Unofficial Translation

National Energy Efficiency Action Plan (NEEAP) (2019–2020)

Contents

Executive Summary 1

Overview of Georgian energy situation 2

Overview of national energy efficiency targets 4

Measures implementing the EED 9

1. Horizontal measures 9

2. Energy efficiency measures in buildings 13

3. Energy efficiency measures in public bodies 17

4. Energy efficiency measures in industry 22

6. Promotion of efficient heating and cooling 2

7. Energy transformation, transmission, distribution, and demand response 2

List of abbreviations

BAU	Business As Usual
BP	British Petroleum
CCGT	Combined Cycle Gas Turbine
CO	carbon monoxide
CO_2	carbon dioxide
CO_2eq / CO_2eqv	carbon dioxide equivalent
CoM	Covenant of Mayors
CNG	Compressed Natural Gas
EBRD	European Bank for Reconstruction and Development
EE	Energy Efficiency
EED	Energy Efficiency Directive
EEO	Energy Efficiency Obligation
EaPGREEN	Greening Economies in the European Union's Eastern Neighbourhood
EnPC	Energy Performance Contracting
EPBD	Energy Performance in Buildings Directive
ESCO	Electricity System Commercial Operator of Georgia

EU	European Union
EUR	Euro
E5P	Eastern Europe Energy Efficiency and Environment Partnership
GDP	Gross Domestic Product
GHG	Greenhouse gas
GNERC	Georgian National Energy and Water Supply Regulatory Commission
GSE	Georgian State Electrosystem
HPP	Hydro-power plant
HID	High Intensity Discharge
IFC	International Finance Corporation
IFI	International Financial Institute
IRR	Internal Rate of Return
INDC	Intended Nationally Determined Contribution
LED	light-emitting diode
LEDS	Low Emission Development Strategy
LFI	Local Financial Institution
NAMA	Nationally Appropriate Mitigation Action
NEFCO	The Nordic Environment Finance Corporation
NEEAP	National Energy Efficiency Action Plan

NGO	Non-governmental Organization
NO_2	nitrogen dioxide
MOESD	Ministry of Economy and Sustainable Development of Georgia
MEPA	Ministry of Environmental Protection and Agriculture
PPP	Purchasing Power Parity
RECP	Resource Efficient and Cleaner Production
SEAP	Sustainable Energy Action Plan
SME	Small and medium-sized enterprises
SON	Sodium discharge lamps
TPP	Thermal Power Plant
UNIDO	United Nations Industrial Development Organization
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States dollar
WPP	Wind power plant

Dimensions and coefficients

kV	Kilovolt		kV.	
kWh	kilowatt-hour		kWh.	
MWh	megawatt-hour/	=1000 kWh	MWh.	=1000 kW.h

GWh	gigawatt-hour	=1 000 000 kWh	GWh.	=1000 000 kW.h
TWh	terawatt-hour	=1000000000 kWh	TWh.	=1000000000 kW.h
Mtoe	million tonnes of oil equivalent		Mtoe	
W	watt		w.	
kW	kilowatt	=1000 W	kw.	=1000 W.
MW	megawatt	=1000000 W	mW.	=1000000 W.
Kg	kilogram		kg.	
t	tonne	=1000 kg	t.	=1000 kg.
Kt	kiloton	=1000000 kg	kt.	=1000000 kg.
Mt	megaton	=1 000000000kg	mt.	=1 000000000 kg.
km	kilometer		km.	
tkm	tonne-kilometer		t.km.	
pkm	passenger-kilometer		pass.km.	
TOE per MWh	0,085984523		The tonne of oil equivalent per Megawatt hour	
TOE per GJ:	0,02388459		The tonne of oil equivalent per gigajoules	
MWh per GJ	0,277777778		megawatt hours per gigajoules	

Gcal per MWh	0,859845228		Gigacalories per megawatt hours	
GEL per EUR	2,7206		Gel per EUR	
USD per EUR	1,092		USD per EUR	

Executive Summary

This document sets out Georgia's First National Energy Efficiency Action Plan (NEEAP) which establishes a set of investment and policy measures to be carried out in the coming period (2019- 2020) which can last up to 2022 year. The aim of NEEAP is at optimizing and reducing the use of energy resources as compared to a Business As Usual (BAU) scenario. The NEEAP has been developed in order to assist in meeting a number of strategic goals of Georgia, including:

- Setting out energy savings targets for the coming 3 year period and beyond in order to:
  - Improve competitiveness
  - Reduce the needs for import of energy
  - Reduce greenhouse gas emissions in a way that is consistent with Georgia's commitments, such as the Nationally Determined Contribution (NDC) submission to the UNFCCC in 2015;
- Providing a signal to the international and national community on energy efficiency priorities and plans
- Laying out a roadmap for implementation of priority measures – including development of the EE Law
- Reporting on the plans for implementation of the EU's Energy Efficiency Directive (EED - 2012/27/EU) which Georgia has committed to under the EU – Georgia Association Agreement and also by signing up to the Energy Community.

This document is a summary of the full NEEAP report. It lays out targets for savings of primary energy consumption[1] as well as policy and investment measures to achieve these targets. Measures described include:

a) those already underway;

b) thosecommitted by various international agreements;

c) those being planned for implementation in the coming years which are in-line with national priorities. The measures are sorted by the following categories:

9 Horizontal measures which impact more than one sector (e.g. public and private) and / or are consistent with horizontal measures as laid out by the EU's guidance on developing NEEAPs

- **1 Building measure** in *private* commercial and residential buildings;
- **9 Public sector measures** which will be carried out at the level of central and non-central government
- **6 Industry sector measures** which include 1 information gathering and various investment types of measures, which are also related to the horizontal measures;

[1] Primary energy consumption measures the total energy demand of a country. It covers consumption of the energy sector itself, losses during transformation (for example, from oil or gas into electricity) and distribution of energy, and the final consumption by end users.

- **Transport sector measures;**
- **8 Energy sector measures** related to energy transformation, transmission, and distribution sub-sectors.

According to calculations developed for the NEEAP, in 2020 the implementation of the measures mentioned above could lead to 9% of energy saving in primary energy sources and 4% in final energy consumption.

In 2025 it could lead to 13% in primary energy sources and 9% in final energy consumption; In 2030 - 14% in primary energy sources and 11% in final energy consumption, compared to the BAU scenario.

Those energy-saving measures can have an important contribution to the targets set by Georgian Nationally Determined Contribution (NDC). In December 2015, Georgia determined the fulfilling of this commitment on COP21Paris conference of the parties for United Nations Framework Convention of the Climate Change.
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It is also noteworthy, that out of the measures defined within the NEEAP:

- 5 of them considers the implementation of large public and private sector investments. The implementation is already planned by the Government / private sector;
- 3 measures are under development stage, which envisages the policy introduction in different directions;
- 9 measures envisage introduction of policy directions, committed by the accession of Georgia to the Energy Community Treaty/ signing the Association Agreement (AA) with EU. / EU;
- Implementation of 21 measures which envisages policy introduction at the municipal level and relevant investment realizations, are not yet committed;
- 6 of them are policy measures targeting mostly private sector.

The process of designing the NEEAP involved significant interaction and consultation with stakeholders, including:

- Contact with over 100 national-level, municipal, Government and international stakeholders of which the vast majority of them provided inputs into the NEEAP in some way;
- A total of over 50 people attended 2 workshops carried out for discussions of the NEEAP draft
- Written comments provided by 25 different stakeholders on the NEEAP.

Overview of Georgian energy situation

Currently Georgian energy sector, energy policy and regulatory framework is in a state of active reforms and development. It should be noted that, in order to regulate field of energy efficiency several draft law are prepared, draft law on Energy Efficiency, draft law on Energy Performance of Buildings and draft law on Energy Labelling, (draft law on Energy Performance of Buildings and draft law on Energy Labelling are submitted to the Parliament of Georgia). Once those are in force, legal base for the mandatory implementation of the targetedmeasures defined by NEEAP will be established.

Reforms are particularly influenced by the Association Agreement signed with the European Union in June 2014. Under the Agreement, Georgia took an obligation of implementing the EU directives in energy

sector and will have to comply with the requirements of the third energy package.[2] Georgia joined the Energy Community as a Contracting Party in July 2017.

Based on energy balance dataof 2017, fossil fuels accounted 73% of primary energy consumption in Georgia. Almost entire domestic supply of fossil fuels (98%) are imported from neighbouring countries, which means that energy security and independence are significant challenges for the country – especially since there are strained relationships within the region. Moreover, the situation has also been exacerbated by a tendency of an increase in fossil fuels consumption in recent years. (Figure1 and figure 2), Which leads to an increase in imports. The largest increase can be seen/observed in natural gas imports.

