Energy Efficiency Finance II

Task 1 Energy Efficiency Potential

FINAL Country Report: Georgia

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OESTERREICHISCHE ENTWICKLUNGS-BANK AG

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OeEB
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Abbreviations

AA	Association Agreement
ADB	Asian Development Bank
CDM	Clean Development Mechanism
CEEP	Caucasus Energy Efficiency Programme
DCFTA	Deep Comprehensive Free Trade Area
EE	Energy Efficiency
EEC	Energy Efficiency Commission
EIB	European Investment Bank
ESCO	Electricity Service Commercial Operator
EU	European Union
EUR	Euro
GEEP	Georgian Energy Efficiency Programme
GEDF	Georgian Energy Development Fund
GEL	Georgian Lari
GHG	Green House Gases
GNEWRC	Georgian National Energy and Water Supply Regulatory Commission
GNI	Gross National Income
GWEM	General Whole Electricity Market
GWh	Giga Watt Hour
IFC	International Finance Corporation
IMF	International Monetary Fund
MWh	Mega Watt Hour
OeEB	Development Bank of Austria
PEEREA	Protocol on Energy Efficiency and Related Environmental Aspects
PF	Partnership Fund
PJ	Peta Joule
RE	Renewable Energy
SEAP	Sustainable Energy Action Plan
TFC	Total Final Consumption
USD	United States Dollar

General Remarks

Most financial values mentioned in the available studies were provided in the year 2012.
For this report the exchange rate used to convert the local currency, Georgian Lari (GEL), to EUR is:
1 EUR = 2.37 GEL (National Bank of Georgia, February 2015).

1 Executive Summary

The Georgian **energy matrix** relies mostly on hydropower and imported hydrocarbons, which makes the country vulnerable to changes in climate and external situations. The total final consumption for 2012 was 133 PJ according to the International Energy Agency.

Hydropower plants account for about 44% of the electricity generation, while natural gas is mainly used to cover heating and hot water demand in households. Oil products are the main energy source in the transportation sector, which is the second most important sector in terms of final energy consumption. The use of biomass is also widespread, especially in the rural areas, representing almost 44% of energy production.

In terms of **renewable energy sources** (RES), hydropower and biomass are the only types being used. Solar energy has an estimated potential of 108 MW, but the lack of incentives and low energy prices have prevented the development of this technology. The same issues occur with geothermal and other RES.

The lack of investment and maintenance that the energy infrastructure suffered in the years after the dissolution of the USSR represents a huge setback in terms of efficiency. In 2012, approximately 24% of the electricity generated was lost in transmission and distribution, which represents a high share of losses.

The **residential sector** is the main consumer of energy, accounting for about 33% of the final energy consumption. Households commonly use natural gas in Georgia, but biomass and electricity are also used for space heating. Great possibilities to save energy are present in the residential sector due to the age and condition of the building stock. Measures like proper insulation and replacement of windows can significantly reduce the thermal energy demand of buildings. Together with the utilisation of more efficient household appliances, better lighting systems, and RE, the potential energy savings amount to about 12 PJ.

The **industrial sector** is the third largest energy consumer, after transportation. Among its sub-sectors, the iron and steel industry and the chemical industry are the most significant ones, and the savings potential for them is approximately 5.4% of the total industrial sector's consumption. Regardless, the greatest opportunity for energy efficiency improvement is found in the food, beverage, and tobacco sector. To achieve energy savings in heavy industry, higher amounts of investment are necessary, while in the food industry, the situation is the opposite. This allows for the introduction of measures that yield results in the short term, and that could help to expand the sector.

In regards to its **legislative framework,** Georgia has neither implemented laws concerning energy efficiency (EE), nor has it adopted a building code to regulate the construction of new buildings and to assess the condition of the current building stock. However, Georgia is a signatory member of international treaties regarding energy efficiency and is expected to harmonise its legislation with EU legislation. Currently, the Georgian Government is working on an action plan to draft its Energy Efficiency Law, with the help of international organisations.

Georgia has great potential for energy efficiency measures, but further efforts must be taken, especially in policy implementation and encouraging EE programmes.

2 Aim and Scope of this Report

The Development Bank of Austria (OeEB) aims at increasing its activities in the field of energy efficiency in selected countries via dedicated credit lines, but also via supportive programs for selected financial institutions and project developers and also analyses the options for direct financing. The present study is part of the overall study, which analyses the status of energy efficiency in the countries Serbia, Bosnia and Herzegovina, Albania, Montenegro and Georgia.

The Study is carried out in cooperation of ALLPLAN GmbH and Frankfurt School and is based on the latest available information collected directly in the country by local experts in March-June 2015.

This report focuses on Task 1, “Potential of the Energy Efficiency Market” in Georgia and analyses the following questions:

- What is the Status of Energy Efficiency in each economic sector?
- In which sectors is the efficiency potential the highest and which companies are active in these sectors?
- What is the country’s framework for energy efficiency - in terms of legal, economic, and technical aspects?

3 Studies Available

3.1 Overview

Despite the fact that a number of international financial and donor organisations have been actively financing the energy sector in Georgia, there are very few studies available regarding energy efficiency and energy efficiency investment potential in the country. It should be mentioned that the collection of information, such as energy statistics, energy consumption distribution per sector of the country’s economy, etc.is still difficult.

The latest report regarding energy efficiency in Georgia is dated 2012. The table below presents available studies conducted by different organisations, such as: Energy Charter Secretariat, Winrock International, USAID, OSCE, UNEP, and Inogate.

Table 1: Overview of available reports

Name/Author/Date/Link	Purpose/Scope	Brief description
In-Depth Review of Energy Efficiency Policies and Programs Energy Charter Secretariat 2012 http://www.encharter.org/index.php?id=128	This document develops policies and recommendations to improve energy efficiency and reduce the environmental impacts of the energy cycle.	The following issues are discussed: ▪ Energy policy ▪ Energy efficiency policy ▪ Renewable energy policy ▪ Environmental policy related to energy ▪ Overall assessment of progress ▪ Recommendations
Sustainable Energy Action Plan: City of Tbilisi for 2011-2020 Government of Tbilisi, 2011 http://mycovenant.eu-mayors.eu/docs/seap/1537_1520_1303144302.pdf	The main objective of the Sustainable Energy Action Plan for Tbilisi is to reduce CO_2 emissions caused by city energy usage through different municipal infrastructure.	The following issues and municipal infrastructure are analysed: ▪ Transportation sector ▪ Building sector ▪ Street lighting sector ▪ Municipal landfills ▪ Waste water treatment ▪ Green space ▪ Electricity and gas distribution
Energy Efficiency Potential in Georgia Rural Energy Programme, 2008	This document forms the legal and institutional framework for improved energy efficiency in the residential and industrial sector of Georgia.	The following issues are discussed: ▪ Institutional issues of energy efficiency in Georgia: barriers and opportunities ▪ Energy efficiency potential in residential and non-residential sectors of Georgia ▪ Assessment of energy efficiency measures ▪ Global energy conservation trends ▪ International aspects of energy conservation in Georgia

Geo-cities: An Integrated Environmental Assessment of State and Trends for Georgia's Capital City, 2011 Malkhaz Adeishvili, Environmental Expert Tamar Chachua, Environmental Expert Tamar Gugushvili, Environmental Expert Zurab Jincharadze, Environmental Expert Ekaterine Kakabadze, Environmental Expert Merab Sharabidze, Environmental Expert http://www.unep.org/geo/pdfs/GEO-Cities_Tbilisi_Full-report.pdf	**The Geo-Cities Tbilisi Report** aims to (i) shed light on the state of the environment of Tbilisi, revealing its causes and consequences, (ii) review what is being done about the state of the environment in Tbilisi and what still needs to be done to improve current situation and (iii) illuminate potential features for Tbilisi.	The following issues are discussed: ▪ Drivers and pressures: socio-economic and political context of Tbilisi ▪ State of the environment ▪ Environmental impact ▪ Urban environmental governance in Tbilisi ▪ Policy options ▪ Outlook 2020 - four scenarios for Tbilisi's near-future development
Georgia National GHG Inventory, 2008 Government of Georgia	**National GHG Inventory** aims to provide a full overview about the trends of GHG emissions in order to reach the goal of stabilising GHG emissions throughout the world and develop sustainable mechanism for emission reductions.	The following issues are discussed: ▪ GHG emissions trend for 1987-2005 ▪ Power sector ▪ Industrial processes ▪ Agriculture and forestry ▪ Waste and waste water treatment
A New Resource for Sustainable Growth. Researching energy efficiency practices among Georgian companies. International Finance Corporation World Bank Group, 2008	The survey assessed how industrial enterprises in each of the survey countries prioritise, understand, plan, finance, and implement energy efficiency investments. The resulting analysis is intended to help governments, financial institutions, companies, donors, and private investors identify opportunities to provide goods and services that improve energy efficiency.	The following issues are discussed: ▪ Energy consumption and energy efficiency in the survey countries ▪ Prioritisation and understanding of energy efficiency potential ▪ Implemented and planned investments in energy efficiency ▪ Incentivising, planning, and evaluating energy efficiency investments ▪ Project financing in energy efficiency ▪ Recommendations

3.2 Main results of existing studies

The above-listed studies were conducted by different institutions or organisations with different purposes, starting from the identification of energy efficient equipment and market research through development of policy recommendations and analysis of the legal basis for EE development.

