SUSTAINABLE ENERGY FOR ALL IN EASTERN EUROPE, THE CAUCASUS AND CENTRAL ASIA. ANALYSIS OF NATIONAL CASE STUDIES

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CONTENTS

ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
AERA	Azerbaijan Energy Regulatory Agency
Bcm	billion cubic meters
BPP	Bio power plant
BYN	Belarusian ruble
CEN	European Committee on Standardization
CFS	Centre of Financial Settlement, Kazakhstan
CHPP	Combined heat and power plant
CIS	Commonwealth of Independent States
CO_2	Carbone dioxide
CSP	concentrated solar power
DEE	Department for Energy Efficiency of the State Committee on Standardization, Belarus
DNI	direct normal irradiance
DSO	Distribution System Operator
EAEU	Eurasian Economic Union
EBRD	European Bank for Reconstruction and Development
EECCA	Eastern Europe, Caucasus and Central Asia
EC	European Commission
EDB	European Development Bank
EDGAR	Emissions Database for Global Atmospheric Research, EC
EE	Energy Efficiency
EnC	Energy Community Treaty
EMS	Energy Management System
ESCO	Energy Service Company
EU	European Union
EUR	Euro
FDI	Foreign Direct Investment
FIT	feed-in tariff
GDP	Gross Domestic Product

GHG	Greenhouse Gas
GHI	global horizontal irradiance
GNERC	Georgian Natural Energy and Water Supply Regulatory Commission
GW	gigawatt
GWh	gigawatt hour
HPP	Hydro Power Plant
HR	Human resources
ICSHP	International Centre on Small Hydro Power (UNIDO)
IEA	International Energy Agency
INOGATE	International energy co-operation programme
ISO	International Organization for Standardization
KEGOC	Kazakhstan Electricity Grid Operating Company
KESC	Kyrgyz Electricity Settlement Centre
km^2	square kilometre
kV	kilovolt
kW	kilowatt
kWh	kilowatt hour
kWh/m^2	kilowatt hour per square metre
KZT	Kazakhstani tenge
LOP	light oil products
LPG	Liquefied petroleum gas
MART	Ministry of Antimonopoly, Regulation and Trade, Belarus
MENRP	Ministry of Environment and Natural Resources Protection, Georgia
MEPS	Minimum energy performance standard
MESD	Ministry of Economy and Sustainable Development, Georgia
m^3	Cubic metre
Mtce	million tons of coal equivalent
Mtoe	million tons of oil equivalent
MTTP	Medium-term Tariff Policy, Kyrgyzstan
MW	megawatt

MWh	megawatt hour
NEHC	National Energy Holding Company, Kyrgyzstan
NEEAP	National Energy Efficiency Action Plan
NPP	Nuclear Power Plant
NREAP	National Renewable Energy Action Plan
OECD	Organisation for Economic Co-operation and Development
OSJC	Open Join-Stock Company
PEEREA	Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects
PPP	Public-Private Partnership
PV	Photovoltaic
RES	Renewable energy sources
SAARES	State Agency on Alternative and Renewable Energy Sources, Azerbaijan
SARFPC	State Agency for Regulation of Power Complex, Kyrgyzstan
SCIES	State Committee on Industry, Energy and Subsoil, Kyrgyzstan
SDGs	Sustainable Development Goals
SEforALL	Sustainable Energy for All
SER	State Energy Register, Kazakhstan
SHPP	Small hydro power plant
Som	Kyrgyz currency
tce	tons of coal equivalent
toe	tons of oil equivalent
TPEC	Total primary energy consumption
TPES	Total primary energy supply
TPP	Thermal power plant
TSO	Transmission System Operator
tU	tons of Uranium
TWh	terawatt hour
TYNDP	Ten-year network development plan, Georgia
UN	United Nations
UNDA	United Nations Development Account

UNDP	United Nations Development Programme
UNECE	Economic Commission for Europe
UNESCAP	Economic and Social Commission for Asia and Pacific
UNIDO	United Nations Industrial Development Organization
UPS	Unified Power System, Kazakhstan
USD	United States dollar
WEC	World Energy Council
WTO	World Trade Organization

INTRODUCTION

The 2030 Agenda for Sustainable Development, adopted by the United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet for today and into the future. The core of the Agenda is the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries – developed and developing – in a global partnership.

Sustainable Development Goal 7 is to ensure access to affordable, reliable, sustainable and modern energy for all. Focusing on universal access to energy, increased energy efficiency and the increased use of renewable energy through new economic and job opportunities is crucial to creating more sustainable and inclusive communities and resilience to environmental issues like climate change.

The Sustainable Energy for All (SEforALL) is a global initiative led by the UN Secretary General. It was a precursor to SDG 7 and now serves to catalyse faster and bolder action to implement it and support the Paris Climate Agreement. In particular, the SEforALL pursues three key development objectives for the energy sector by 2030: ensuring universal access to electricity and modern cooking solutions; doubling the rate of improvement of energy efficiency; and doubling the share of renewable energy in the global energy mix. These objectives have been endorsed by the UN General Assembly, which declared 2014–2024 the Decade of Sustainable Energy for All.