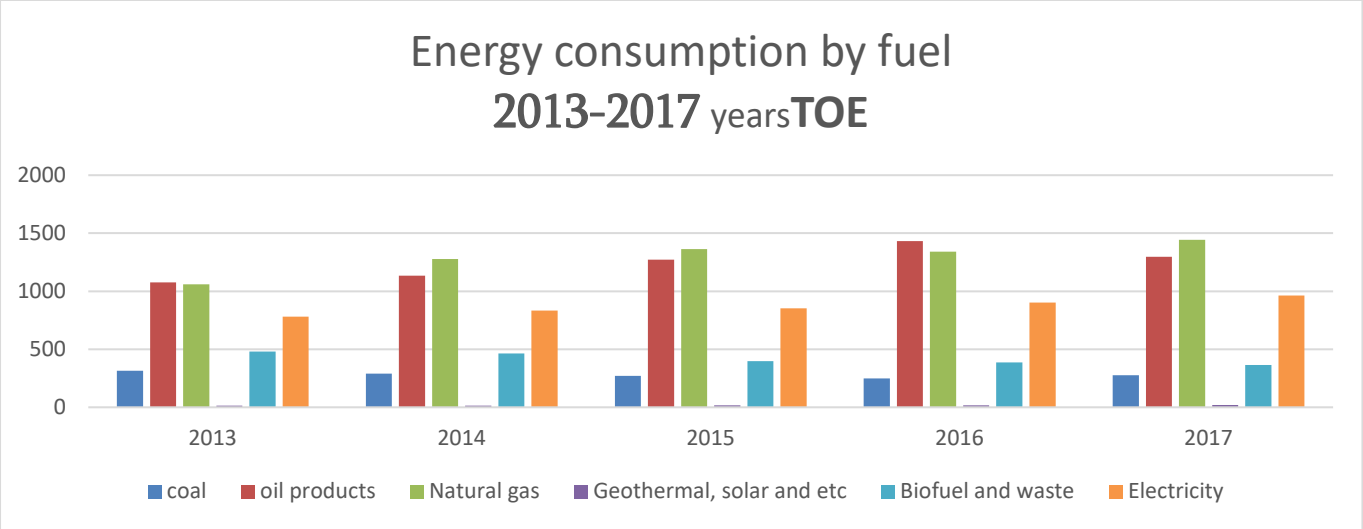

Figure 1: Graphical representation of final energy consumption according to fuel categories – 2013 and 2017

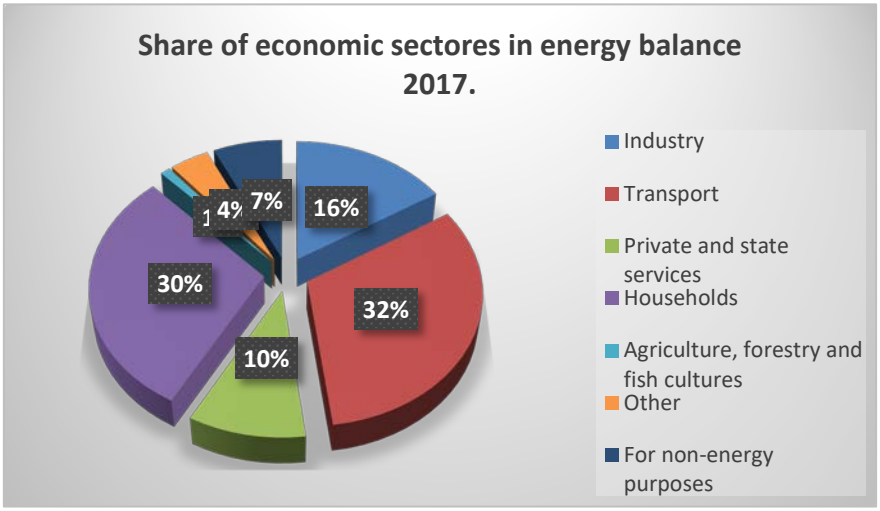

Figure 2: Share of economic sectors in energy consumption

Source: GeoStat (2018) Energy balance of Georgia,2017

Even though compared to other countries, the Georgian economy does not have much energy intensive industry. Its GDP intensity is still much higher than, for instance, in Turkey, whose economic structure (industrial

[2] European Union (30 August 2014) Association Agreement between the European Union and the European Atomic Energy Community and their Member States, of the one part, and Georgia, of the other part. Official Journal of the European Union L261/4 Available at http://eeas.europa.eu/georgia/pdf/eu-ge_aa-dcfta_en.pdf

sector) is characterized by high rate of energy use. This indicates that there is potential for energy efficiency improvements in Georgia..

Overview of national energy efficiency targets

Georgia's indicative national energy efficiency targets for 2020, are laid out/shown in Table 1.

The table also outlines expected results of the planned activities for 2025 and 2030,as an additional indicative target period. That target can be reached by implementing all measures of the NEEAP. The given targets are symbolic and are not legally binding.

Table 1: Georgia's indicative energy efficiency targets for 2020, 2025, and 2030 Compared to the Business As Usual (BAU) Scenario

Year	2014		2020		2025		2030	
Category	**Primary Energy (GWh)**	**Final energy (GWh)**	**Primary Energy (GWh)**	**Final energy (GWh)**	**Primary Energy (GWh)**	**Final energy (GWh)**	**Primary Energy (GWh)**	**Final energy (GWh)**
Business as Usual (BAU)	54,894	46,758	63,185	57,426	85,542	70,201	101,810	83,710
Savings from measures	-	-	5,455	2,588	10,856	6,167	14,584	9,253
With measures	54,894	46,758	57,729	54,838	74,687	64,034	87,226	74,457
% energy reduction from the BAU	0%	0%	9%	4%	13%	9%	14%	11%

Note: Figures for energy consumption in 2014 come from Geostat's Energy Balance (published in 2015). The final energy consumption figures for 2014 do not include 27 GWh of non-energy use consumption of oil products in the energy sector.

AsTable 1 shows energy efficiency measures described in this NEEAP would have a significant impact on Georgia's energy consumption.

The BAU scenario was developed using MARKAL modelling software using inputs developed by the Georgian Government as part of the LEDS project. Assumptions underlying the Business As Usual scenario are as follows:

- The current population is assumed to be 3,720,400 people[3] – and would remain constant at this level.
- GDP growth is projected to be 5.6% annually through 2030.
- Per capita GDP is projected to grow from ~EUR 3,450 in 2015 to ~EUR 7,660 in 2030.
- The number of households is projected to remain steady at 955,000 by 2030.
- The number of families by 2030 will remain the same - 955 000;
- Growth of energy electricity consumption in industry is projected to grow by 5.6% per year by 2030.

[3] See Geostat (2016) Population: http://www.geostat.ge/index.php?action=page&p_id=152&lang=eng

The impact on energy consumption has been calculated through the use of individual models for each measure – wherein a BAU case was developed in terms of final energy consumption and primary energy consumption, and then the energy efficiency case was developed which entailed a number of potential changes including:

Use of renewable energy technologies, instead of technologies working on traditional, primary energy sources and energy carriers. – such as full or partially switching from electricity to solar resources for hot water heating . As a result, there is no change of final energy demand, but there is savings of primary energy sources(which is consumed to create electricity).

- **Improvement of energy distribution / transmission / transformation efficiencies –** such as reducing electricity losses or natural gas losses on their networks, or improving the efficiency of natural-gas fired power plants by switching to combined-cycle plants.**Improving the efficiency of end-use equipment –** such as introducing efficient lighting, efficient wood-stoves, improving the efficiency of vehicles, use of efficient pumps, boilers and etc. in industry and other sectors.
- **Switching to more efficient transport means –** such as switching from personal cars to buses or metros. This also involves the shift of freight transportation from heavy goods vehicles to railways;

Reduction of end-user demand – such as reduction of heating losses in building envelopes, reduction in the use of internal-combustion-engine vehicles (ICEV) , improving maintenance of industrial firms, etc.The targets for measures were calculated based considering EE market potentialas much as possible. Also, – with certain assumptions made regarding the market penetration levels or levels of investment which would occur. These are described in details for each measure in the full NEEAP document. The dates of 2020, 2025, and 2030 as the target dates were chosen to be consistent with the planning horizon of the EU and Energy Community – as well as with Georgia's Intended Nationally Determined Contribution for reduction of greenhouse gases .

The achievement of the indicative targets of this NEEAP is particularly dependent on three factors:

1. **The implementation of an ambitious policy agenda for energy efficiency**:
    a. Implementation of an overall project identification, technical assistance, and grant distribution scheme by the Ministry of Economy and Sustainable Development of Georgia (H-1)
    b. Incentivizing energy efficiency in industry (H-2)
    c. In buildings, implementation of the EPBD including energy audit rules (H-9) and building up energy auditors' expertise (H-5).
    d. In industry, building up knowledge and capacity amongst decision-makers on energy efficiency issues (H-3), adopting energy audit rules and assisting increase of expertise amongst energy auditors (H-6)
    e. The introduction of energy efficient public procurement practices (P-8)
    f. A regulatory mechanism to increase the share of the market for efficient light bulbs (B-1 , P-3 and investments in industry); and
    g. A technical inspection programme of vehicles (T-2)
2. **The availability of technical assistance for implementation:** Many measures are contingent upon the availability of technical assistance within the various sub-sectors in planning energy efficiency investments.
3. **The availability of investment funds for implementation of projects:** The availability of lending funds at a reasonable rate and grants for implementation of measures.

Figure 3 shows the /distribution of the amount of energy savings per sector while Figure 4 shows the percentage breakdown of energy savings according to sectors. It should be noted that the savings are fairly well spread across the sectors, with the energy sector and transport sectors having a large impact on

savings. Savings targets were not calculated for some horizontal measures, as their impact will be mostly related to stimulation of energy efficiency development and investments in other sectors.