Unfortunately, no studies have been conducted regarding the identification of energy efficiency potential in the country, and in particular its industrial capacities.

The currently existing available studies provide an opportunity and an initial basis to conduct more comprehensive and all-inclusive studies. These will cover not only the industrial sector of the country, which needs urgent and qualified assistance in order to keep capacities and production, but also the residential sector which suffers mainly from a lack of awareness about EE technologies and incentives for EE utilisation. It should also be mentioned that the adoption of a sufficient legislative basis is ongoing under the Georgia-EU Association Agreement that was signed in 2014.

4 Status of Energy Efficiency

4.1 Energy supply

The main energy source in Georgia is hydropower, and almost 100% of consumed natural gas and petroleum products are imported.

The following chart shows the energy balance in Georgia for 2012:

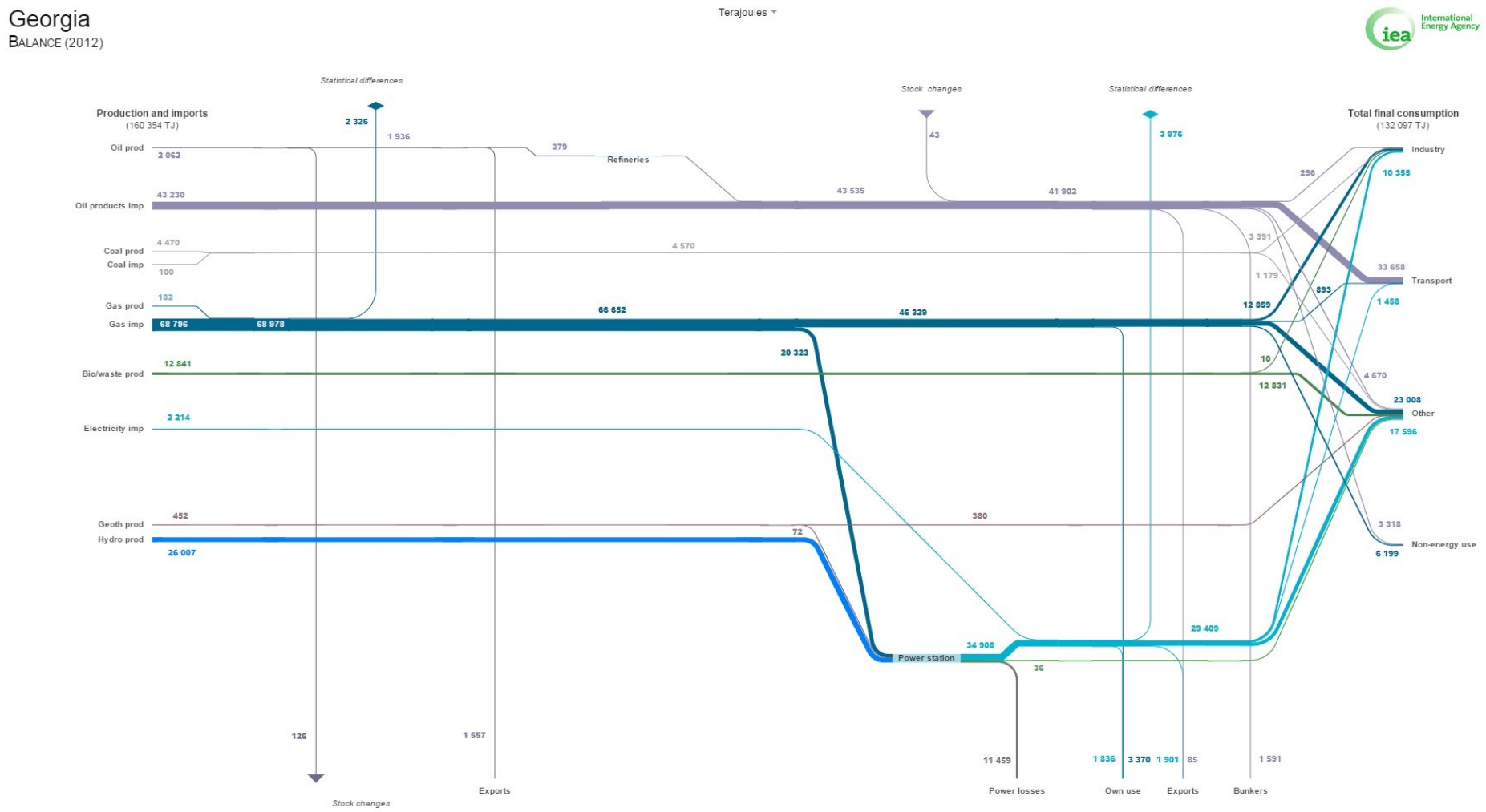

Figure 1: Energy Balance Georgia 2012
Source: IEA statistics (figures inserted by ALLPLAN)

From the chart above, which shows about 160 PJ of primary energy consumption, the following conclusions can be derived:

- Georgia imports about 95% of its demand for natural gas and petroleum products;
- All natural gas is imported into Georgia and represents the main source for energy and heat demand in the industrial and residential sectors;
- Petroleum products are imported and represent the main energy source for the transportation sector;
- About 11 PJ of the total 46 PJ of energy produced through power stations, is lost in transmission and distribution, which is quite a high indicator;
- The share of renewables (Biomass, Geothermal) in total electricity production is 44%.This is equivalent to 26 PJ generated from hydropower and less than 1% is from geothermal (0.072 PJ).

As a summary of the chart, it can be concluded that about 45% of total energy in Georgia is consumed by the residential and commercial sectors, followed by the transportation sector with 36 % *(source: IEA statistics).*

Georgia's energy infrastructure is well developed, but as a result of management failures and a lack of financial support, it is poorly maintained. Currently, three distribution companies and eight direct consumers are present on the electricity market in Georgia – about 83% of energy is supplied to distribution companies and 17% to the direct consumers*(source: Ministry of Energy of Georgia).*

The country's power grid is well integrated into the regional electrical system, and allows the country to maintain the balance between summer and winter seasonal energy demand. Legislative improvements and technical development have resulted in an increase in annual electricity generation from 7.4 GWh in 2000 up to 10.1 GWh by 2011.Electricity Service Commercial Operator (ESCO), established in 2007, opened possibilities to export electricity to neighbouring countries and gave a boost to the development and utilisation of hydro resources and potentials in the country. As a result, electricity exports increased by 100% between 2005 and 2012.

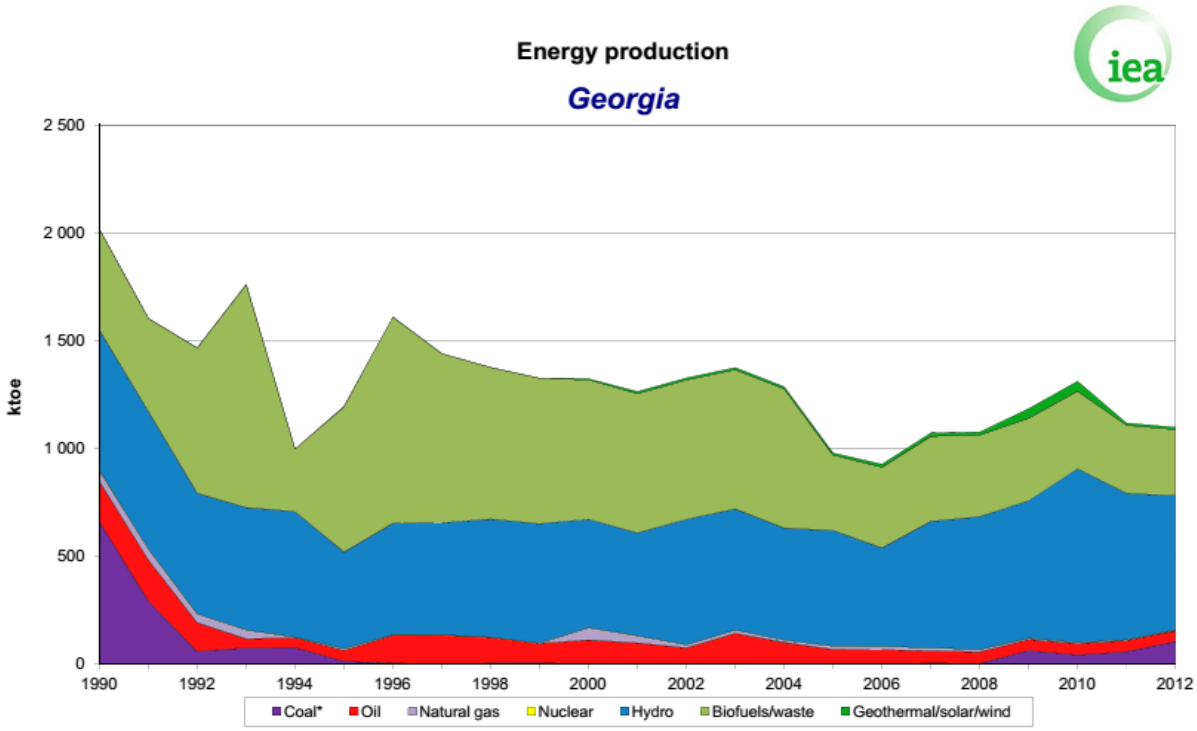

Figure 2: Energy production for the period 1990-2012
Source: *IEA statistics*

From the figure above it can be concluded that hydro generation still has a significant share in Georgia`s electricity generation.