The "Sustainable Energy for All (SEforAll) in Eastern Europe, the Caucasus and Central Asia" project covers five countries of the EECCA region, namely Azerbaijan, Belarus, Georgia, Kazakhstan and Kyrgyzstan. The selected countries represent different geographic areas and have different energy profiles: Azerbaijan and Kazakhstan are the energy-rich countries with significant fossil fuels resources; Belarus and Georgia are important transit countries for oil and gas routes; and Kyrgyzstan is important hydro power electricity producer and has significant potential for renewable energy development.

The project aims to assist member states with emerging economies to identify best policy practices, measures and procedures to fostering the sustainable energy transition, with particular focus on the cross-cutting nature of energy efficiency, renewable energy and energy access. The energy efficiency policies are also regarded as a tool to deliver more social and economic benefits, including environmental gains, contributing to enhanced economic development of the countries.

The analysis of the reports provided by the project countries has shown that all of them develop energy policies and practices, however the emphasis on various policy types and maturity of energy efficiency policies and programmes vary from country to country. Consequently, they demonstrate different pace of progress on the way to attain the SEforALL objectives and SDG 7 targets. Even though certain results have been successfully achieved, there is still more work to be done to adjust and implement their national energy efficiency policies and practices to build enabling policy, legislative and institutional frameworks conducive to attracting foreign and domestic investments to their power and energy sectors and to ensuring access to affordable, reliable, sustainable and modern energy for all.

EXECUTIVE SUMMARY

The UNECE is implementing the United Nations Development Account (UNDA) project "Sustainable Energy for All (SE4All) in Eastern Europe, the Caucasus and Central Asia". The overall goal of the project is to assist countries of the region (Azerbaijan, Belarus, Georgia, Kazakhstan and Kyrgyzstan) to strengthen capacities for the preparation of National Action Plans to achieve Sustainable Development Goals related to energy.

Within the overall goal of the project, the report provides an analysis of the national case studies and gives the assessment of existing policies and practices in sustainable energy, focusing on prevailing regulatory and institutional frameworks, and providing recommendations for policymakers that would assist them in reforming and adjusting policies aimed at fostering favourable climate for investments in energy efficiency.

The scope of the report includes the review of the energy sector of the project countries, analysis of existing best policy practices, including national programmes and strategies aimed at strengthening the sustainable energy development and analysis of gaps and challenges that governments face in implementing these policies. In addition, the report aimed at performing a comparative analysis of the five countries' case studies on their progress towards achieving the SEforALL objectives.

The analysis of national reports demonstrated that despite the huge challenges that all countries were facing when undertaking reforms and restructuring in their economies, to date they have all invested a lot in improving functioning of the energy sector, its transition to a sustainable development, providing enhanced energy efficiency, wider use of renewable energy sources and better energy access.

All considered countries develop energy policies and practices which have many features in common; at the same time each country pursues its specific path considering a prevailing local context. In reforming their energy sectors countries pay particular attention to building and implementing enabling regulatory and institutional frameworks, issuing laws and regulations supported with secondary legislation and norms-setting mechanisms; designating the state and public authorities in charge of planning, executing and monitoring energy policies; developing strategic programmes and documents; promoting appropriate fiscal policies conducive to attracting foreign and domestic investments and others. They also consider the SDGs objectives when developing their national strategies and programmes for economic development. However, the emphasis on various policy types and maturity of energy efficiency policies and programmes varies from country to country.

Particular focus was put on the status of institutional/structural reforms; existing legislative and regulatory infrastructure and policies related to improving energy efficiency and wider use of renewable energy; status of investment climate to foster financing and application of modern EE and RE technologies; energy intensity of the sector and some others. While certain similarities in problems and barriers that countries are facing on their way to meet the SDGs and the SEforALL objectives were noted, the country-specific issues which require special attention by the governments in order to improve attractiveness of the market for investments to foster employment of advanced energy efficiency and renewable energy technologies were also highlighted. In some

countries, lack of relevant information and data on access to modern energy services, energy efficiency and renewable energy hindered accurate assessment.

The report concludes that in spite of significant advancement, not a single country out of five has displayed to date a required pace of progress on the way to attain the SEforALL objectives on time. Consequently, no country has developed an engaging investment climate for foreign and domestic businesses to employ advanced energy efficiency and renewable energy technologies. Consequently, there is a need for the governments to mobilize resources, including natural, technological, political, human and financial, along with international assistance, where appropriate, and to undertake more efforts in building up a required level of institutional, policy and regulatory infrastructure to achieve the SEforALL objectives within a set timeframe.

1. BASELINE STATUS OF THE COUNTRIES ENERGY SECTOR

1.1 AZERBAIJAN

Azerbaijan, officially the Republic of Azerbaijan, is a country in the South Caucasus region of Eurasia at the crossroads of Eastern Europe and Western Asia. It borders by the Caspian Sea to the east, Russia to the north, Georgia to the northwest, Armenia to the west and Iran to the south. The exclave of Nakhichevan is bound by Armenia to the north and east, Iran to the south and west, and has an 11 km long border with Turkey in the north-west. The population, according to estimates for March 2018, is more than 9.9 million people, the territory is 86,600 km² and by both these indicators is the largest country in the Caucasus. The capital is Baku with over 2.2 million of inhabitants.