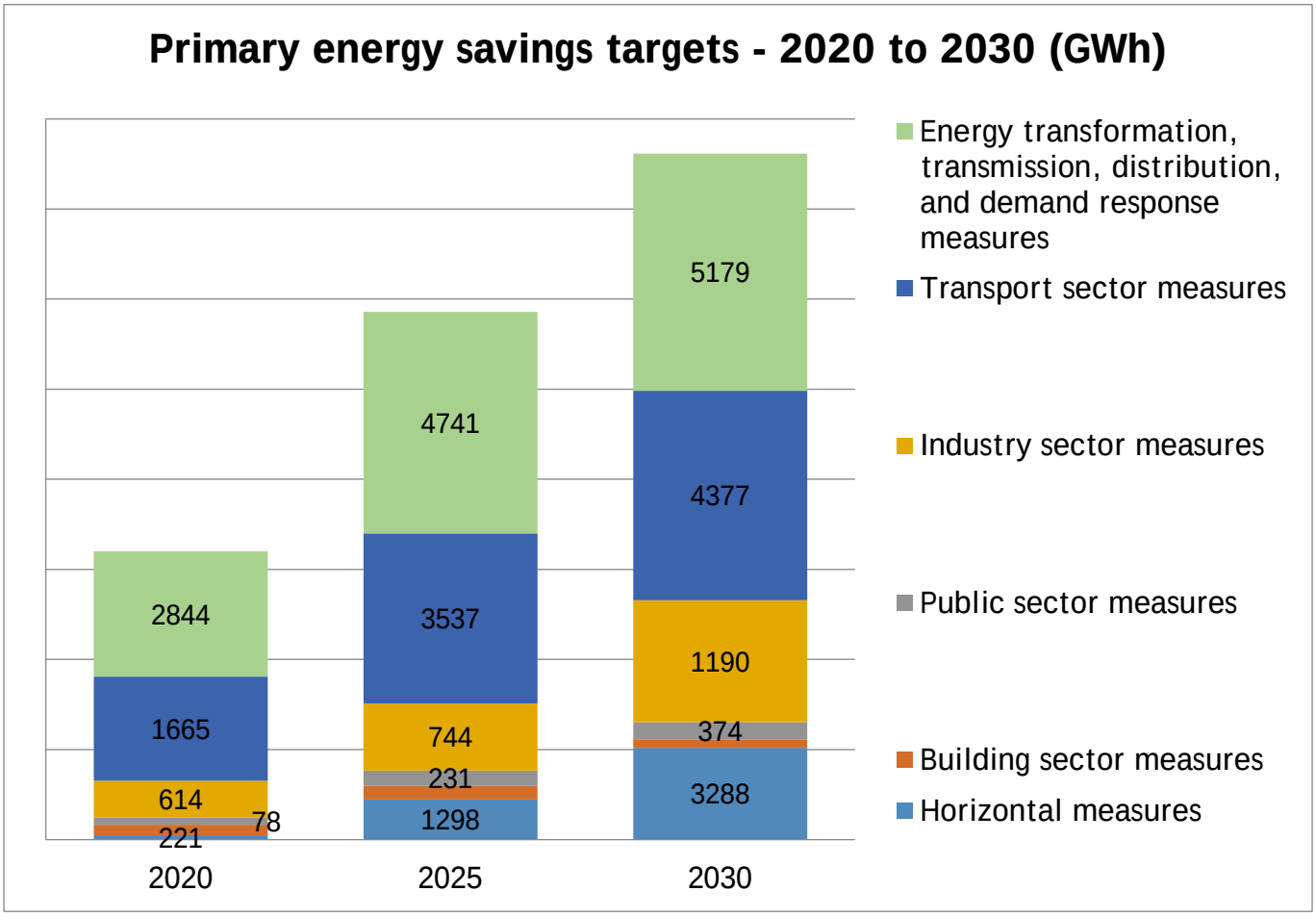

Figure 2: Primary energy savings according to sector for 2020, 2025, and 2030 (GWh)

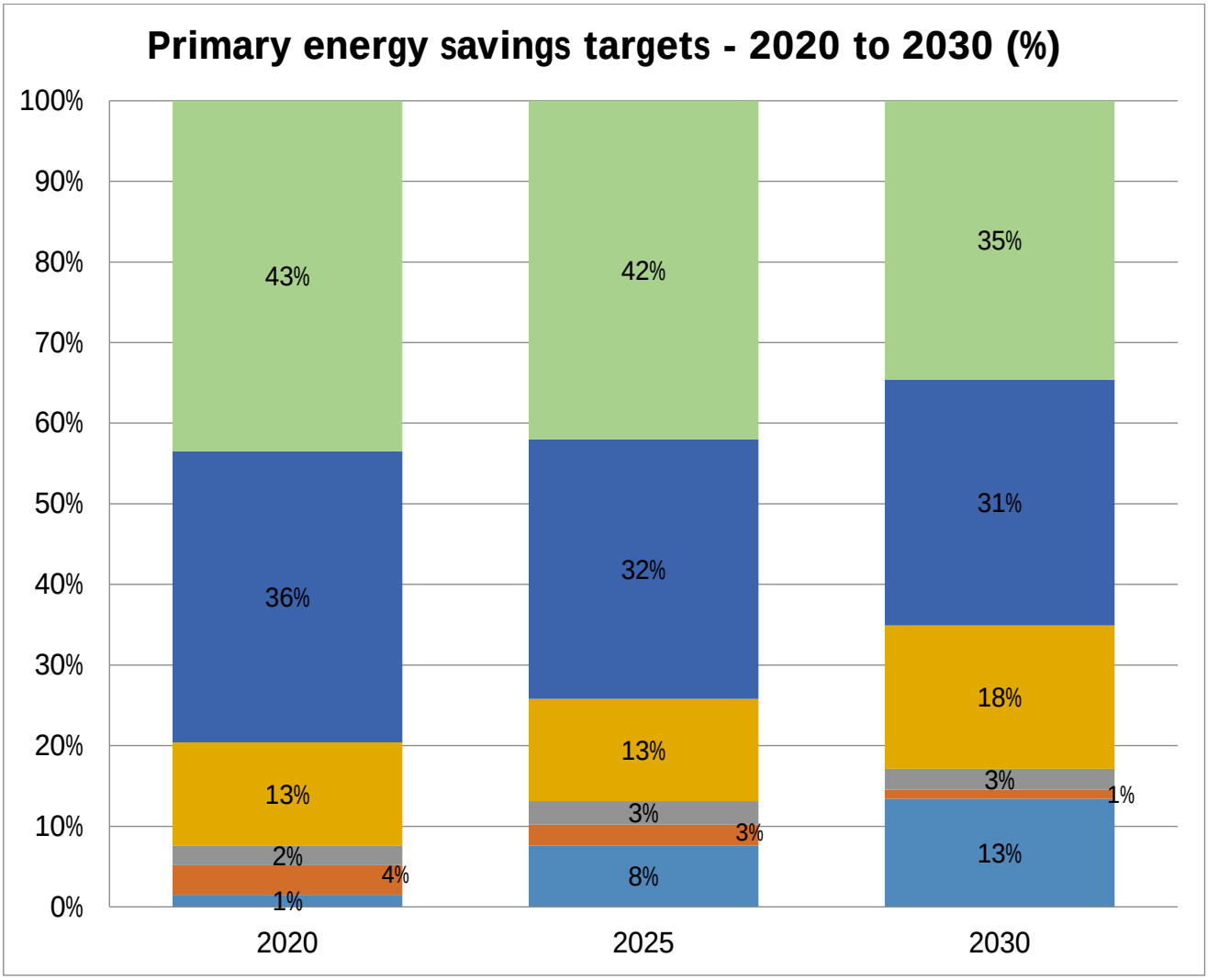

Figure 3: Primary energy savings targets in percentage for 2020, 2025, and 2030 (%)

The Table 2 below shows the key priority policy measures planned as part of the NEEAP – which are directly related to facilitating investment in EE and also to implementation of measures reflected in a 3-year long DCFTA Action Plan. The most critical measures as far as energy saving and /or facilitation of investments have a light blue background.

Table 2

No.	Title of the energy saving measure	2019		2020		2021		2022	
Horizontal measures to be implemented by the Ministry									
H-1	Alternative policy measures - Financing schemes for energy efficiency								
H-3	Alternative policy measures – Training and education, including energy advisory programmes								
H-8	Consumer information programmes and training								
T-2	Public awareness - Information campaign for transport								
H-2	Alternative policy measures – Incentivising / mandating energy efficiency in industry								

H-7	Energy audits and management systems, boiler inspections in the industry sector*									
Public sector and Building policy measures										
H-4	Standards and norms and labelling schemes in appliances*									
H-5	Qualification, accreditation, and certification schemes – Buildings*									
H-9	EPBD Transposition and Enforcement: Standards and norms and energy performance certification schemes in buildings*									
B-1	Regulations leading to improved efficient lighting systems in residential and commercial buildings									
P-1	Develop a national energy efficiency information system for publicly owned buildings									
P-8	Energy efficient procurement**									
Transport sector policy measures										
T-1	Vehicle improvement - Mandatory periodic roadworthiness tests for motor vehicles									
T-8	Vehicle improvement - Increase of hybrid and electric vehicles**									
Primary Energy sector policy measures										
E-2	Policies and investments to rehabilitate hydropower assets									
E-3	Optimization of reserves and seasonal operational regimes									
E-5	Regulations on the rules of calculation of normative electricity losses - stimulating investments**									
E-6	Regulations on the rules of calculation of normative natural gas pipeline losses - stimulating investments**									

Policy development and adoption

Policy implementation

Priority measures for energy saving / facilitation of market development

* Policy required as part of Energy Community Membership / EU accession

** Policies already in place

Measures implementing the EED

This section is aimed at bringing together information on all important energy efficiency measures planned to be adopted in Georgia to implement the EU's Energy Efficiency Directive (EED - 2012/27/EU). The analysis and presentation of the measures planned for the NEEAP was developed by Ministry of Economy and Sustainable Development with the assistance of a consortium of local and international experts. Significant inputs from a variety of national-level and municipal stakeholders have been incorporated into the action plan. Overall responsibility for the implementation and monitoring of the NEEAP is on the Government of Georgia. A number of other national and sub-national entities (including municipalities) will play a significant role as well. These are outlined in detail within the description of the measures in the full NEEAP document.