Oil and gas infrastructure development started in the last century by establishing a specialised company to study natural resources and conduct research to identify oil and gas fields (*source: Oil and Gas Company*).Maximum oil production in the country was observed in the early eighties of the last century (3.2-3.3 mill. tons), and current values differ by 60-140 thousand tons. Nevertheless, Georgia uses its geographic location to generate revenues from the oil and natural gas that transits from the Caspian region to Turkey and southern Europe.

Although centralised heating systems were demolished soon after the Soviet Union collapsed, natural gas still remains the main energy source for thermal energy, especially for the residential sector.

4.2 Energy demand

The residential sector is the main energy consumer in Georgia, factoring in all sources of energy. According to statistics from the International Energy Agency, the “Others” sector includes residential, commerce and public services, and the agriculture and forestry sub-sectors, and accounts for over 45% of final energy demand. According to the latest figures (2012), 43.9 PJ (33% of TFC) is attributable to the residential sector. Industry accounts for approximately 20% of TFC (26.8 PJ); transportation for 27 % (36 PJ).

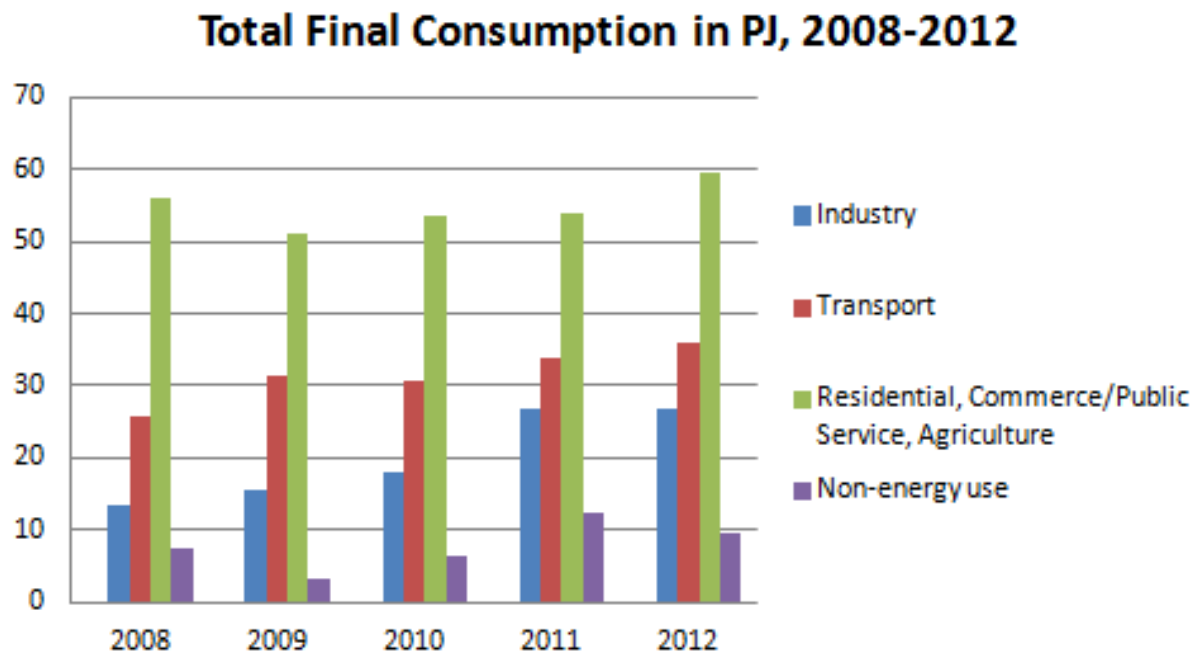

Figure 3: Total Final Consumption (TFC) by sector, 2008-2012
Source: *IEA statistics*

Consumption in transportation covers all transportation activity regardless of the economic sector to which it is contributing. As shown in Figure 3 the transportation sector accounts for a significant portion of TFC. This includes fuel used in vehicles and also in agricultural and industrial applications.

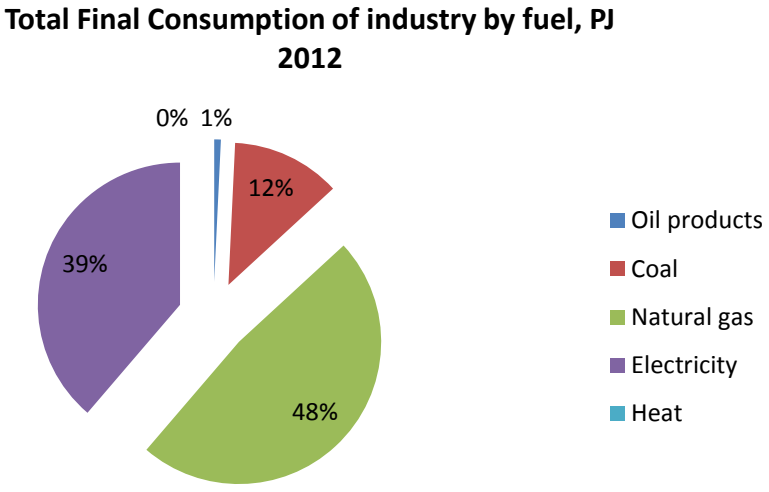

Figure 4: Industry sector TFC by fuel, 2008-2012
Source: *IEA statistics*

In the industrial sector, energy consumption is mostly related to active production companies. For example, the iron and steel industry, which includes iron and steel casting, consumes 8.8% of natural gas and 62.3%

of electricity; Chemicals and petrochemical production consumes 12.9% of electricity and 3.0% of natural gas of the industrial sector's TFC.

To sum up, Figure 5 presents TFC trends in Georgia.

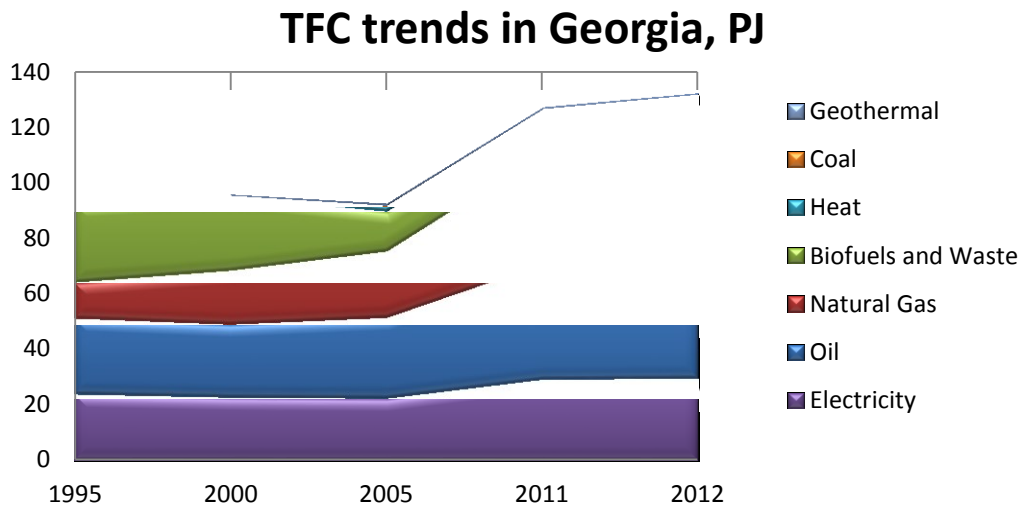

Figure 5: TFC trends in Georgia, 1995-2012
Source: *IEA statistics*

The chart above shows that the country's energy demand grew significantly in the 2005-2011 period and looks to continue with its upward trend in the following years.