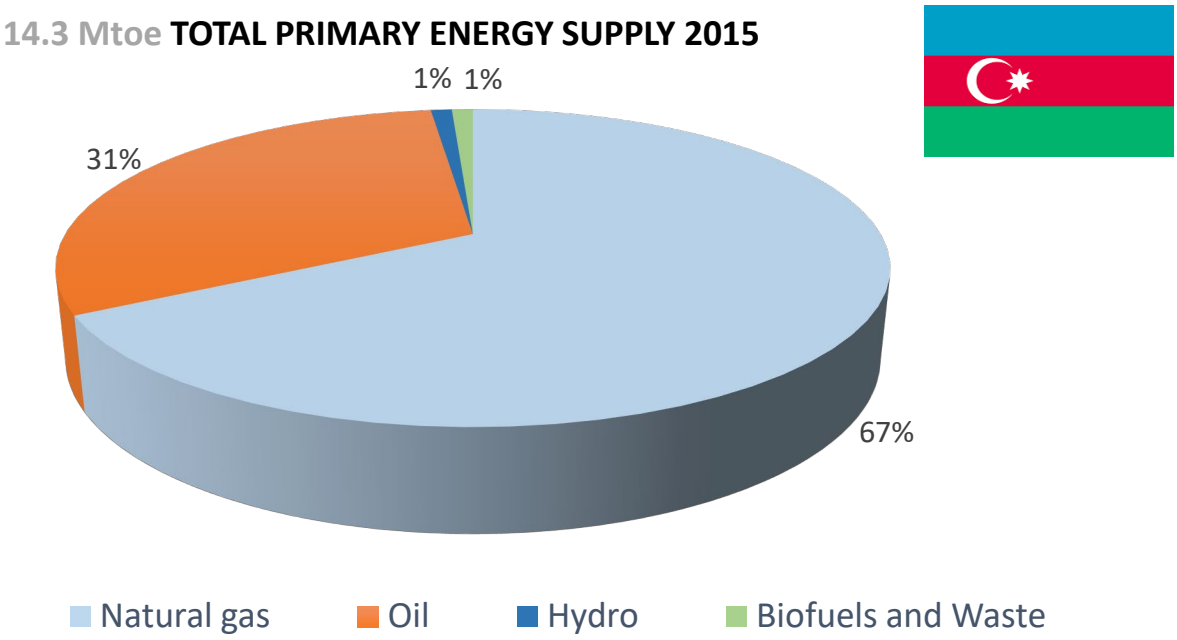
Azerbaijan is an energy-independent country – it covers all energy requirements from domestic production, in particular with regards to crude oil, oil products, natural gas and hydro energy. It is a net-exporter of oil, gas and electricity – in 2017 Azerbaijan produced 38.8 Mtoe of crude oil (26th world ranking) and 17 Mtoe of natural gas (18.2 billion cubic meters). About 80% of these amounts go for export. Because of this large hydrocarbon production, it has one of the highest energy self-sufficiency ratios in the world: the country energy production is more than four times its energy demand.

Natural gas is the main fuel in the energy mix of Azerbaijan – in 2015 it accounted for 67% of the Total Primary Energy Supply (TPES) (Fig. 1), the remaining were oil (31%), hydro (1%) and biofuels and waste (1%). Azerbaijan produced 25 TWh of electricity in 2015, mostly from natural gas (86%). Renewables accounted for 7% of the electricity mix.

Households are the largest final energy consumers in Azerbaijan – 41.3% in 2017; they are also the largest consumers of natural gas and electricity. The second largest final energy consuming sector is transport -31.2% in 2017; it is the main driver of oil consumption. Industry and construction consumed 13.4% and remaining 14.1% go to commercial and public sectors.

In the electricity sector the joint stock company (OJSC) Azerenerji is the largest electrical power producer - about 90 % of generating capacity of Azerbaijan. The current (June 2018) installed power capacity of Azerbaijan is 6,257 MW, including 14 thermal power plants (5,113 MW), 17 hydro power plants (1,122 MW) and Nakhchivan Solar Power Plant (22 MW). It is planned to commission about 400 MW of additional generating capacity by the year 2020. The Azerishig OJSC is responsible for efficient and secure distribution of electricity to final consumers in Azerbaijan. Production, transmission and distribution of heat power to consumers, including households, is executed by the public holding company Azeristiliktedjizad OJSC. The State Agency on alternative and renewable energy sources is the major norm-setting institution of Azerbaijan in this area. The current installed capacity of renewable energy is about 104 MW of which 61 MW is produced by the wind mills, 38 MW by bio power plants and some 5 MW (with the exception of Nakhichevan) by solar power plants. Oil and gas sectors are owned and operated by the state. The State Oil Company of Azerbaijan Republic - SOCAR is a state-owned national oil and gas company which produces oil and natural gas from onshore and offshore fields in the Azerbaijani sector of the Caspian Sea. It operates the country's two oil refineries, one gas processing plant and runs several oil and gas export pipelines throughout the country. It owns fuel filling stations under the SOCAR brand in Azerbaijan, Georgia, Ukraine, Romania and Switzerland. Azerigaz is responsible for transmission, distribution and marketing of natural gas in the Republic of Azerbaijan. It also transports SOCAR gas to the Islamic Republic of Iran, Georgia, and the Russian Federation. The total volume of gas transported annually by Azerigaz inside and outside the country is 12.6 billion m^3. The proven reserves of the country are estimated at 7 billion of barrels of oil and 2.6 trillion cubic meters of gas.