The section below outlines the measures planned broken down by the sector impacted – as consistent with EU guidance for NEEAP development.

1. Horizontal measures

1.1. Energy efficiency obligation scheme / alternative measures

Article 7 of the EED requires EU member states to set up an energy efficiency obligation (EEO) scheme ***or to achieve the same amount of savings with alternative measures***. The EEO scheme requires energy distribution companies to achieve energy savings of at least 1.5% of annual sales to final consumers. For Energy Community Contracting Parties, the target for EEOs was set at 0.7% each year from 1 January 2019 to 31 December 2022 . A country can opt to introduce the above 0.7% target gradually (i.e., 0.5% in 2019 and 2020; 0.7 % in 2021 and 2022), and such and other alternative calculation measures should notify to Energy Community Secretariat by the end of 2019. In order to achieve above mentioned target, as a result of consultations, Georgian government has opted to implement alternative policy measures, To achieve this, implementing capital investments and a number of technical measures in various sectors of the economy will be needed. Therefore, the EEO target will not be used for Georgia's NEEAP. **Instead of implementing an EEO scheme, Georgia plans to implement a set of alternative policy measures linked with technical/financial measures which reduce final energy consumption.**

As an alternative (or supplement) to setting up an energy efficiency obligation scheme, the Article 7 of EED allows to take other policy measures to achieve energy savings among final consumers.

- The alternative measures included in Georgia's first NEEAP are as follows: Financing schemes for energy efficiency (H-1)
- Incentivising /mandatingng energy efficiency in industry (H-2)
- Training and education, including energy advisory programmes (H-3)
- Standards and norms and labelling schemes in appliances (H-4)[4]

The above measures will not achieve **direct** savings equivalent to the impact of the EEO scheme, however they will make it possible to achieve savings through the specific technical/investment measures described

[4] This measure is linked to Directive 2010/30/EU. Even though Georgia is not yet an EU Member State, it is a Contracting Party to the Energy Community. Therefore, for classification purposes the measure is considered as an "Alternative Policy Measure" for this NEEAP.

later in this section It is possible to achieve more savings through implementation of sector-specific measures than through implementation of an EEO scheme.Additional Horizontal measures include:

- Qualification, accreditation, and certification schemes in Buildings impacting the buildings and public sector (H-5)
- Qualification, accreditation, and certification schemes in industry (H-6)
- Energy audits and management system, as well as boiler inspection requirements for large industrial companies (H-7)
- Consumer information programmes and training (H-8)
- EPBD Transposition and Enforcement: Standards and norms and energy performance certification schemes in buildings impacting the buildings and public sector (H-9)

Table 3: Overview of individual horizontal measures

No.	Title of the energy saving measure	Implementing body	Source	Type of financing	Required financing in the coming period (2019-2020)		
					2019	2020	Total 2019 - 2020
H-1	Alternative policy measures - Financing schemes for energy efficiency	Initially Ministry of Economy and Sustainable Development	Central Government	In-kind	TBD	TBD	TBD
			IFIs/Banks - Investment	Grants	TBD	TBD	TBD
			Total				
H-2	Alternative policy measures – Incentivising / mandating energy efficiency in industry	Ministry of Economy and Sustainable Development	Central Government	In-kind	€ 0	€ 79,000	€ 79,000
			Industry/Private companies	In-kind and investment	€ 0	€ 9,361,000	€ 9,361,000
			Total		**€ 0**	**€ 9,440,000**	**€ 9,440,000**
H-3	Alternative policy measures – Training and education, including energy advisory programmes	Ministry of Economy and Sustainable Development in cooperation with other relevant entities, donors/ IFIs	Central Government	In-kind	€ 0	€ 0	**€ 0**
			Total		**€ 0**	**€ 0**	**€ 0**
H-4	Standards and norms and labelling schemes in appliances	Ministry of Economy and Sustainable Development in cooperation with other relevant entities	Central Government	In-kind	€ 13,000	€ 91,000	€ 104,000
			Private Sector	Investment	€ 0	€ 0	€ 0
			Total		**€ 13,000**	**€ 91,000**	**€ 104,000**
H-5	Qualification, accreditation, and certification schemes - Buildings	Ministry of Economy and Sustainable Development in close cooperation with training institutions and other relevant entities.	Central Government	In-kind	€ 138,000	€ 133,000	€ 271,000
			Total		**€ 138,000**	**€ 133,000**	**€ 271,000**
H-6	Qualification, accreditation, and	Ministry of Economy and Sustainable	Central Government	In-kind	€ 138,000	€ 133,000	€ 271,000

	certification schemes - Industry	Development in close cooperation with training institutions and other relevant entities.	**Total**		**€ 138,000**	**€ 133,000**	**€ 271,000**
H-7	Energy audits and management systems, boiler inspections in the industry sector	Ministry of Economy and Sustainable Development in cooperation with other relevant entities	Central Government	In-kind	€ 38,000	€ 39,000	€ 77,000
			Industry/Private companies	Investment	€ 83,000	€ 413,000	€ 496,000
			Total		**€ 121,000**	**€ 452,000**	**€ 573,000**
H-8	Consumer information programmes and training	Ministry of Economy and Sustainable Development in cooperation with other relevant entities (possibly Municipalities), donors/ IFIs	Central Government	In-kind	€ 0	€ 756,000	€ 756,000
			Municipalities	In-kind	€ 0	€ 200,000	€ 200,000
			Total		**€ 0**	**€ 956,000**	**€ 956,000**
H-9	EPBD Transposition and Enforcement: Standards and norms and energy performance certification schemes in buildings	Ministry of Economy and Sustainable Development in cooperation with other relevant entities	Central Government	In-kind	€ 25,000	€ 130,000	€ 155,000
			Real estate developers/ building owners	Investment	€ 0	€ 7,377,000	€ 7,377,000
			Municipalities	In-kind	€ 25,000	€ 25,000	€ 50,000
			Total		**€ 50,000**	**€ 7,532,000**	**€ 7,582,000**
Total					**€ 460,000**	**€ 18,737,000**	**€ 19,197,000**

1.3 Energy Services

Information on measures related to energy performance contracting (EnPC)[5] and energy services are not yet applicable as the market does not exist – nor are there concrete plans to promote them yet.

Based upon analysis carried out in preparation of this NEEAP, the scope for the potential market for Energy Performance Contracting are as follows related to specific sectors in which EnPCs are common:

- **Industry:** There is a large market potential for EnPC implementation in the industrial sector, with potentially over EUR 200 million in investment opportunities available with IRRs over 30%. However, there are significant market barriers which would inhibit the growth of such a market – notably lack of awareness of savings opportunities, and lack of stability within the industry sector leading to risk-averse behaviour related to capital investments (i.e. industries are not willing to invest or implement energy efficiency measures due to concern about the basic health of the business).**Public sector buildings:** There is limited scope for EnPC implementation in the public building sector due mostly to low IRRs related to heating of buildings (typically 1 – 10% at a maximum). This is primarily due to low energy consumption in existing buildings and low energy prices – particularly natural gas.
- **Public sector lighting:** There is a large market potential for EnPC implementation in public sector lighting – with potentially over EUR 90 million in investment required and typical IRRs of over 30%. Specific steps will need to be taken to establish this market.

The types of companies which could provide these services include national engineering and construction firms – likely linked with international firms interested in the Georgian market. An additional potential implementing company could be the energy distribution companies – who could set up separate companies to implement energy efficiency measures via an EnPC modality.

Actions which should / could be taken to develop the market for energy services in Georgia include:

- Addressing specific regulatory and non-regulatory barriers – Review of public procurement legislation issues (see P-8 – Energy Efficient Public Procurement);
- Development and publication of model contracts for energy services providers and best practices for energy performance contracting;
- Assignment of a national point of contact to provide consumers with information on energy services;
- Development of an independent mechanism such as an ombudsman to ensure the handling of complaints on energy service contracts;
- Steps to enable independent market intermediaries to play a role in stimulating market development of the demand and supply sides; and
- Steps to ensure that energy distributors, distribution system operators and retail energy sales companies refrain from activities that may impede the demand for and delivery of energy services, or hinder the development of markets for such services.

[5] An EnPC is a partnership between an organisation (the client) and an energy service company (ESCO). The ESCO conducts a comprehensive energy audit for the facility and identifies improvements to save energy. The ESCO then designs and carries out the project interventions that meets the client's needs and the ESCO also arranges the necessary financing. The ESCO guarantees that the improvements will generate energy cost savings sufficient to pay for the project over the term of the contract. The client then continues to pay energy bills at the same (or equivalent) rate for a certain period of time to the ESCO – which makes a profit off of the difference in energy costs which it pays and the income which it receives from the client (minus investment costs). After the contract ends, all additional cost savings accrue to the client.

In addition to those Horizontal measures describe above, in the coming period, Georgia also plans to undertake the following activities/measures to encourage energy efficiency:

- Defining changes in existing regulations for simplifying investments in multi-family apartment buildings
- Improving public procurement regulations (See measure P-8 Energy efficient procurement); and
- Transposing the EU's Energy Performance in Buildings directive in the coming years (see H-9 below).