4.3 Greenhouse gas emissions

During the preparation of the First National Notification of Georgia for the United Nations Framework Convention on Climate Change (UNFCCC), the GHG First Inventory for 1987-1997 was issued. The second National Notification covered the GHG inventory for the years 1998-2006.

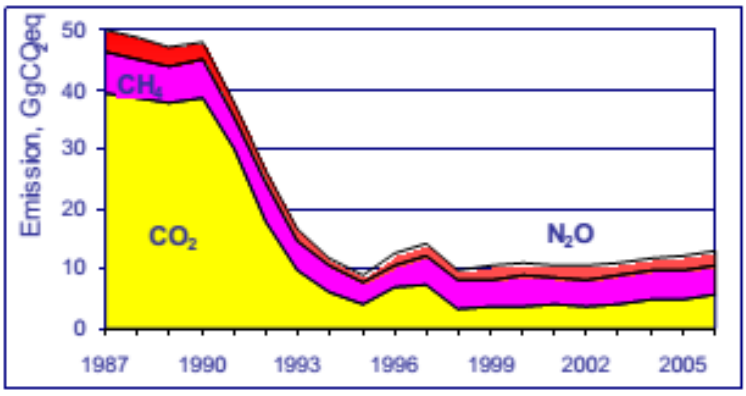

Figure 6: GHG emissions, 1990-2005
Source: *Ministry of Environment and Natural Resources Protection*

According to the chart above, the highest CO_2 emissions were observed between 1987 and 1990. As shown in the chart, GHG emissions were reduced by almost 75% in2005: CO_2 emissions dropped by85%, CH_4

and N_2O by 30% and 15% respectively. But since 2005, steady increase can be observed. Unfortunately, no recent data regarding GHG emissions are available to show an increase in GHG emissions in parallel with the TFC trend.

The distribution of GHG emissions by sector is given in the figure below:

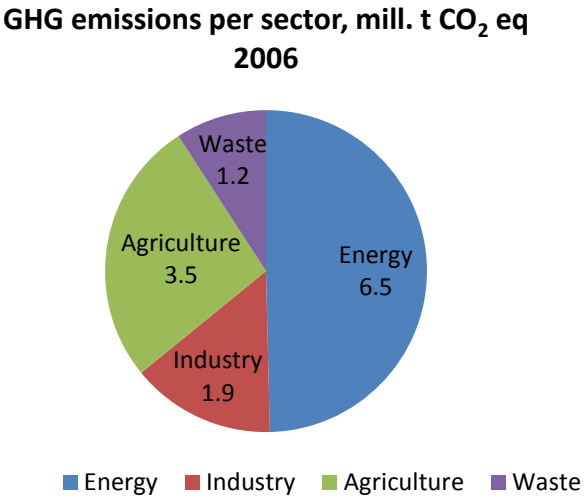

Figure 7: GHG emissions by sector, 1990-2006
Source: *Ministry of Environment and Natural Resources Protection*

4.4 Energy efficiency in the industrial sector

The table below shows the total final energy consumption of various industries.

Table 2: Industrial consumption for 2013
Source: National Statistics Office of Georgia

Industry	Natural Gas TJ		Electricity GWh	
	2,914.4	**%**	**2,327.3**	**%**
Iron and steel	255.8	8.8	1.449.8	62,3
Chemical (including petrochemical)	87.6	3,0	301.2	12,9
Non-metallic minerals	800.8	27.5	244.1	10.5
Transport equipment	26.4	0.9	10.4	0.4
Machinery	4.7	0.2	4.6	0.2
Mining and quarrying	9.3	0.3	-	
Food beverages and tobacco	1,361.6	46.7	177.7	7.6
Paper pulp and printing	53.5	1.8	10.9	0.5
Wood and wood products	5.3	0.2	4.3	0.2
Construction	275.7	9.5	87.4	3.8
Textiles and leather	14.7	0.5	6.0	0.3
Not elsewhere specified (Industry)	19.0	0.7	30.9	1.3

Table 3: Manufacturing sectors with the greatest energy saving potentials
Source: *National Statistics Office of Georgia, 2013*

Sector	Percentage of Industrial Energy Consumption (%)	Estimated Energy Saving (technical potential) (%)	Energy Saving Potential on whole Industrial Energy Consumption (%)
Iron and steel, basic metals	21.6	25	5.4
Non–metallic minerals (cement, ceramic, glass)	51.5	20	10.3
Chemicals, oil, rubber, plastics	4.3	0.5	0.02
Food, beverages, and tobacco	8.4	10	0.8
Construction	10.9	23	2.5
Mining and quarrying	1.9	35	0.6
Textile, clothing, and leather	0.1	8	0.008
Paper, pulp, and printing	0.3	30	0.09

Food, beverages, and tobacco could be the most interesting and promising subsectors. These sectors require relatively smaller investments to replace equipment compared to heavy industrial sectors, and at the same time, payback periods are shorter –these sectors produce consumable goods.

Additionally, the country's location creates an excellent opportunity for the development of food and beverage sub-sectors: wineries, mineral water bottling and tourism infrastructure – all these are currently operating with outdated and inefficient technologies (with few exceptions).

4.5 Energy efficiency of SMEs

Enterprises are grouped in Georgia by size as:

- Small enterprise – 20 employees and 0.5mill.GEL annual turnover;
- Medium enterprise – 100 employees and 1.5 mill. GEL annual turnover;
- Large enterprise – more than 100 employees and over 1.5mill.GEL annual turnover

Local commercial banks use different approaches to differentiate enterprises and mainly consider the company's annual turnover. Different commercial banks have different thresholds for such evaluation of the companies. For example: Bank of Georgia and TBC Bank define SMEs up to a turnover of 1.5 mil GEL./year, while Bank Republic and VTB Bank set the limit at 1 mill. GEL.

No specific figures on energy efficiency potential of SMEs are currently available. The relative importance of SMEs in Georgia and conclusions relevant for energy efficiency are deduced in this sub-chapter.

The following table shows the gross-output of SMEs in Georgia with especially high outputs in the sectors agriculture and sub-sectors food and construction.

Table 4: Gross Output of SMEs
Source: *National Statistics Office of Georgia, 2015*

GROSS OUTPUT SME (at current prices, mil. GEL)	2007	2008	2009	2010	2011	2012	2013	2014*
Agriculture	2,390.2	2,375.2	2,228.9	2,396.7	2,877.7	3,018.7	3,393.6	3,579.0
Mining and quarrying	283.5	263.2	233.7	305.7	352.7	389.8	355.3	345.4
Food, beverages, and tobacco	1,638.9	1,532.0	1,550.1	1,954.5	2,573.4	2,747.7	3,157.0	3,821.1
Textile, clothing, leather/Paper, pulp, and printing	444.7	435.1	372.7	397.0	513.6	575.8	536.7	616.0
Chemicals, oil, rubber, plastics	786.9	900.4	710.8	889.1	1,374.8	1,525.5	1,474.8	1,617.6
Iron and steel, basic metals	454.6	745.4	553.4	1,147.0	1,237.8	1,322.7	1,328.2	1,237.7
Construction	2,666.9	2,298.5	2,403.9	2,623.7	3,582.3	4,472.4	3,904.5	4,605.9

Data regarding the share of SMEs in the total GDP or sector activity is not available; but statistical data regarding turnover by enterprise and kind of economic activity is given by the National Statistics Office of Georgia and shown below.

Table 5: Turnover by Enterprise Size
Source: *National Statistics Office of Georgia, 2015*

TURNOVER BY ENTERPRISE SIZE, 2014				
Year	Total EUR Mio	of which:		
		Large	Medium	Small
2008	8,291.4	7,269.5	613.6	408.3
2009	8,566.3	7,230.8	717.8	617.8
2010	10,295.7	8,636.8	991.7	667.2
2011	15,496.3	12,419.8	1,620.1	1,456.4
2012	17,741.8	14,733.8	1,360.2	1,647.8
2013	18,703.8	15,291.3	1,812.5	1,600.0
2014	19,468.9	16,176.7	1,578.8	1,713.3

Table 6: Turnover by Kind of Economic Activity
Source: *National Statistics Office of Georgia, 2015*

TURNOVER BY KIND OF ECONOMIC ACTIVITY, 2014												
		of which:										
Year	Total	Agriculture, hunting and forestry	Fishing	Industry	Construction	Wholesale and retail trade; repair of motor vehicles and personal and household goods	Hotels and restaurants	Transport and communication	Real estate, renting and business activities	Education	Health and social work	community, social and personal service activities
	EUR Mln.											
2008	8,291.4	38.1	1.4	1,956.8	595.8	3,897.9	94.8	1,267.8	219.5	31.2	105.0	83.2
2009	8,566.3	42.9	3.4	1,859.7	732.6	4,035.0	118.1	1,205.9	298.0	38.3	144.8	87.6
2010	10,295.7	46.5	4.6	2,337.5	715.0	4,926.4	162.0	1,398.1	351.5	51.3	182.2	120.6
2011	15,496.3	73.7	3.3	3,051.5	1,412.7	7,867.7	242.1	1,707.1	613.7	56.2	206.8	261.5
2012	17,741.8	83.4	3.3	3,187.2	1,875.4	8,778.1	308.0	1,906.8	711.6	66.9	262.8	558.4
2013	18,703.8	92.8	7.3	3,393.0	1,369.1	9,633.6	332.2	2,053.7	784.4	85.7	331.2	620.7
2014	19,468.9	103.7	7.3	3,644.5	1,416.1	10,117.2	308.1	2,180.3	891.8	90.6	330.0	379.3

Since no data regarding the sub-sectors with the highest shares of SMEs are officially available, estimated indication about the sub-sectors with most active SMEs can be listed as

- Trade (food, textile, consumer goods);
- Agriculture (mainly in the rural areas);
- Food production (fruit processing, bakeries, milk and milk products);
- Service (consulting, tourism, hotels, etc.)