The Ministry of Energy of Azerbaijan is responsible for activities in production and energy sectors and regulates operations of state and public companies (SOCAR, Azerenerji, Azerishig, Azerigaz etc). It has agreements and cooperates with various international organisations (Energy Charter, OECD, CIS, WTO, WB, EBRD, UNECE etc.). Following Presidential Decree the Azerbaijan Energy Regulatory Agency (AERA) was established in December 2017. The aim of the regulator is to harmonise the Azerbaijani legislative system with EU practices. It assists in designing tariffs and market structure through transparent mechanisms and competition, develops unbundling strategy, provides modernisation of system operators (TSO and DSO) and organizes trainings and capacity building of staff.



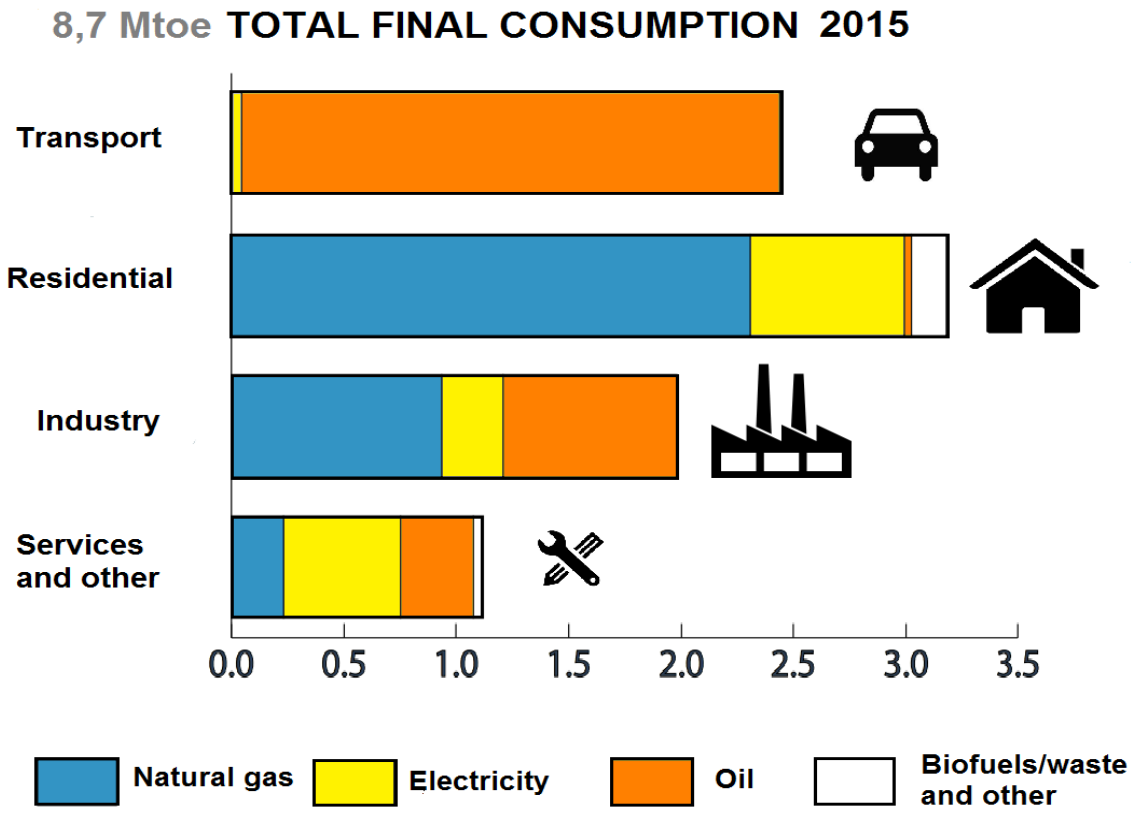


Figure 1. Azerbaijan Energy Mix

(Source: International Energy Agency for EU4Energy. World Energy Statistics and Balances 2017)

1.2 BELARUS

The Republic of Belarus (Belarus) is a landlocked country in Eastern Europe, bordering Russia to the northeast, Ukraine to the south, Poland to the west, and Lithuania and Latvia to the northwest. Its area is 207,595 km² (40% of which is forested) with 9.5 million inhabitants. The capital of Belarus is Minsk with population of about 2 million.

