Case specific
Consider the installation of high efficiency motors for near continuous operation over the year	Case specific

Pumps

Energy saving opportunities in pumping systems are presented in Table 0-4.

Table 0-4: Energy saving measures in pumping systems

Measure	Energy Savings
Shut down unnecessary pumps	-
Trim or change impellers if head is larger than necessary[15]	Case specific
Replace oversized pumps with more efficient models[16]	1-2%
Use multiple pumps instead of one large one	Case specific
Change the speed of a pump for the most efficient match of horsepower requirements with output[17]	5-40%

Lighting systems

Table 0-5 presents energy saving opportunities in lighting systems.

Table 0-5: Energy saving measures in lighting systems

Measure	Energy Savings
Use of high efficiency lamps and luminaires[18]	~ 75% from incandescent to LED lamps and ~45% from T12 to T5
Change high-pressure mercury lamps against metal halide lamps	-
Implement automatic time switches and motion detectors	-
Use electronic ballasts[19]	~ 20%
Implement modern lighting management systems[20]	~ 30 - 50%

Industrial refrigeration and cooling

[15] https://www1.eere.energy.gov/manufacturing/tech_assistance/pdfs/trim_replace_impellers7.pdf
[16] Energy Efficiency Best Practice Guide, Pumping Systems, Sustainability Victoria
[17] Energy Efficiency Best Practice Guide, Pumping Systems, Sustainability Victoria
[18] https://energy.gov/energysaver/led-lighting & http://greensavingsco.com/2009/12/changing-from-t12-to-t5/
[19] Taking Action on Climate Change, Long term mitigation scenarios for South Africa, Harald Winkler, 2010
[20] https://www.carbontrust.com/media/13067/ctv049_lighting.pdf

Table 0-6 presents energy saving opportunities in industrial refrigeration and cooling.

Table 0-6: Energy saving measures in industrial refrigeration and cooling

Measure	Energy Savings
Refrigeration load reduction	Case specific
Condenser – heat recovery	Up to 30% of the cooling capacity
Improving system controls	2% to 4% for each degree change in temperature
Reducing refrigeration leakage[21]	Up to 15%
Use of high efficiency compressors – increase the compressor size[22]	~ 10% of energy use by increasing the compressor size by 30%
Use of high efficiency fan motors	-
Good housekeeping of refrigeration plants[23]	Up to 10%

Furnaces, kilns and ovens

Table 0-7 presents energy saving opportunities in furnaces, kilns and ovens.

Table 0-7: Energy saving measures in furnaces, kilns and ovens

Measure	Energy Savings
Optimization of combustion air[24]	5-25%
Operating at optimum furnace temperature[25]	5-10%
Optimum capacity utilization	Case specific
Use of high temperature heat recovery systems (recuperators or regenerators)[26]	10-30%
Reduction of losses from furnace surface and openings[27]	2-15%
Selecting the appropriate refractories	Up to 25%

Monitoring and Targeting and Energy Management Systems

The purpose of Monitoring and Targeting (M&T) is to relate energy consumption data to the weather, production performance or other measures by providing a better understanding of how energy is being used. In particular, it will identify if there are signs of avoidable waste or other opportunities to reduce consumption.

M&T is a part of an Energy Management system applied to industrial processes.

An EnMS is required to create a foundation for positive change and to provide guidance for managing energy throughout an organisation. The most recognised tool that helps organisations put in place an EnMS and use their energy more efficiently is the ISO 50001 standard.

[21] Carbon Trust "Refrigeration systems, Guide to energy saving opportunities, CTG046, 2008"
[22] Carbon Trust "Refrigeration systems, Guide to energy saving opportunities, CTG046, 2008"
[23] https://www.carbontrust.com/resources/guides/energy-efficiency/refrigeration/
[24] US DoE "Office of Industrial Technologies, Roadmap for Process Heating Technology, 2001
[25] US DoE "Office of Industrial Technologies, Roadmap for Process Heating Technology, 2001
[26] Reference document on Best Available Techniques for Energy Efficiency, Feb. 2009
[27] US DoE "Office of Industrial Technologies, Roadmap for Process Heating Technology, 2001