As for the **energy efficiency potential** regarding SMEs, it should be mentioned that due to the fact that there are no requirements or regulations regarding EE in the production or construction, neither requirements regarding the energy efficiency labeling of the offered products (so called “white goods”), the main motivation for replacement is the economic viability of the measures.

Given the energy saving potentials in industry (see chapter 4.4), considering on the one hand the highest estimated energy saving shares in the sub-sectors of non-metallic minerals, iron and steel, food, construction and the sectors with highest shares of SMEs (trade, agriculture, food production and service) on the other hand – it can be concluded that the main share of energy saving potentials in these (sub)sectors are attributable to SMEs.

Regarding the most important sub-sectors the following facts should be stressed:

The **textile sector** does not necessarily mean production facilities. Typical companies comprise max. 10 tailors working on different types of clothes (such as working, service, police and other special clothes). Larger companies (with 50, 100 and more workers), are covered under a different economic sector (corporate).

Paper–typically companies are only active in the field of recycling, because the country never had its own paper production. A paper production facility was intended to be built (during soviet era), but was never finished. In this sector almost the same types of companies are found like in the textile sector.

In the **construction sub-sector** the companies are mainly service providers. This means they are the legal entities, which hire different workers (e.g. iron-welders, concrete makers, plastering workers, painters) and provide service to larger developer companies. Larger companies have their own "in-house" specialists, but those are mainly used for quality assurance. Smaller SMEs are easy to contract and control and at the same time work on several projects.

4.6 Energy efficiency in the residential sector

The residential sector consumes over 33% of total final consumed energy, which is equivalent to 43.9 PJ.

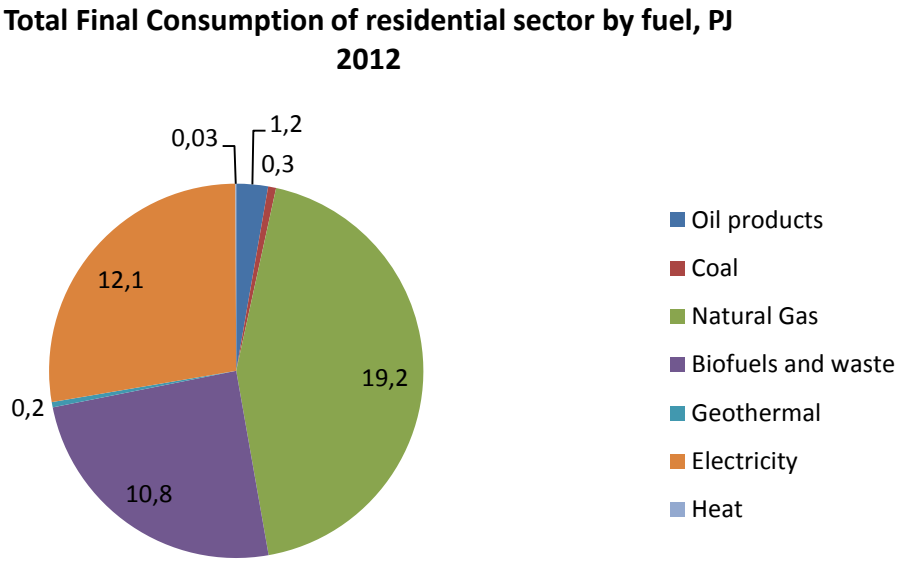

Figure 8 shows the share of natural gas and electricity consumption in the residential sector. Bio-fuels and waste utilisation is attributed to the high usage of biomass for space heating purposes in rural areas of the country.

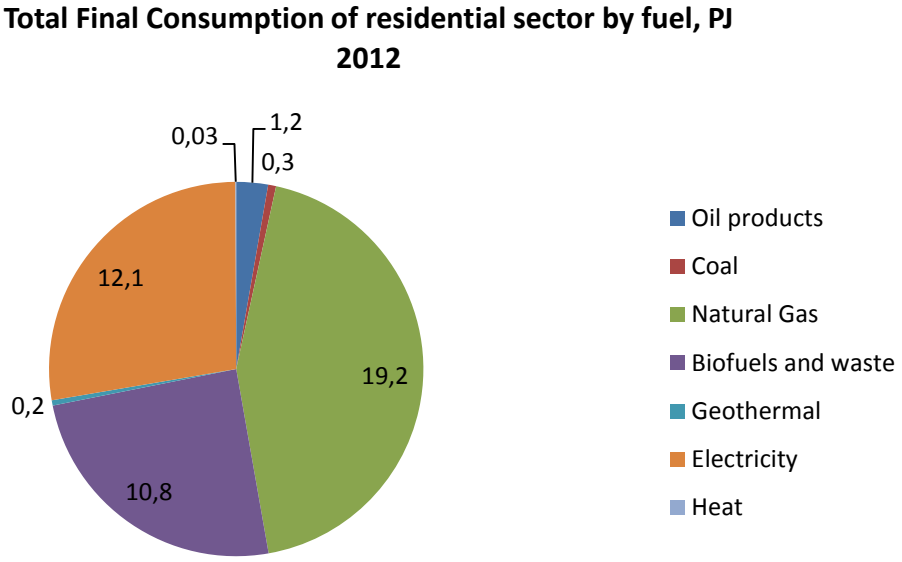

Figure 8: Residential sector TFC by fuel, 2008-2012
Source: *IEA statistics*

The energy supply of the population is characterised by a large number of consumers using electric heaters. Monthly energy consumption in villages and rural regions is higher than in towns. Available data shows that

80-85% of natural gas is consumed for heating and hot water supplies. The reason for this is that there are no effective mandatory EE standards in the Building Code, and therefore housing stock in the country is a major source of excessive energy losses.

A large share of the housing stock was constructed between 1960 and 1990 in accordance with old, Soviet standards, and made out of concrete blocks or panels. This results in an increased share of the housing stock deteriorating. Buildings in the cities and in Tbilisi especially have more than five floors and basements and exterior walls with sand-cement rendering and paint finish. The standard thickness of the walls is 40-50 cm, usually without any thermal insulation. The main problem in buildings made out of panel concrete is the "thermal bridges". Buildings are of poor quality due to improper design and assembly. Rarely ceramic bricks are found, but they are mostly in rural areas. About 60% of windows and doors in the block buildings in Tbilisi are of old, wooden construction and have to be replaced.

Figures about the exact quantities of apartments and dwelling houses in Georgia are not available, but according to the data from the Institute of Demography and Sociology (last available year: 2008), about 60-65% of dwelling houses are blocks of flats in Tbilisi, 20-25% are individual houses, and the rest are a mixed kind of flat. In other cities, 40-45% are block apartments and about 40% are individual houses. Energy demand for heating such types of buildings is in the range of 200-410 kWh/m^{2}y.

About 54% of the population (2.4 mill.) lives in urban centres – the share is increasing steadily over the years.

The main areas of energy saving potential in the residential sector are:

- Building envelope insulation – reducing energy demand for space heating (about 20-30% compared to current consumption);
- Lighting – replacement of incandescent bulbs (about 15-20%);
- High efficiency household appliances – condensing gas boilers for central heating and hot water preparation (about 25%);
- Increase of RE usage especially in rural areas – solar water heaters and photovoltaic systems, biogas utilisation.

These measures have a savings potential of **about 20% or 12 PJ** of the country's total energy consumption.

Currently, Georgia utilises only hydro energy in terms of renewable energy sources, although the country has significant potential for solar energy usage development. The total annual solar energy potential in Georgia is estimated to be 108 MW, which is equivalent to 34 thousand tons of standard fuel (*Source: Ministry of Energy of Georgia*).