The energy sector is owned and operated by the government and the President holds the exclusive right to all strategic decisions. Since Belarus has practically no natural resources, its main priority is to provide a reliable and sustainable energy supply for the national economy, while reducing dependence on energy imports and improving the financial stability of the sector. It has also made significant progress in improving energy efficiency in electricity and heat production and is in the process of phasing out subsidies for electricity, heat and gas to improve the attractiveness of the energy sector for private investors.

Natural gas is the main energy source of Belarus. In 2015 it accounted for 63% of TPES (Fig. 2), the remaining were oil (28%), biofuels and waste (6%) and 3% of coal. Nearly all (98%) electricity production comes from natural gas (33 TWh in 2015) but it will change with the commissioning of two units of the Belarusian nuclear power plant with a total capacity of about 2,400 MW.

Although Belarus is the world`s third-largest producer of peat, it covers (together with small amounts of domestic oil and gas production) less than 15% of the country's energy demand. This makes Belarus one of the least energy self-sufficient countries in the world. In 2016, Belarus was thirteen-largest importer of natural gas – 18.6 bcm (15 Mtoe) and imported even larger quantities of crude oil, but most of it were re-exported in the form of oil products. With a production of 23 million tons of oil products in 2015 Belarus was a key regional refiner. The largest final energy consuming sector is industry, followed by residential. The transport sector is by far the final largest consumer of oil products in the country. Since 2000 the largest increase in energy demand has come from the transport sector (an increase of 1.3 Mtoe). However, total energy consumption has been decreasing rapidly since 2012, by around 5% per year.

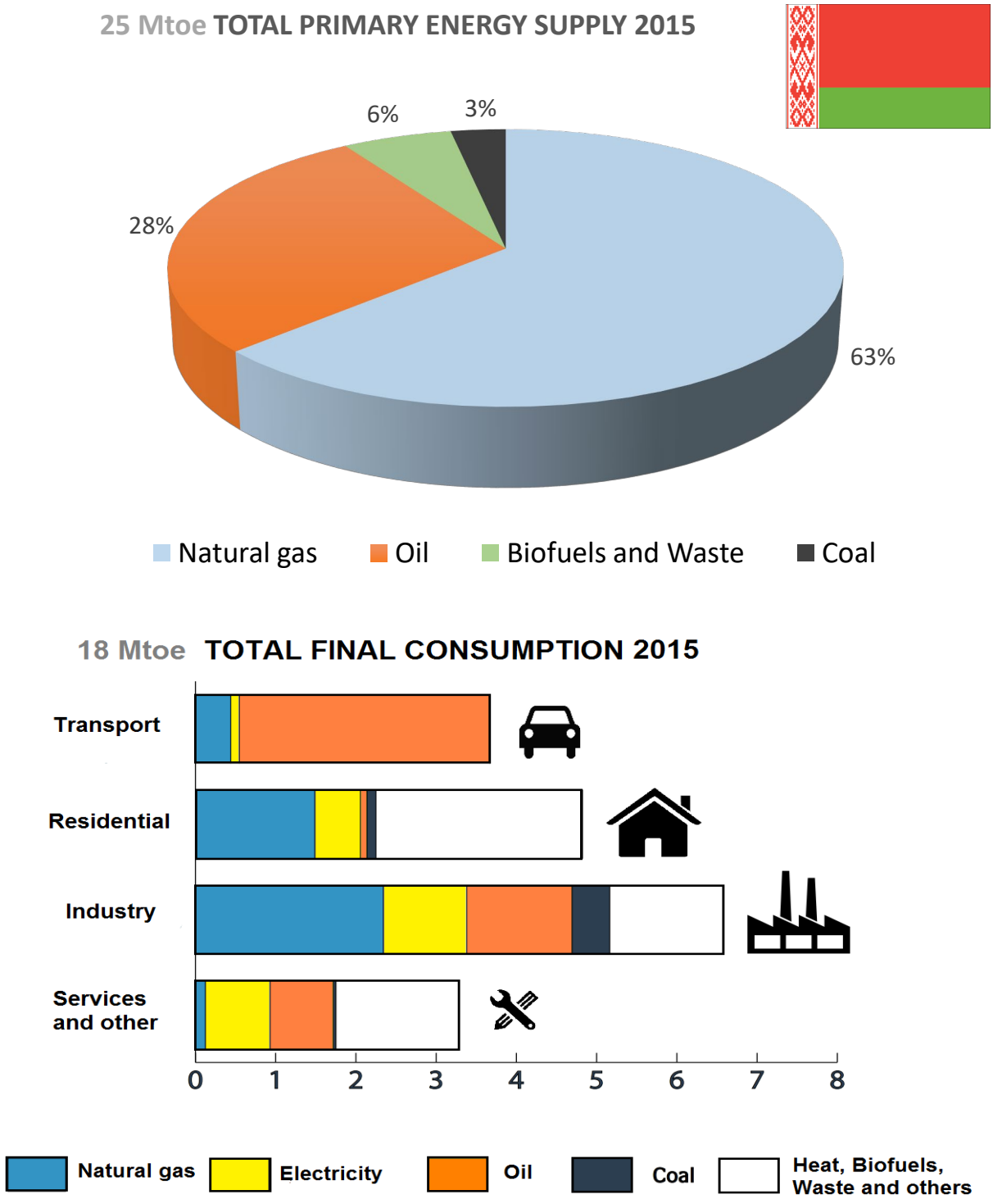


Figure 2. Belarus Energy Mix

(Source: International Energy Agency for EU4Energy. World Energy Statistics and Balances 2017)