2. Energy efficiency measures in buildings

Policy and investment measures linked together and are closely connected to to buildings and to public bodies. This is because public sector measures are often linked to EE in buildings and also because the policy framework bringing about investments in the private building sector and public sector are closely linked.

2.1 Addressing the requirements of the recast EPBD (2010/31/EU)

In 2014 the EU and Georgia signed the Association Agreement (AA), The Association Agreement recognizes Georgia's commitment to implementing and promoting energy efficiency in the buildings sector under the EPBD. Georgia is obligated to align its national laws with the EU legislation and is at the beginning of the EPBD transposition process. Support for reforms in the field of energy outlined in the EU-Georgian Association Agreement for building sector improvement is currently being planned within the framework of the Danish Neighbourhood Program launched by the Ministry of Foreign Affairs of Denmark and Ministry of Economy and Sustainable Development of Georgia as well as with the Energy Community supported technical assistance under EU4 Energy entitled "Gap analysis of Georgian legislation in relation to energy performance of buildings and development of Draft Energy Performance of Buildings Law".

2.2 Building renovation strategy

The EED requires that the NEEAP present a long-term strategy for mobilising investment in the renovation of buildings and that it is included in the NEEAP. However, there is currently no national building renovation strategy in place and very limited information on the sector available (in particular, on the building stock).Public sector buildings

The inventory of the building stock in Georgia is not available and thus providing reliable information on the entire public building stock will not be possible. Related to fuels used, electricity is used for lighting, appliances, and cooling. The typical fuels used for Central Government buildings are natural gas for heat, and some electric space heaters. Central, District heating is not used.

Non-Central Government buildings represent a large part of public buildings. In Georgia there is not yet an inventory of public buildings and their energy performance – nor have minimum energy performance requirements been established. Information on public buildings not owned and occupied by the Central Government is partially available based on the SEAPs developed by specific municipalities – Tbilisi, Kutaisi, Batumi, Rustavi, Zugdidi, Gori, and Telavi. Additionally, information on schools is available from the Ministry of Education, Science, Culture and Sport of Georgia . It is likely that schools, kindergartens, and administrative buildings are the predominant type of public building not owned and occupied by the Central Government.

- Schools heat using a mix mostly of natural gas and wood logs with some electricity as follows.Total number of schools: 2,200

- Total number of schools with central heating – electricity: 72
- Total number of schools with heating – natural gas: 536
- Total number of schools with heating – wood: 377
- Total number of schools with unknown heating source – 1,215

Technologies typically used in other publicly-owned building are natural gas boilers, natural gas space heaters for smaller spaces, electricity based air conditioning/heating units, and highly inefficient wood stoves for area heating.

There are number of barriers complicating the wide implementation of energy efficiency in this sub-sector. The most important are:

- Lack of pipeline of good energy efficiency projects
- No legal requirements about the minimum energy performance
- An absence of incentives for implementing agents (administrators)
- Lack of Awareness of options and impacts.

Commercial sector buildings – private

There is no official information on private commercial buildings sector. It is noteworthy that most hospitals and medical centres are privately owned. The typical fuels used in these buildings varies, but in general, natural gas is used for heating in more urban areas, while wood (and sometimes electricity) is used in more rural areas. Energy consumption in these buildings is not generally known in any systematic way – though some energy audits have been conducted for hospitals/medical centres and large supermarkets and generally have high energy consumption (e.g. Specific heating and hot water demand of 250 kWh/m^2 in hospitals). There are severe data limitations in this sector, so development of the building stock will be an important first step in developing a strategy.

Special features in energy consumption for the private commercial buildings sector include:

- A significant amount of under-heated buildings meaning there is suppressed demand;
- Very poor energy properties of the external building envelopes;
- The use of inefficient wood or electric space heaters in many instances which only heat parts of the buildings.

Key barriers to investment are mostly related to finance and awareness of potential energy savings from implementing measures.

Residential sector buildings

There is no official information on residential buildings sector related to area, number of dwellings, or number of buildings. The results of the recently carried out census will likely have information on the residential sector. It is noteworthy that the vast majority of residential buildings are privately owned by the families living in them.

The typical fuels used in these buildings varies, but in general, natural gas is used for heating in more urban areas, while wood is used in more rural areas. Energy consumption in these buildings is not generally known in any systematic way – though some energy audits have been conducted which show that they generally have high energy consumption (e.g. Specific heating demand of 200 kWh/m^2 in houses and 170 kWh/m^2 in apartments). There are severe data limitations in this sector, so development of the building stock will be an important first step in developing a strategy.

Special features in energy consumption for the residential buildings sector include:[6]

- A significant amount of under-heated buildings meaning there is suppressed demand. This is particularly prevalent amongst single houses;
- Very poor energy properties of the external building envelopes;
- The use of inefficient wood, electric, or natural gas space heaters in many instances which only heat parts of the buildings.

Key barriers to investment are mostly related to finance and awareness of potential energy savings from implementing measures.

It should also be noteworthy, that the survey on energy consumption in household sector was conducted by the National Statistics Office of Georgia in 2017 with the methodological support of Energy Institute of Croatia. The survey gives detailed picture in terms of energy efficiency of households. It's planned, that the same survey should be conducted once per 5 years.

Steps in the coming 3-year period to develop a strategy

In the coming 3-year period, the following steps should be carried out to develop a full strategy for improvement of energy efficiency in the building sector:

1. Adoption of the legislative framework and it's harmonization with European directives;

2. Define upon reference building types to be examined

3. Establish a system for tracking the inventory of buildings. This should be linked to Measure P-1 Develop a national energy efficiency information system for publicly owned buildings

4. Conduct energy audits and building inventories for the various sub-sectors throughout the country – first of all, focus should be made on the cities. (in particular, municipalities, which are the signatories to the Covenant of Mayors) Energy audits can be conducted and filed as a part of training programmes under H-5: Qualification, accreditation, and certification schemes - Buildings. When an energy audit is performed as a part of a training course, it can be filed in the national energy information system.

In parallel to these steps, there should be an energy efficiency programme set up for the various sub-sectors which stimulate investment in each of them. Energy audits and lessons learned as a part of these

[6] Multiple surveys in various parts of Georgia have been carried out related to this topic, including:

SDAP (2013) Technical Report 21: Energy Analysis of Lower Alazani-Iori Pilot Watershed Area (Dedoplistskaro Municipality, Kakheti Region)

SDAP (2013) Technical Report 22: Energy Analysis of Lower Rioni Pilot Watershed Area (Khobi and Senaki Municipalities, Samegrelo and Zemo Svaneti region)

SDAP (2013) Technical Report 23: Energy Analysis of Upper Alazani Pilot Watershed Area (Akhmeta and Telavi Municipalities, Kakheti Region)

SDAP (2013) Technical Report 24: Energy Analysis of Upper Rioni Pilot Watershed Area (Ambrolauri and Oni Municipalities, Racha-Lechkhumi and Kvemo Svaneti region) and

VTT (2016) Market Assessment of the Residential Sector in Georgia: Policy, Legal, Regulatory, Institutional, Technical and Financial Considerations (Phase I)

investments can be filed with the national energy information system. Particular measures which can be implemented in parallel to data-gathering include:

- B-1: Regulations leading to improved efficient lighting systems in residential and commercial buildings
- P-2: Pilot project for low energy public sector buildings
- P-3: Efficient lighting systems in public buildings
- P-5: Improvement of the energy efficiency in schools
- P-6: Improvement of the energy efficiency of non-central government-owned public buildings - kindergartens

The following additional measures, which haven't been considered within the NEEAP but can be revisited in the coming years, are:

- Improvement of energy efficiency in existing private houses
- Improvement of energy efficiency in multi-family apartment buildings
- Improvement of the energy efficiency in existing commercial buildings.

B-1 considers energy saving measures, replacement of inefficient incandescent light bulbs or other Halogen lamps with high-efficient models, like fluorescent or LED bulbs. The implementation of the said measure is possible by adoption of the relevant regulations.

Table 4 Describes approximate assumptions regarding the cost of implementing the measures

#	Title of the energy saving measure	Implementing body	Source	Type of financing	Required financing in the coming period		
					2019	2020	Total 2019 - 2020
B-1	Regulations to improve the efficiency of lighting systems in residential and commercial buildings	Ministry of Economy and Sustainable Development of Georgia	Central Government	Non-financial	€ 13000	€ 6000	€ 19000
			Household Sector	Investment	€ 0	€ 3382000	€ 3382000
			Commercial Sector	Investment	€ 0	€ 753000	€ 753000
			Total:		€ 13000	€ 4141000	€ 4 154 000
Total:					€ 13000	€ 4141000	€ 4 154 000

3. Energy efficiency measures in public bodies

A number of measures defined for the public sector are mandatory and recommended to implement as part of the EED.

As per the Energy Community's adoption of the EED, Contracting Parties to the Energy Community must ensure that, as from 1 December 2017, 1% of the total floor area of heated and/or cooled buildings owned and occupied by their central government is renovated each year to meet at least the minimum energy performance requirements set out in the recast EPBD. Georgia has a commitment to carry out renovations on 1% of the public building stock each year starting from 2019. However, the number of buildings and useful floor area are not yet known in Georgia. Additionally, the national minimum energy performance requirements have not been established.