As for the geothermal potential, according to modern hydro-geological studies, the geothermal water reserves reach 250 mill. m^3 per year in Georgia. At present, there are more than 250 natural and artificial water channels where the average temperature of geothermal waters ranges from 30 to 110 ºC, while the total volume is 160,000 m^3 per day and night.

There is a small number of solar water heaters and photovoltaic systems installed in the country. The main reason behind this is the relatively high cost of the equipment and the lack of experience and technicians that could service and solve problems with the equipment.

To sum up, the reasons for low RES utilisation are:

1. Lack of economic incentives for industries to use RES/EE technologies;
2. Relatively cheap energy in the country;
3. Low awareness about available technologies;
4. Lack of operating experience of new and modern technologies

4.7 Energy efficiency in the agricultural sector

According to statistical data, the share of agribusiness in the total output of the economy is over 17% (*Source: National Statistical Agency of Georgia)*, while the energy consumption share is less than 5% - 6.5 PJ *(Source: IEA, 2012)*. The evolution of the consumption shows that the agriculture sector's share in the total final consumption tends to increase in parallel with TFC itself. This fact indicates that no significant technological or organisational improvements have been implemented.

The relatively low figure of energy consumption does not mean that there is no energy savings potential – the most promising fields for energy efficiency improvement are:

- Fruit and vegetable processing– modern and energy efficient technological units and automated processes;
- New technologies for livestock breeding and meat processing;
- Utilisation of RE sources – biogas, solar photovoltaic, and hot water systems.

These actions could benefit the total energy demand in future developments, as well as provide a reduction of operational expenses of the involved companies.

4.8 Summary of energy efficiency potential

To summarise the energy efficiency potential of the country, it is highly essential to develop an exact and step-by-step plan and strategy to improve energy independence and energy security. Several main points involve developing and adopting the Law on Energy Efficiency and supporting all activities of energy efficiency organisations, energy efficiency product importers, and most importantly – developing an effective action plan to encourage businesses to invest in and implement EE/RES technologies.

In the first place, the highest energy efficiency potential is in the residential sector – there is huge room for energy savings on electricity and natural gas consumed for space heating, followed by lighting, and household appliances.

As for the industrial sector –although the country cannot be classified as a heavily industrial country, there is still potential for improvements from both the technological and institutional sides.

The technological side entails the replacement of old and inefficient machinery with modern, energy efficient, and environmentally friendly equipment, that consumes less power and guarantees excellent quality goods. This would allow local enterprises to become more competitive and effective on the local and global markets.

The institutional side entails changes in the behaviour and management approaches to modernisation – highlighting more practical examples of the benefits of energy efficiency and increasing public awareness through effective information campaigns and research projects promoting energy efficiency and renewable energy sources.

5 Framework for Energy Efficiency

5.1 Legal and policy framework

It should be noted that currently in Georgia there is no Law or set of Regulations in place for Energy Efficiency. Unfortunately Georgia has not adopted yet a Construction Code considering energy efficiency issues.

Georgia is pursuing market-orientated policies to promote its economic development and, where possible, to better align its prospects for trade with neighbouring markets. The aim is to integrate into the wider regional and EU economy.

The Government of Georgia has displayed a strong commitment to the creation of a business-friendly environment. The simplification of the tax code, the permitting of energy projects, and the alignment and integration of support measures are all well underway, as is the establishment of an appropriate regulatory and governance framework.

Recent increases in energy prices, the desire to reduce the risks of dependence on external energy supplies, and improvements in energy distribution collection levels have created prerequisites for active development of energy efficiency in Georgia.

In June 2014, the EU and Georgia signed an Association Agreement (AA), which includes a Deep and Comprehensive Free Trade Area (DCFTA). The Agreement significantly deepens political and economic ties with the EU in the framework of the Eastern Partnership. It follows the Partnership and Cooperation Agreement, the previous basis for EU-Georgia bilateral relations since 1999. An EU-Georgia Association Agenda was also agreed to in June to help implement the AA/DCFTA through joint priorities for 2014-2016. It replaces the EU-Georgia ENP Action Plan of 2006.

The above-mentioned AA considers assimilation of Georgian Legislation towards EU regulations including drafting and adopting the Energy Efficiency Law in Georgia. Currently, a number of Donor Organizations and IFIs like the EBRD, World Bank, and USAID are supporting the Georgian Government to prepare an Action Plan to draft the Energy Efficiency Law for the county.

International organisations are very active in Georgia, with the EBRD publishing a Strategy for Georgia on February 9th, 2010 that includes an assessment of the transition challenges facing key sectors of the Georgian economy and lays out initiatives planned by international organisations in Georgia.

The EBRD has lead the effort to establish the Georgian Energy Efficiency Programme (GEEP), which is a technical assistance project to help industrial and residential clients reduce their energy intensity and make greater use of RE sources.

GEEP started in December 2007 and was scheduled to last until at least the end of 2010. Starting in 2010, EBRD transformed GEEP to CEEP (Caucasus Energy Efficiency Programme) which includes Georgia, Armenia, and Azerbaijan. It is jointly financed by the Early Transition Countries Fund, the Canadian International Development Agency/EBRD 2006-09 Fund, and the United Kingdom Sustainable Energy Initiatives Fund. The new extension of the CEEP project is jointly financed by the Federal Ministry of Finance of Austria/NIF- EU Neighbourhood Investment Facility.

The credit line is being disbursed through five participating Georgian banks TBC Bank, Bank of Georgia, Republic Bank, VTB Bank Georgia and Basis Bank and one microfinance institution (Credo) in loans of any size up to $2.5 million per project. The CEEP project helps the banks to promote the credit facility and to identify, audit, and approve suitable projects.

The IFC is focusing its efforts on investments in RE, infrastructure, manufacturing, and agribusiness, while the EIB Framework Agreement with Georgia is already bearing fruit with a first project, the 500 kV Transmission Lines Project, nearing the end of the due diligence process. Further projects in the energy sector are at various stages of preparation. The IMF has provided technical assistance in eight areas, of which statistics is one. Energy statistics merit inclusion in such capacity-building measures. The Interim Operational Strategy for 2008-2009 of the ADB in Georgia has identified three priority areas including the upgrading and development of energy infrastructure. These investments will also address energy waste that is associated with outdated infrastructure and, in the process, help secure future energy supplies. However, this supply-side approach does not address or adequately recognise the power of the energy efficiency action lines agreed in priority 4.6.2 Energy of the EU-Georgia Action Plan. These lines called for the development of an action plan including a financial plan for improving energy efficiency and enhancing the use of RE.

Despite the fact that Georgia signed different international agreements, including the Energy Charter Treaty, the Framework Convention on Climate Change, and the Kyoto Protocol, the Energy Community Treaty, the European Neighbourhood Policy which agrees to develop RES/EE in Georgia, there is no State policy and/or legislation advancing RES/EE development. Since 2004, this kind of approach was explained by the Georgian government's belief in free economic development where the market regulates itself in the energy sector. Consequently, the absence of a general vision and/or realistic targets and the fragmented legislative initiatives (Law on Electricity and Gas, Main Directions of State Policy in the Power Sector of Georgia) do not fully address the needs of EE/RES development.

Georgia has signed the above-mentioned, voluntary agreements. The agreements themselves offer some financial incentives and project financing opportunities for Georgia to develop innovative EE/RES projects

and undertake energy sector reforms to harmonise its energy legislation with international standards. Georgia is the only country in the region which has not adopted energy efficiency and renewable energy laws.

The main activities in terms of EE/RES policy have taken place since 2010, when some Georgian municipalities (Self-governing Tbilisi City, Self-governing Rustavi City, Self-governing Batumi City, Self-governing Kutaisi City, Self-governing Poti City, Gori municipality, Zugdidi municipality, and Telavi Municipality) joined the EU initiative and signed a Covenant of Mayors, committing to reduce CO_2 emissions by 20% by 2020. Some of the Georgian signatories of the Covenant of Mayors (Self-governing Tbilisi City, Self-governing Rustavi City, Self-governing Batumi City, and Gori municipality) elaborated the Sustainable Energy Action Plans (SEAPs) which envisage the implementation of EE/RES measures in various sectors. Thus, it can be said that these SEAPs are the only real political documents which reflect EE/RES policy on a local, municipal level. Some developments have also been observed on state/governmental level as well. More specifically, at the Ministry of Energy of Georgia, the Department of Energy Efficiency and Renewable Energy, responsible for the development of EE/RES policy of the country, has been recently created. Currently this department is actively working on the development of the country's EE/RES policy/strategy, with USAID support.

Currently in Georgia, there is no public support mechanism to bolster Energy Efficiency investments, such as grants or tax exemptions.

There are several state funds and state organisations which finance large investments by supporting technical assistance (feasibility studies, market research, business plan development, etc.) and also provide relatively cheap financing or subsidising of the commercial banks' interest rate. Such funds are the Georgian Energy Development Fund (GEDF) and the Partnership Fund (PF).