The electricity and heat sectors are owned and operated by the State Production Concern BelEnergo, a vertically integrated state-owned association. BelEnergo is responsible for electricity and heat generation, transmission, distribution and retail services. It operates through a number of subsidiaries, including six regional (oblast) distribution companies known as Oblenergo. At the end of 2014, the government was considering a possible future law on electricity that includes electricity sector unbundling and the separation of transmission, distribution and retail operations of BelEnergo.

Natural gas sector is managed by Gazprom-TransGaz company which is fully owned by the Gazprom (Russian Federation). It operates high-pressure transportation, transit and storage systems, and is responsible for new construction and maintenance. Gas policy issues related to transit, infrastructure, system operation, tariff structure and technical services are governed through a bilateral agreement with the Gazprom.

The natural gas distribution infrastructure is owned by the state, along with responsibilities for technical services, tariffs, and upgrade and maintenance programmes. The distribution network is operated by the State Production Concern of Fuel and Gasification BelTopGaz which is managed by the Ministry of Energy. BelTopGaz includes seven distribution companies which serve Minsk and six other regions.

The petrochemical sector of Belarus is operated by enterprises and organisations of the Belarusian State Concern for Oil and Chemistry BelNeftekhim, which reports directly to the Council of Ministers. BelNeftekhim includes more than 80 companies and organisations which carry out oil exploration and production, transportation, refining and retailing, as well as the production of a wide range of chemical and petrochemical products. The Mozyr oil refinery is owned by several Russian companies.
Regarding the institutional framework it is the Ministry of Energy which is in charge of the country's energy policy, including the security of supply. It manages the vertically integrated state-owned natural gas supplier BelTopGaz, and the vertically integrated state-owned electricity producer, supplier and retailer, BelEnergo. This ministry also oversees the State Institute for Management of Construction of Nuclear Power Plants and other state-owned organizations operating in the energy sector.

State regulation of the energy sector, including energy efficiency and renewable energy, is carried out through decrees and directives of the President, government decisions and the Ministry of Economy. Other relevant ministries and departments are active participants.

The Department for Energy Efficiency (DEE) of the State Committee on Standardization is responsible for the development and implementation of national energy efficiency and renewable energy policies. It also monitors and ensures state control over rational use of fuel, electricity and heat.

BelEnergo incorporates six regional energy supplying companies, including construction/installation/adjustment companies and other organizations. The main areas of BelEnergo's activities include the operation of the Belarusian energy system, generation, transmission, distribution and sale of electricity and heat, operational dispatch management, maintenance of power plants, power and heat supply networks and organization of activities for the purposes of energy system development (demand forecasting, investments, rehabilitation, construction, etc.). BelTopGas incorporates seven distribution companies (unitary state enterprises), which supply gas to Minsk and six regions of Belarus.

The energy policy of Belarus sets two major goals - securing reliable and sustainable energy supply for national economy; and reducing dependence on energy imports and improving the financial stability of the sector. Both renewable energy and energy efficiency have been identified as priorities to achieving these goals, however significant change in the energy sector will occur after commissioning of the new nuclear power station in 2020.

To improve energy efficiency of the economy it is planned to reduce by 2030 the energy intensity of GDP by 2.6 times, and by 3.0 times by the year 2035. One of the main objectives for industrial development is creation of a "green" industrial technological platform based on energy saving, introduction of ecological "green" technologies, renewable and alternative energy sources, and efficient technologies for waste processing

At the first stage (until 2020), the development of the fuel and energy complex will be aimed at improving the energy efficiency of existing heat power plants and developing non-carbon energy sector. In the medium term (2020-2030), the main objective will be increasing the country's energy security through introducing nuclear energy and renewable energy sources in the energy balance.

The most recent policy document in Belarus – a "Concept of Energy Security" came into force on 1 January 2016. It confirmed again major policy objectives, such as increased use of local fuels and reduction of gas import dependency; enhanced trade and regional cooperation; strengthened state control and providing legal protection for smaller private companies; development and application of new technologies and reduced energy intensity of Belarus.

The Concept identified the following major strategic directions:

- Reduction of import dependence and development of indigenous energy resources;
- Diversification of suppliers and increase of energy transit;
- Reduction of natural gas in the energy mix;
- Improving reliability through rehabilitation and modernisation, and increasing oil reserves;
- Enhancing demand-side energy efficiency and reducing GDP energy intensity;

- Enhancing energy efficiency in production and distribution of energy;
- Improving customer affordability while phasing-out subsidies;
- Regional and global cooperation and trade/export development;
- Improving energy sector management.