Based on some assumptions, the NEEAP expert team estimates that 1% of the total area would be 6,446 m^2 to be renovated per year. While this number is indicative, it does provide a sense of scale of the needs for renovation to comply with the Energy Community requirements. The NEEAP includes a number of measures related to central Government-owned buildings to:

- The development of National Energy efficiency information system for public buildings/Evaluate current energy consumption and potential savings (P-1)
- Implement a pilot project (P-2)
- Implement EE lighting in all public buildings as replacements become necessary (P-3)
- Improvement of Energy efficiency in public buildings(P-4)

The EED also requires that public bodies that are not owned and occupied by the central government should be encouraged to demonstrate their exemplary role in buildings energy efficiency. Measures to be implemented related to this sub-sector involve EE measures in schools (P-5) kindergartens (P-6) and in other non-central Government-owned buildings (P-7).

In addition, The EEDrequires that central governments purchase products, services and buildings with high-energy efficiency performance and that all public bodies should be encouraged to do likewise. Green

public procurement leads the market by example, by creating demand of EE goods, reducing the market prices, enhancing the sustainability and diversity of the market for EE goods and services. The implementation of this measure is included in measure P-8.

An additional measure which is in the public sector but not related to buildings is improvement of efficiency in street-lighting / outdoor lighting. The measure is to be carried out in: Tbilisi, Kutaisi, Batumi, Rustavi, Zugdidi, Gori, Telavi, and potentially others. To some extent, this measure is already underway in a number of the municipalities, but will be scaled up. Additionally, lighting improvements can be made for inter-city roads.

Table 5 describes approximate assumptions regarding the cost of implementing the measures

#	Title of the energy saving measure	Implementing body	Source	Type of financing	Required financing in the coming period		
					2019	2020	Total 2019 - 2020
P-1	Develop a national energy efficiency information system for publicly owned buildings	Ministry of Economy and Sustainable Development for elaboration of the System. Ministry of Regional Development and Infrastructure for the coordination and obtainment of the information from the Municipalities	Central Government	Non-financial	€ 13000	€ 6000	€19 000
			Municipalities	Non-financial	€ 48 000	€ 122 000	€ 170 000
			Total:		**€ 61 000**	**€ 128 000**	**€ 189,000**
P-2	Pilot project for low energy public sector buildings	Municipal administration – After getting the information on results, they are spread to the various Municipalities and Public institutions. (Ministry of Economy and Sustainable Development)	Central Government	Non-financial	€ 12 000	€ 0	€ 12 000
			Donors-Grants	Grants	€ 35 000	€ 0	€ 35 000
			Total:		**€ 47000**	**€ 0**	**€ 47000**
P-3	Efficient lighting systems in public buildings	Ministry of Economy and Sustainable Development - the buildings owned by the Public Institutions	Central Government	Investment	€ 25 000	€ 78 000	€ 103,000
			Municipalities	Investment	€ 13 000	€ 41 000	€ 54 000
			Total:		**€ 38 000**	**€ 119 000**	**€ 157 000**
P-4	Improvement of the energy efficiency in central government-owned public buildings	The Ministries, which use specific buildings - Ministry of Economy and Sustainable Development	Central Government	Non-financial	€ 13000	€ 13000	€26 000
			NEFCO	Investment	€ 1 500 000	€ 1500 000	€ 3,000,000

#	Title of the energy saving measure	Implementing body	Source	Type of financing	Required financing in the coming period		
					2019	2020	Total 2019 - 2020
			E5P	Grants	€ 1 000 000	€ 1 000 000	€ 2,000,000
			Total:		**€ 2 513 000**	**€ 2 513 000**	**€ 5,026,000**
P-5	Improvement of the energy efficiency in public schools	Ministry of Education, Science, Culture and Sport Ministry of Regional Development and Infrastructure	Central Government	Non-financial	€ 19 000	€ 20 000	€ 39 000
			E5P	Grants	€ 1 207 000	€ 1 231 000	€2,438,000
			IFIs/Banks	Investment	€ 0	€ 0	
			Total:		**€ 1226000**	**€ 1251000**	**€ 2,477,000**
P-6	Improvement of the energy efficiency of non-central government-owned public buildings - kindergartens	Municipalities with the assistance of international organizations	Municipalities	Non-financial	€ 62000	€ 63 000	€ 125 000
			IFI/Banks-Investment	Investment	€ 0	€ 490 000	490000
			Total:		**€ 62000**	**€ 553000**	**€ 615000**
P-7	Improvement of the energy efficiency of non-central government-owned public buildings - non-kindergartens	Municipalities with the assistance of Ministry of Regional Development and Infrastructure	Central Government	Non-financial	€ 6000	€ 6000	€ 120 00
			Municipalities	Non-financial	€ 62000	€ 63000	€ 125 000
			Total:		**€ 68000**	**€ 69000**	**€ 137 000**
P-8	Energy efficient procurement	State Procurement Agency with the Ministry of Economy and Sustainable Development for elaboration of the procedures regarding procurement	Central Government	Non-financial	€ 25000	€ 496000	€ 521,000

#	Title of the energy saving measure	Implementing body	Source	Type of financing	Required financing in the coming period		
					2019	2020	Total 2019 - 2020
		Also the Ministry of Regional Development and Infrastructure will be involved in terms of implementation with the local Public authorities	Municipalities	Non-financial	€ 0	€ 26000	€ 26000
			Total:		**€ 25000**	**€ 522000**	**€547,000**
P-9	Improvement of efficiency in street-lighting/outdoor lighting	Municipalities and Ministry of Regional Development and Infrastructure with the assistance of donors/IFI regarding the increasing of the competence of the implementing agencies for supporting the implementation of the process.	Central Government	Non-financial	€ 6000	€ 6000	€ 120 00
			Municipalities	Non-financial	€ 102 000	€ 35000	€ 137,000
			IFI/Banks-Investment	Investment	€ 0	€ 9 145 000	€ 9 145 000
			Total:		**€ 108 000**	**€ 9 186 000**	**€ 9,294,000**
Total:					**€ 4 148 000**	**€ 14 341 000**	**€ 18,489,000**

4. Energy efficiency measures in industry

4.1. Characteristics of industry in Georgia

Georgian industrial sector is not a large consumer of energy. However, the 10.5 TWh of energy consumed in industry in 2014 (for both energy and non-energy use) represents 22% of finalenergy consumed in Georgia that year.

Historically, Georgia was a much larger energy consumer; Industrial sector consumed nearly 3 times more energy in 1990 than in 2013/2014. However, there it has been a large reduction of industrial (and other sectors) development since 1990, after the break-up of the Soviet Union.

Ministry of Economy and Sustainable Development of Georgia developed the MARKAL model,, that predicts annual growth of energy consupmtion (4.94% per year) in 2016-2030, , that is – directly linked to GDP growth. While the preparation of NEEAP the MARKAL projected growth figures have been used. This level of growth would involve doubling of production between 2016 and 2030.

The predominant energy consuming sub-sectors in industry are:

- Non-metallic minerals with 26% of final energy consumption;
- Chemicals (including petrochemical) with 26% of final energy consumption, even if non-efficient use of natural gas is included; and
- Cast Iron and steel with 25% of final energy consumption

Additionally, it is assumed that energy consumption in Food, beverages and tobacco does not fully reflect energy consumption in the energy balance.

Number of large industries and number of SMEs

There are 170019industrial enterprises, 421 “large, 1851 “medium” and 162452 “small” industrial organisations registered in Georgia according to Geostat Data. There are also 5295 enterprises, the size of which, according to Geostat, is unknown at this stage.

Comparisons of the energy intensity (energy consumption per tonne of output) for other industrial processes with the EU are difficult as there is not disaggregated/detailed available information on exact products and processes for production in Georgia and their energy consumption. For this reason, the measure “I-1: Industry data disaggregation” ” is necessary to improve the information available and allow for meaningful comparisons.

Special features in energy consumption

Based on reviews of energy audits and reports composed after sites visits conducted during the preparation of the NEEAP, it turned out that industry energy savings will come from 4 main routes:

No/low cost energy-saving, good energy management and control, which is an enabling step to identifying and eliminating poor behaviour/ bad practice. These include:

- Understanding site energy consumption patterns, through suitable sub-metering and software;
- Identifying and eliminating poor-practices, "good-housekeeping", behavioral changes;
- Careful development of theplanning and scheduling for optimum efficiency;
- Identifying and financially assessing low-cost technical opportunities.

Low-cost technical opportunities which naturally follow good energy management andsome of the more importantmeasures are the following: :

- Thermal insulation on steam/ hot-water/ refrigerant gas pipes;
- Attention to steam leaks, steam traps, maximum condensate returns, etc.;
- Compressed air leak detection, water traps, etc.
- Upgrades to building fabric: glazing, roof and wall insulation;
- Lighting: replacing HID (High Intensity Discharge), incandescent or old style T8 tubes with EE LED lighting.

Sector specific technical investment opportunities: Traditionally, this is what emerging economy nations focus upon. There are several excellent sector-specific opportunities within Georgia. Details of two of these sectors – steel and cement – are provided in the list of measures of NEEAP.

Cross-sector investment opportunities, that are common to several industrial sectors: Four of the more important are also provided in the list of measures:

- Boilers and Steam/ hot water systems: combination of no/low cost EE actions combined with replacing old (inefficient, over-sized) boilers with new, correctly sized EE boilers
- Refrigeration compressors and distribution systems – similar comments related to replacing old (inefficient, oversized) refrigeration units with new, correctly sized ones.
- Motors: replacing old (inefficient and over-sized) motors with new, correctly sized IE3 or better motors, where applicable with Variable Speed Drive (VSD) controls.
- Lighting: concerted effort to upgrade, particularly incandescent lights with LED equivalents.