The following table provides an overview of the current energy and EE policies in Georgia:

Table 7: Energy and EE laws and policies

Year	Name of Legislation
1997	Georgian Law on Electricity and Natural Gas
1999	Amendment to Georgian Law on Electricity and Natural Gas
2002	Georgian Law on the Independent National Regulator
2006	Resolution of the Parliament Concerning the Main Course of State Energy Policy

Summary Information on the KeyLaws and Policies:

Despite the fact that Georgia doesn't have an energy policy and/or energy strategy or even legislation related to the energy policy/strategy including renewable energy and energy efficiency policy, it has signed various international, multilateral, and bilateral agreements that require concrete development and establishment actions from Georgia in terms of renewable energy sources and energy efficiency:

- Energy Charter Treaty and Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA);
- Framework Convention on Climate Change and the Kyoto Protocol;
- Clean Development Mechanism (CDM) under the Kyoto Protocol;
- European Neighbourhood Policy;
- EU Green paper;
- MoU signed with Kingdom of Denmark in 2004;
- Covenant of Mayors;
- EU Association Agreement 2014

All of the above international agreements oblige Georgia to implement the following actions:

- Harmonisation with EU legislation;
- Enactment of the respective Laws;

- Development of a Law on Energy Efficiency;
- Development of a Law on Renewable Energy Sources;
- Enactment of a Climate Development Mechanism;
- Enactment of building standards and codes;
- Enactment of the Standards on Energy Efficiency and Renewable Energy;

5.2 Technical framework

The energy efficient construction materials sector in Georgia is evolving, with high growth potential supported by a strong and competitive construction industry. The most common materials in Georgia are perlite, glass wool, rock wool, and polystyrene. Perlite and polystyrene insulation materials are produced locally or imported from Iran, the Czech Republic, Italy, France, and Turkey. Glass wool and rock wool are imported to Georgia from Turkey, Russia, and Germany. The most frequently-used, local natural resources for the production of construction materials are perlite, basalt, pumice, slate, and tuff, vast reserves of which are owned by Georgia. During the last 4-5 years, the use of energy efficient building materials has grown up to 40% per year. Currently the most common EE materials on the Georgian construction materials market are:

Perlite –amorphous, volcanic glass with high water content. Perlite manufactured in Georgia is exported to Azerbaijan and Russia. In Georgia, there is only one operation manufacturing perlite – ltd "Samto Kompania Paravanperliti". The perlite blocks/bricks are produced by ltd "Semi" and ltd "HB".

Polystyrene –a polymer produced from liquid hydrocarbon. Polystyrene is frequently used in extruded form. It is imported by ltd "GRC" from Turkey, Russia, Poland, and Finland. There are some companies importing polystyrene together with other building materials, because polystyrene is very light and not compact, and importing it by itself is not profitable. Local producers of polystyrene are ltd "Kemkheli" and ltd "Interplasti".

Glass wool – is imported to Georgia from Turkey, Iran, and Russia. The demand for wool glass is higher, than for mineral wool, because it is a cheap thermal isolation material. The importers of glass wool are ltd "GRC" and distributors of "Knauf". The price of one square meter of glass wool in Georgia is 1.75 USD (with foil) and 1.45 USD (without foil).

Mineral wool –is also imported from Turkey, Iran, and Russia. There is a growing demand for it. The price of one square meter of mineral wool is about 8-10 USD. The main importers are ltd "GRC" and ltd "Knauf Marketing".

Alufoam – heat, steam, and noise insulating material composed of one or two layers of special, clean (99.4%) aluminum and foamed polyethylene. It keeps its insulating properties in moist environments. This material is environmentally friendly, light, and lasts at least 25 years. Another insulating material with similar properties is Terrafoam. Those materials are imported from Ukraine.

Sandwich-panels – are imported to Georgia from Turkey and Germany, and the local producer is "Interplasti Ltd.".

Pumice blocks – pumice blocks are a traditional building material in Georgia. The demand for pumice blocks is higher than for other light building materials (pearlite blocks and foam concrete). There are various companies producing pumice blocks in different regions in Georgia that have pumice stocks ("Geokabadoki Ltd.", "Delta Ltd.", "Karieri Ltd.").

Foam concrete – is produced in different regions of Georgia by a few production units, but production is unsteady. The general consumers of foam concrete are big building companies. Foam concrete is 20 times lighter than traditional concrete and 8 times lighter than silicate brick. The main producers of foam concrete are ltd "Dugabi +", ltd "Porobetoni", ltd "Evrobloki".

Double glazed windows and doors– As a means of improving energy performance of buildings, the installation of double glazed PVC windows and doors has become very popular in Georgia in recent years.

There is a producer of such windows and doors in almost every town/district centre in Georgia. These production units import all necessary supplies and accessories, mainly from Turkey and Germany.

EE lighting – Currently, there is no production of EE bulbs (diode, fluorescent, or LED lamps) in Georgia; they are mainly imported from China, Turkey, Germany, the Czech Republic, and Poland. Their prices, in accordance with quality and lighting power, are from 5 to 30 GEL (2.1 to 12.6 EUR). The principal importers are: ltd "AkhaliNateba", ltd "Insta", OSRAM, and others.

EE household appliances–Energy saving can be realised through using Energy Efficient home appliances such as refrigerators, washing machines, ovens, LED TVs, and dishwashers. Georgia does not produce such equipment and mainly imports it from EU states, China, Korea, Japan, Turkey, and the US. There are many suppliers of household equipment in Georgia that are promoting EE appliances with EU, EE labeling (Elit Electronics, Eurotechnics OK, Galaxy, Geosmiley, Metromart, Megatechnica etc).

Heating and air conditioning systems– After the breakup of the USSR, district heating was abandoned and individual heating and air conditioning systems were introduced for each apartment and house in Georgia. Currently, Georgia does not produce such equipment and mainly imports it from China, EU states, the US, Turkey, and other countries that manufacture such equipment. The main importers of the mentioned equipment are Saga, Saga Impex, TbiliSakhli, and Thermarsenal. It should be mentioned that all main and large importers of heating and air conditioning equipment also provide quality design, installation, and maintenance services.

Industrial and SME equipment – Due to the fact that such equipment in most cases is tailor made and is specifically adjusted to customers' needs, there is no local production in Georgia, and basically such equipment is imported from EU states and Eastern European Countries, China, and Turkey. It should be mentioned that large industrial equipment manufacturers such as Bosch, Siemens, GE, Mitsubishi, Vilo, etc. have their representative service providers in the county, thus supporting local industry with the design and maintenance of the equipment.

5.3 Economic framework

The Georgian National Energy and Water Supply Regulatory Commission (GNEWRC) sets tariffs for the generation, transmission, dispatch, distribution, import, and consumption of electricity and for the transport, distribution, and consumption of natural gas.

Electricity consumption tariffs for electricity in Georgia are regulated by the GNEWRC. Large consumers can be supplied through direct contracts with generators in the bilateral market. The tariff policy methodology is based on a full cost recovery principle for production and supply, which is stipulated by the law and tariff methodology.

In order to create additional guarantees for social protection and for the promotion of the rational consumption of electricity, rigid step tariffs were introduced: for the consumption of up to 100 kWh and 101-300 kWh, and for more than 301 kWh.

Energy Indicative current prices for residential customers (population) are as follows:

Table 8: Electricity prices for residential customers
Source: JSC "Telasi", JSC "Energo-Pro Georgia", 2015

Consumption Stage	For residential customers in Tbilisi (EUR/kWh)	For residential customers outside of Tbilisi (EUR/kWh)
Up to 101 kW/h	0.034	0.038
From 101 kW/h to 301 kW/h	0.045	0.055
301 kW/h and more	0.063	0.074

As for the industrial sector, the GNEWRC set the following prices for electricity:

Table 9: Electricity prices for the industrial sector
Source: JSC "Telasi", JSC "Energo-Pro Georgia", 2015

Voltage	For industrial customers in Tbilisi (EUR/kWh)	For industrial customers outside of Tbilisi (EUR/kWh)
220/380 volts (for non-residential, commercial customers)	0.057	0.067
6-10 kV	0.053	0.043
35-110 kV	0.031	0.041

Averages for residential and industrial tariffs in Georgia are 0.034-0.074EUR/kWh and 0.031-0.067 EUR/kWh, respectively (exchange rate in March 2015 – 1 EUR=2.37 GEL).

These values have to be compared with average prices in the European Union of 0.199EUR/kWh for households and 0.094 EUR/kWh for industry *(Source: EUROSTAT 2013)*.

Current tariffs for natural gas consumption have to be differentiated between residents of Tbilisi and other residents and are shown in the table below.