Belarus is a member of the Eurasian Economic Union (EAEU) that came into force on 1 January 2015. Other members include Russia, Kazakhstan, Armenia and Kyrgyzstan. The EAEU includes free movement of goods, capital, services and people and provides for common transport, agriculture and energy policies, with provisions for a single currency and greater integration in the future. Belarus also participates in the European Commission's Eastern Partnership programmes and is involved in the implementation of a number of interstate and international treaties in the field of energy, including participation in the Commonwealth of Independent States (CIS) Agreement on the co-ordination of interstate relations in the power sector, and the treaty on the parallel operation of power systems of the CIS. It is also envisaged to enhance cooperation with the European Union, China and international organizations within the CIS, promoting the transfer of technologies and system solutions in the field of renewable energy sources and energy efficiency.

1.3 GEORGIA

Georgia is a country in the Caucasus region of Eurasia. Located at the crossroads of Western Asia and Eastern Europe, it borders the Black Sea to the west, Russian Federation to the north, Turkey and Armenia to the south, and Azerbaijan to the southeast. The capital is Tbilisi (around 1.1 million inhabitants). Georgia covers territory of 69,700 km², and its population in 2017 was about 3.7 million. Georgia is classified as an upper-middle-income country with a per capita Gross Domestic Product (GDP) at current prices of approximately USD 4,068 in 2017. The Georgian economy has been developing with a steady growth rate, though this has been undermined by the global financial and economic crisis and conflict with the Russian Federation. In the period 2010-2015 real GDP in domestic currency has increased by 37%.

Georgia's main economic activities include agriculture, mining, industrial sector and tourism. It has very limited domestic energy production of 1.3 Mtoe in 2015 which comes mainly from hydro (0.7 Mtoe), biofuels and waste (0.4 Mtoe) and some 0.2 Mtoe from oil, gas and coal. Hence, Georgia relies on imports to cover most of its natural gas and oil consumption. Natural gas is the main energy source of Georgia – its share in the 2015 Total Primary Energy Supply was 43%, followed by oil (26%), hydro (16%), biofuels and waste (9%) and 6% of coal (Fig. 3).

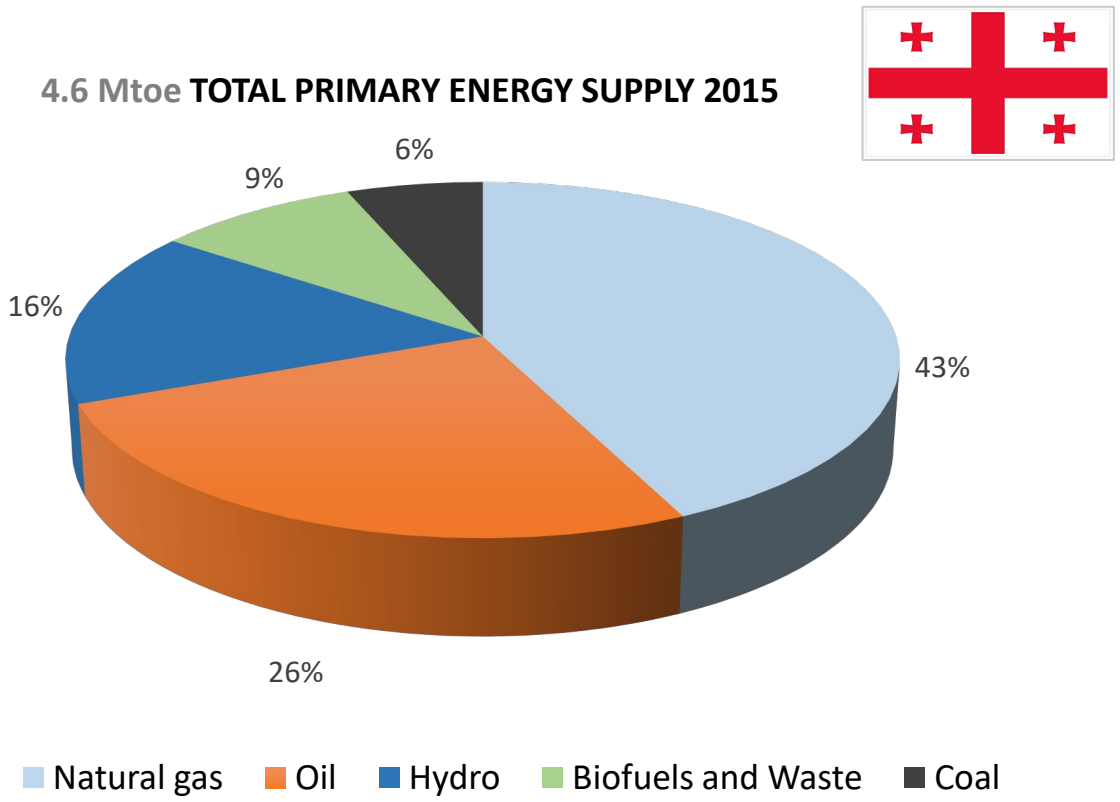
From 2000 to 2015, total final energy consumption in Georgia has been multiplied by 1.5 and it was mostly due to increased consumption of fossil fuels. In turn this leads to increased import volumes from neighbouring countries, the largest increase was seen in natural gas imports.