Key barriers and drivers /stimulations of investments

There are several key barriers to investment in the industry sector. These include:

Technology & Equipment: Historically, there has been little or no investment in energy-saving equipment; In some industries, this is a step backwards in decades.

Mentality and awareness: The mind-set of industry is still production driven, a historic mind-set and not entirely due to the poor state of the economy. There is limited awareness of modern energy management techniques and EE technologies relevant to the site.

Energy Management: There is limited understanding of where energy is consumed across each site. This is true for electricity consumption and secondary energy consumption such as steam, hot water, or compressed air. For example, the consumption at the boiler may be known but where this heat is used is not known.

ESupport and skills/ expertize: Unlike EU Member States, there is very little amount of independent energy-efficiency expertize that Georgian industry can draw-on, including generic / cross-sector technologies and sector-specific technologies.

Limited funds or opportunity to borrow: The Georgian industrial sector has had significant market-based problems, particularly in the past 2 years. Many long-standing export markets: Russia, Ukraine and other Regional countries – have been directly or indirectly affected by conflicts or embargos, which has reduced export demand hence production. Issues, such as EE, are a long way down the priority list. Even when good EE investment opportunities are identified by site managers or by external consultants, there is limited opportunity to borrow for investment.

Low energy costs: Although unit costs have been rising substantially in recent years and are now approx. 50 – 70 EUR/MWh (electricity) and 20 to 25 EUR/MWh (natural gas), they are still only around 50% (electricity) to 70% (natural gas) of the unit costs for EU industry.

High cost for investment in EE technologies: There is no local production of EE equipment in Georgia: boilers, furnaces, motors, etc. As such, Georgian industry has to pay international prices for any EE equipment plus transport and any import levies.

Lack of incentives, covering several areas: There are currently no incentive-based mechanisms to encourage energy efficiency or renewable energy in industry.

4.2. Industry measures: Energy savings and financing

The following measures can be carried out in the industry sector. They are directly linked with the following horizontal measures:

- H-2: "Alternative policy measures – Incentivising / mandating energy efficiency in industry" – which will stimulate interest and improve the financial case for investment even beyond the strong financial parameters present;
- H-3: "Alternative policy measures – Training and education, including energy advisory programmes" – which will educate industry's decision-makers on investment options;
- H-6: Qualification, accreditation, and certification schemes in industry", will increase the level of certified expertise in the industry sector to better enable investment planning and implementation;
- H-7: „Energy audits and management systems, boiler inspections in the industry sector" – which will require energy audits/energy management in large industries and encourage them in SMEs.

The implementation of these measures would involve the following key aspects:

- Improvement of the statistical data on industry production and energy consumption
- A programme of technical assistance;
- Energy audits from the horizontal measures (H-7) would also be linked to investments in this sector – which has technical assistance requirements;
- nvestment toindustry – via a credit line, bank financing, or other financing sources in 2019 – 2020.

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Table 6Overview of estimated prices of individual measures.

#	Title of the energy saving measure	Implementing body	Source	Type of financing	Required financing in the coming period		
					2019	2020	Overall 2019-2020
I-1	Industry data disaggregation	GEOSTAT	Central government	Non-financial	€ 6000	€ 0	€ 6000
			Total:		**€ 6 000**	**€ 0**	**€ 6000**
I-2	Conversion of wet-cement process to dry cement process	Industry of cement and fossil fuel recycle	Industry / private companies	Investment	€ 39616000	€ 0	€ 39616000
			Total:		**€ 39616000**	**€ 0**	**€ 39616000**
Summary					**€ 39622000**	**€ 0**	**€ 39 622 000**

5. Energy efficiency measures in transport

5.1. Characteristics of transport in Georgia

Transport is an important sector for energy consumption in Georgia – and it is noteworthy, that energy consumption in this sector continues to grow.. In 2014, transport accounted for 33% of final energy consumption in Georgia – up from 26% in 2013. The vast majority of fuel used in the transport sector is either oil products (diesel and gasoline) or natural gas – all of which are imported. Diesel, gasoline, and natural gas use make up 91.8% of energy consumption in the transport this sector - 14,175 GWh. This amount represents over 30% of all energy consumed in Georgia in 2014. For this reason, energy efficiency in the sector is becoming more and more important.

The dominant types of transport in Georgia include:

- In passenger transport, there is a strong public transportation system utilizing mini-buses – along with large buses. However, increasingly, private light-duty passenger vehicles are taking up a large amount of passenger.
- n freight transport, there is a significant amount of freight being transported by rail. However, it should be noted that the amount offreight, carried by motor vehicles is not assessed.

There is no official data on the fuel efficiency of the passenger vehicle fleet, though it can be assumed that it is less efficient than that of the EU – given the age of most vehicles in Georgia where 91% of vehicles are older than 10 years.[7]

It is noteworthy that in Georgia, Compressed Natural Gas (CNG) is an increasingly popular fuel and it's consumption is growing– with fueling stations throughout the country and a large number of vehicles utilising this fuel. However, there are no reliable statistics as to the level of penetration of these types of vehicles. Also. It should be mentioned that there is a significant increase of vehicles using Liquefied petroleum gas (LPG), with / the increase of the hybrid vehicles.

Key barriers and drivers / stimulations of investment include:

- Lack of knowledge / awareness about the vehicle fleet and lack of regulation fulfillment to ensure vehicles are less polluting;
- Lack of walking / cycling friendly infrastructure in most major urban areas – in particular the capital;
- A lack of comfortable / reliable public transport;
- A culture increasingly geared towards personal cars resulting significant traffic and pollution problems in the capital and elsewhere.

5.2. Main policy measures addressing energy efficiency in transport

The package of measures outlined below would involve the following key aspects:

[7] saqstati (2015) saqarTvelos 2014 wlis statistikis wlis wigni saqarTvelos statistikisaTvis

Geostat (2015) 2014 year Georgian statistical annual book for statistics of Georgia.

- Vehicle improvement measures – fuel replacement by the natural gas (potentially by the electrical energy) and better management of the vehicle fleet, including the introduction of technical inspections, that has started in 2018 and will be implemented in the future (T-1);
- **Public awareness campaigns** on Eco-driving and to encourage efficient transport modes would increase the efficiency of driving habits (T-2);
- **Investments in intra-city urban mobility** would result in modal shifts from passenger cars to public transport, walking, and cycling. Additionally, improvements in the road infrastructure would improve efficiency of movement of traffic (T-3, T-4, T-5, T-6, and T-7).

Technical assistance would be necessary for implementation of these measures, likely to be divided into 2 programmes to achieve goals:

1. Assistance to municipalities for urban infrastructure and transport planning program– including feasibility studies for major infrastructure projects such as , bike lanes, etc. Infrastructure planning, that will be implemented in Tbilisi, is running step by step.
2. Assistance to the national government in implementing the program for mandatory periodic technical inspection , as well as in planning major national infrastructure projects and evaluating – amongst other aspects - how they may impact energy consumption.

Expences / budget of that type of measures can be available at the planning stage of the program.

6. Promotion of efficient heating and cooling

As part of compliance with the EED in order to encourage efficient production of heat and cooling, it is necessary to analyse the costs and benefits of implementing cogeneration for any large installation (over 20 MW of thermal input – for industry and electricity). The process of identification of competent public authorities, private actors for implementation, and development of methodology for installation-level cost-benefit analysis has not yet been developed in Georgia. This measure will be revisited in future NEEAPs.

7. Energy transformation, transmission, distribution, and demand response

7.1 Characteristics of the energy transformation, transmission, and distribution sector in Georgia

Total installed capacity in the system

Georgia's total installed capacity is 4,225 MW (including a recent 13.2 MW coal power plant) the most significant addition being the 231.2 MW thermal power plant (TPP) operating with new technologies (combined cycle natural gas-fired power plant) commissioned in 2015. Of this total capacity, almost 78% is from hydro power with the remainder being from thermal plants based mostly on natural gas.

Total energy transformation sorted by the source of energy

The only significant energy transformation within Georgia is the transformation of gas (with some coal) for electricity. In 2014, 5.59 TWh of gas were supplied to thermal power plants producing electricity amounted to 2.04 TWh – of which 0.103 TWh were for own use. In 2015 the conversion efficiency is

expected to have been higher due to commissioning of a 231 MW combined cycle gas turbine power plant with expected 54% efficiency.[8]

Grid transmission losses

High voltage transmission grid total losses in 2014 were around 2% which is a high standard.[9] The transmission losses are expected to grow with the commissioning of additional capacities. However, according to the 10 year development plan of the network, investment in certain projects has a local effect of reducing the losses for particular regimes of the network.[10]

Total losses via transmission and distribution

The losses per year via transmission and distribution of the electricity system have been decreasing and the level of losses can be considered average when compared with losses in EU countries such as Bulgaria (9%) and Romania (12%) but high in comparison to EU countries such as Germany (4%) and France (7%). It is noteworthy that in 2015, JSC Telasi and JSC ENERGO-PRO Georgia had losses of below 10%.

Planned development of the sector

The 10-year network development plan has within it an aggressive projection of energy production and export with significant increase of generation capacity. There are three scenarios of demand growth: 3%, 5% and 7% annual growth. There are more than 120 hydropower projects in development under memorandums signed with potential investors.[11] Along with hydropower, the 10 Year Plan Network Development Plan also envisages construction of two 230 MW TPPs operating with new technologies (expected to be combined cycle natural gas-fired power plants) by 2019 and 2026 respectively and one coal fired 150 MW power plant in 2020.