Table 10: Natural gas tariffs
Source: "KazTransGas Tibilisi", local natural gas distribution company

Consumers type	EUR/m^3
Residents of Tbilisi, low pressure	0.23
Residents of Tbilisi, average pressure	0.21
Residents of Tbilisi, high pressure	0.17
Residents outside of Tbilisi	0.23-0.25

There are no differences in terms of industrial or commercial usage of natural gas – if gas is provided with low pressure and it is not residential use – the price is 400 EUR/1000 m^3. As the supply pressure changes (medium or high pressure), price also changes but it is calculated individually each time (considering connection cost, equipment cost, etc.).

EU-28 average figures indicate 0.039 EUR/kWh for industrial consumers (about 0.39 EUR/m^3) and 0.076 EUR/kWh for households (about 0.67 EUR/m^3) *(Source: EUROSTAT 2014)*.

According to data from the World Bank, the GNI per capita for European Union is USD 35,530 (2013) and the same indicator for Georgia is at the level of USD 3,560 (2013). It is clear that the difference between the incomes of about 10 times is larger than the difference between the energy prices.

Payback periods for potential investments with relevance on energy efficiency are estimated by local experts.

Table 11: Simple Pay-Back Periods

Type of project	Simple pay-back period (years)	Remarks
Industrial Sector		
Improvement of industry organization and management	0.2-0.7	Very short payback period due to almost zero investment costs (only investment to be carry out are expenses for staff training). The better management of energy in general refers to the situation when the whole staff of an enterprise is continuously aware of energy costs and adopts simple measures (interventions) to reduce them.
Increase efficiency of existing boilers/furnaces in all industrial sub sectors	3 - 6	Depending on the condition of the existing equipment.
Co-generation of Heat and Power (CHP) and tri-generation systems	7 - 10	The relatively low cost of Diesel/LPG and electricity are the main barriers for development of this market.
Thermal insulation for high temperature equipment and utilities	2 – 4	Average payback period due to the low investment and energy costs.
VSD systems, high efficiency production machines, heat recovery for medium and high temperature heat sources	2 – 4	Average payback period due to the low investment and energy costs.
Residential Sector		
Thermal insulation for outside walls, roofs, and floors	4 – 8	Due to the high cost of investment and legal obstacles related to the building blocks, these investments characterized with long payback period/almost impossible (multi apartment building blocks).
Efficient windows for buildings and houses	6 – 8	Long payback period due to the very low energy price for residential sector.
Solar Hot Water Systems for buildings and houses	5 – 7	Long payback period due to the very low energy price for residential sector.
Efficient boilers for buildings and houses	3 – 5	An average payback period due to the medium investment and low energy costs.
Public and Private Service Sectors		
Thermal insulation for outside walls, roofs, and floors	3– 5	An average payback period due to the high investment cost and intense operating hours.
Efficient windows for buildings	5 – 6.5	Long payback period due to the high investment cost and intense operating hours.
Solar Hot Water Systems for buildings	2.5 – 4	Average payback period due to medium climate zone and great solar radiation conditions.

Efficient boilers for buildings	2.5 – 4	Average payback period due to high investment costs and intense operating hours
Efficient lighting systems (Compact Fluorescent Bulbs and LED) for buildings	1 – 3	Low payback period due to the very low investment costs and low electricity costs.
Agricultural Sector		
Efficient boilers for Green Houses	6 – 10	Long payback period due to low fuel (NG) price.
Efficient Tractors	7 – 9	Relatively long payback period due to high investment costs and low diesel prices.
Efficient drip irrigation system	5 –6	Long payback period due to high investment costs, low energy prices. Not very popular type of investment due the country specifics for water demand.

5.4 Awareness and information level

As a general approach, it is a fact that the awareness and information level about energy efficiency and renewable energy sources is low. There are several reasons for this:

1. Lack of energy efficiency educational and information programmes;
2. The local experience in EE and RES projects is not sufficient and makes the technology investment cycle long;
3. Low interest in investing in the development of the solar and biomass energy sector;
4. Low capacity of local research centres;
5. Absence of energy policy and strategy

International financial institutions are quite active in the country, using a mix of tools and ways that have already been adopted in western countries. For example, the EBRD is providing affordable credit lines to local banks to support energy efficiency and development of renewable energy sources, including subsidised loans and free technical assistance during the project development stage; KfW also has a similar financial tool except for the subsidy component.

Although IFIs are promoting EE/RES development in the country with their credit lines, the efforts are still not enough and are limited and tied to their particular projects or interests. Therefore, a massive and all-inclusive information campaign is necessary.

6 Conclusions

Insufficient governmental support slows down demand for energy efficient technologies and development of renewable energy resources– a lack of tax incentives or reductions for EE/RES implementation, the absence of an energy policy and long term development strategy together with insufficient financial support and the low capacity of research centres could be identified as primary targets that need to be addressed. Also government should consider energy efficiency and renewable energy as a source for the country's economic development, energy security, and independence.

The residential sector – the most promising and largest energy consuming sector – is eager to implement energy efficiency measures, but this depends on awareness of the benefits and motivation to implement EE measures. Effective information campaigns, together with legislative improvements, and financial institution support have a significant role to play in this regard by encouraging importers to import energy efficient appliances and equipment.

Considering the fact that almost 100% of oil products consumed in the country are imported, the transportation sector is second on the list of most energy consuming sectors that needs legislative and financial incentives and support to reduce the amount of imported oil products and follow global trends for the creation of a cleaner environment.

A Building Code that takes into consideration effective ways to transform and improve the energy demand of buildings, both for existing and for new construction, should be adopted speedily.

Given that the consumption of energy in the industrial sector accounts for about 20% of TFC, energy efficiency and modernisation plays a vital role in the country's economic development. This sector consists mostly of private companies which are interested in energy savings and reducing production costs. The only thing that is missing to boost interest and demand for energy efficient technologies is legislative and financial support from government and financial institutions.

7 Relevant Institutions

The Ministry of Energy is responsible for providing the policy framework and legal means for the institutional development of the energy sector of Georgia.

The Georgian National Energy and Water Supply Regulatory Commission is a legal entity defined under the Law of Georgia on Independent Regulatory Bodies. The commission has the authority to grant licenses and to regulate the activities of licensees, importers, exporters, commercial system operators, and suppliers within the electricity and natural gas sectors of Georgia.

Conforming with the applicable law and policy and as determined and overseen by the GNEWRC, the structure of the electricity market in Georgia allows for:

- Direct contracts between power producers and consumers;
- Sales in a balancing market through ESCO;
- Power purchase agreements between hydropower developers and ESCO;
- Deregulated or unrestricted operation of exports and plants less than 13 MW.

The newly created market maker, ESCO (Electrical System Commercial Operator), is a commercial entity owned by the Georgian state and is responsible for ensuring contracts for electricity export and import. When the electricity market in Georgia was deregulated in the 1990s, the Georgian Wholesale Electricity Market (GWEM) was set up as the sole market maker in the system. GWEM purchased and sold electricity. The lack of payment discipline in the sector caused GWEM to file for bankruptcy in 2004, and the company was closed down in 2006 and replaced by ESCO.

The following table provides an overview of institutions relevant for EE in Georgia.

Table 12: Institutions relevant for EE in Georgia

State bodies	
Ministry of Energy of Georgia www.energy.gov.ge	The Ministry of Energy carries out state policy in the energy sector, participates in adoption of the state strategy and programmes, studies their implementation, and draws up the relevant recommendations. One of the main objectives of the Ministry is to create a competitive environment in the energy market. The Ministry has the right to make decisions on deregulation or partial deregulation of specific segments of the sector.
Georgian National Energy and Water Supply Regulatory Commission www.gnerc.org	The Georgian National Energy and Water Supply Regulatory Commission is the regulatory body for the energy sector. It was established on the basis of state property and doesn't depend on the state organisations. The Regulatory Commission issues generation, transmission, dispatching, and distribution licenses. The Georgian National Energy and Water Supply Regulatory Commission approves the tariff methodology. According to this methodology, the commission identifies and regulates the generation, transmission, dispatching, distribution, transition, import, export, supply, and consumption tariffs, as well as the tariffs of the system's commercial operator services, the guaranteed capacity fee and the guaranteed capacity source's power generation tariff.
Other related institutions	
Energy Efficiency Centre www.eecgeo.org	The Energy Efficiency Centre (EEC) was established in 1998 by the European Union within the framework of the EU TACIS Project "Creation of an Energy Efficiency Centre and Development Natural Energy Study in Georgia". The main objectives of the EEC are to support renewable energy and energy efficiency utilisation for sustainable development, and as a result improve national energy security level and minimise negative environmental impacts and increase awareness of the civil society and the country's decision makers on the environmentally friendly and economically sound ways of energy production and consumption as well as on the potential for renewable energy and energy efficiency.

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