Additionally, the completion of a 20.7 MW wind power plant in 2016 is introducing wind technology for the first time in Georgia and generate 88 GWh per year.[12]

The total generation capacity is expected to grow from the current level to:

- 4,820 MW by 2020;
- 6,663 MW by 2025; and
- 7,365 MW by 2030.

[8] At the time of NEEAP development, this efficiency could not be calculated in retrospect for 2015 as the energy balances had not been completed for 2015.

[9] Transmission System Operator JSC "Georgian State Electrosystem" (2015) Ten Year National Development Plan for 2015-2025, table 10.1, page 140. In EU Member States, the average losses in transmission networks are between 1% and 2.6% (Ecofys 2013 "Incentives to improve energy efficiency in EU Grids").

[10] Transmission System Operator JSC "Georgian State Electrosystem" (2015) Ten Year National Development Plan for 2015-2025 Figure 1.11.

[11] Based on information from the Ministry of Economy and Sustainable Development

[12] As of 15 November 2016, the WPP Plant is in its testing regime. Opening ceremony was held on October 6, 2016. The plant is owned by JSC Georgian Energy Development Fund

Furthermore, new regulations have been developed to allow for the integration of distributed energy producers into the grid – such as micro producers. Though this was not modelled as a part of the NEEAP, it can be considered an energy saving measure.

Along with the major expected developments in power sector, there is an ongoing development in oil and gas. Expansion of South Caucasus Pipeline (SCPx) is expected to add about 0.8 billion m^3 of natural gas to Georgia's energy balance by 2019-2020. There is also an ongoing development of a gas storage facility which will be completed for when the new capacity of the SCPx will start operation.

Related to distribution, the completion of individual electricity metering and expansion of the gas network are the major expected developments. In Tbilisi the individual metering has been completed while in the regions about 40,000 consumers still need to be metered individually.

Special features in energy consumption, production, distribution and demand response

Among the special features in energy consumption and production is that there is a strong seasonal dependence on hydropower as the main source of electricity in Georgia. As a result there is a mismatch between hydropower production and demand patterns where peak of consumption is in winter, while peak of hydropower generation is in summer. Additionally, the summer peak and winter peak are both trending upwards as summer demand is increasing. Thus, it becomes difficult to develop hydropower without seasonal trade or exchange with neighbouring countries. Therefore the development of power sector in Georgia is strongly related to its neighbouring countries. For example, a strong stimulating role in developing the HPP projects has been played construction of transmission capacity to Turkey.

Another special feature in Georgia is the significant portion of non-regulated electricity consumption (by Abkhazia. Which accounts about 18% of country's total consumption.It is also worth noting that in energy consumption there is still a strong contribution of fuel wood which is consumed very inefficiently in simple stoves in poorly insulated homes. Furthermore, for this wood, mainly newly cut trees are burned.[13]

Comparison with EU, comment on the tendencies/trends (level of losses);

In comparison with the EU, Georgia has a much higher share of renewable energy for electricity production. In the EU countries - 25.4% of electricity was produced from renewable energy in 2013.[14] In 2014, Georgia had 80.4% of electricity produced was from renewable hydropower.[15]

Related to electricity losses, Georgia's level of system losses are higher than those of some EU countries but lower than others – and can generally be considered average, though with room for improvement.

[13] See Public Policy Research & Training Centre (2014) Policy to encourage sustainable energy consumption by Georgian households") https://tenders.procurement.gov.ge/public/lib/files.php?mode=app&file=866803&code=1408364354

[14] EuroStat (2015) Renewable energy statistics: Available at http://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics

[15] Geostat (2015) Energy Balance of Georgia, 2014. Available at http://geostat.ge/?action=page&&p_id=2084&lang=eng

Key barriers and drivers of investments

In the power sector, as is generally the case with power infrastructure projects, investors are reluctant to invest at their own risk into major projects unless there are strong possibilities for off-taker agreements. For this reason, some major drivers of investments are as follows:

- The Turkish market where electricity can be exported.
- Where there are strong power purchase guarantees provided by ESCO and backed by the Government.
- Companies which are producing power for their own consumption – of which there are a number in Georgia.
- USAID's G4G aiming to establish the trading mechanism that will allow Georgian producers to trade on the Turkish market.

At the same time, the regulations dealing with electricity and gas distribution are highly encouraging of energy efficiency.

One additional driver of investment in the gas sector is that the government is investing in extending the gas network to the regions (to the settlement level). SOCAR is continuing this investment to bring the connection to the customers' property.[16]

7.2 Planned policies and investments in the primary energy sector

Planned investments for the primary energy sector are described in the measures below. The implementation of these measures would involve the following key aspects:

- Large-scale investments in improvements of:
  - More efficient natural gas fired power plants – 2 x 230 MW (E-1);
  - Improvements in the transmission network (E-3)
  - Efficient household energy production from solar hot water heaters and biomass stoves – including a grant mechanism (E-7 and E-8).
- Energy Policies which are to already in place (E-5 and E-6) and which are planned (E-2) Which aims to promote investmentს in the sector (E-5 and E-6)
- Potential improvements of the dispatch system to reduce costs and primary energy consumption[17]
- A programme of technical assistance for the period 2017 – 2020 – This would likely be via:
  - One package oriented towards improvements in the hydro-power and dispatch systems
  - One package oriented towards distribution systems
  - One package linked to the residential sector measures which would be focused on solar hot water heaters & efficient biomass stoves.

[16] The connection cost for low pressure customers (0-6 m^3/h) is 400 GEL (lump sum payment). See GNERC (2009 July 9) Decision #12: http://gnerc.org/files/untitled%20folder2/mierTeba.pdf). "New Customers" of natural gas (those connected to the grid after 2008) are deregulated, which means that GNERC does not set a tariff cap for those customers. See Ministry of Energy's Decree # 69 of 25 September 2007 on "Natural Gas Supply Deregulation and Partial Deregulation": (https://matsne.gov.ge/ka/document/view/73006) and the following amendment in 2008 (Energy Minister's Decree # 73 of 24 July 2008. https://matsne.gov.ge/ka/document/view/78880).

[17] Reducing system costs could be the primary purpose of the measure – and reducing hourly or daily balancing system costs would probably also reduce primary energy consumption.

Table 2: Overview of individual measures in the energy supply sector

No.	Title of the energy saving measure	Implementing body	Source	Type of financing	Required financing in the coming period		
					2019	2020	Total 2019-2020
E-1	Natural gas savings - replacement of old thermal power plants with new technologies	JSC Georgian Oil and Gas Corporation	Government	Non-financial	€ 0	€ 0	€ 0
			Oil and Gas Corporation	Invest	€ 50 000 000	€ 0	€ 50 000 000
			Total		€ 50 000 0000		€ 50 000 000
E-2	Rehabilitation and investments of hydropower plants	Hydropower generation companies with technical assistance and funding from international financial institutions and with the support of the Ministry of Economy and Sustainable Development and GNERC	Government	Non-financial	€ 32 000	€ 6000	€ 38 000
			Industry Private companies	Invest	€ 0	€ 1 732 000	€ 1 732 000
			Total		€ 32 000	€ 1 738000	€ 1 770 000
E-3	Optimization of power reserves and seasonal modes	GNERC, Ministry of Economy and Sustainable Development	Government	Non-financial	€ 32 000	€ 32 000	€ 64 000
			Total		**€ 32 000**	**€ 32 000**	**€ 64 000**
E-4	Expanding the power grid, integrating new generation capacities into the grid and reducing losses	Georgia State Electrosystem	Private companies	Invest	€ 58 000 00	€ 172 918 000	€ 178 718 000
			Total		**€ 5 800 000**	**€ 1 72 918 000**	**€ 178 718 000**
E-5	Regulatory Requirements for Rules for Calculating Normative Electricity Losses - Investment Incentives	Energo-Pro Georgia Ltd, JSC Telasi,	Industry / Private companies	Invest	€ 9 945 000	€ 10 143 000	€ 20 088 000
			Total		**€ 9 945 000**	**€ 10 143 000**	**€ 20 088 000**
E-6			Goverment	Non-financial	€ 13 000	€ 13 000	€ 26 000

	Rules for calculating natural gas normative losses in pipelines - investment incentives	Distribution licensees	Industry / Private companies	Invest	€ 4 410 000	€ 4 410 000	€ 8 820 000
			Total		**€ 4 423 000**	**€ 4 423 000**	**€ 8 846 000**
E-7	Introduction of energy efficient stoves	Non-governmental organization WECF - in cooperation with relevant agencies	Government	Non-financial	€ 25 000	€ 26 000	€ 51 000
			Donors / Grants	Grants	€ 0	€ 300 000	€ 300 000
			Customers	Invest	€ 0	€ 649000	€ 649000
			Total		**€ 25 000**	**€ 975 000**	**€ 1 000 000**
E-8	Solar water heaters	Non-governmental organization WECF - in cooperation with relevant agencies	Government	Non-financial	€ 12000	€ 12000	€ 24000
			Donors / Grants	Grants	€ 0	€ 246 000	€ 246 000
			Families	Invest	€ 0	€ 369 000	€ 369 000
			Total		**€ 12 000**	**€ 627 000**	**€ 639 000**
Total					**€ 70 269 000**	**€ 190856000**	**€ 261 125 000**