The transport sector was the largest final consumer of energy (mainly oil products and gas) - 35% in 2015, followed by residential (29%) and industry (14%). Households are the first consumers of natural gas and biomass. It is worth noting that extensive use of biomass, mostly the firewood, is increasingly causing forest degradation.

The share of renewables in the electricity mix of Georgia is among the highest in the world (78% in 2015) - nearly 4/5 of the electricity comes from hydro (the rest from natural gas) although only some 20% of its potential is currently used. Georgia has an immense untapped potential of wind, solar, geothermal and particularly hydro resources. The estimated total potential of hydropower is about 15,000 MW with a total production potential of 50TWh per year. The average annual electricity generation potential of wind is estimated at 4 TWh with an installed capacity of 1,500 MW.

According to recent hydro-geological studies, Georgian geothermal water reserves are estimated at 250 million m^3 per year. At present, there are more than 250 natural and artificial water channels, where the average temperature of geothermal waters ranges from 30ºC to 110ºC. Due to favourable geographical location, most regions of Georgia enjoy 250-280 sunny days annually with approximately 6,000-6,780 hours of sunlight per year. The annual solar radiation varies depending on the region from 1,250 to 1,800 kWh/m^2.

Georgia's energy sector is in a state of active restructuring. Reforms are particularly influenced by the Association Agreement signed with the European Union in June 2014 and which entered into force on 1 July 2016. 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. The priority of these reforms is to



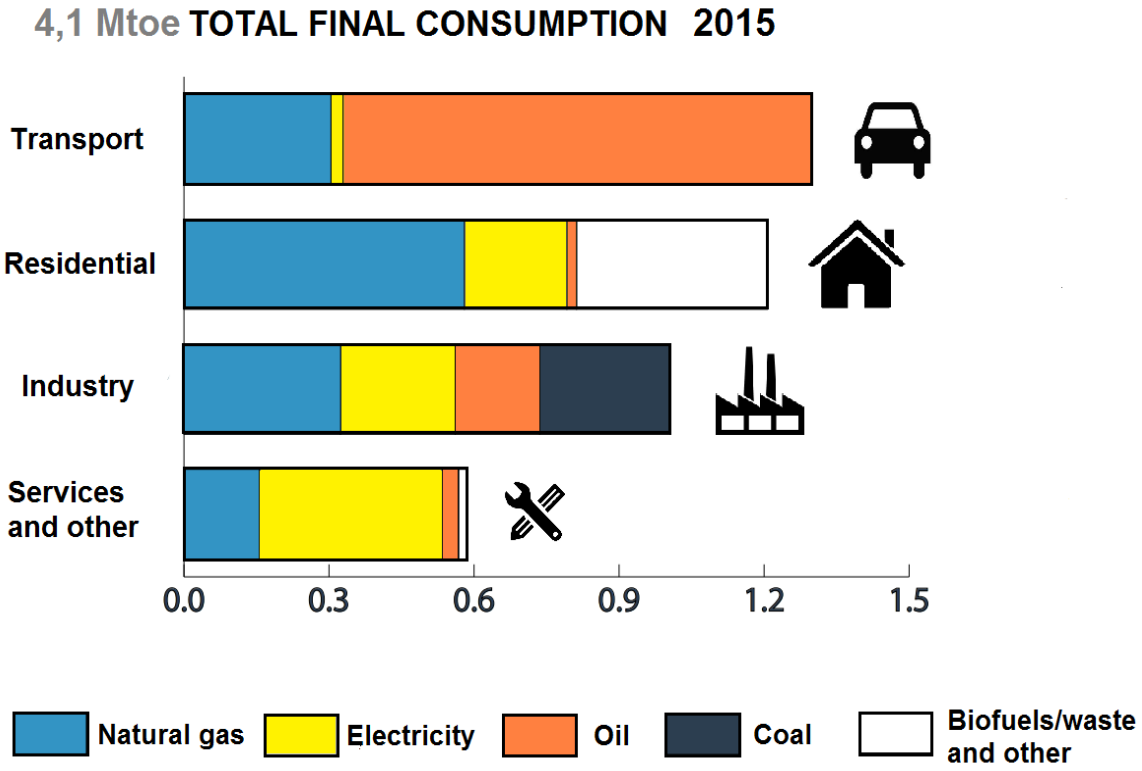


Figure 3. Georgia Energy Mix

(Source: International Energy Agency for EU4Energy. World Energy Statistics and Balances 2017)

enhance the legal and regulatory framework for doing business, along with deregulation, which has helped to trigger strong economic growth.

Early in 2018 the Ministry of Energy of Georgia was merged with the Ministry of Economy and Sustainable Development (MESD). Among other energy issues, the Ministry is also responsible for issuing authorization for renewable energy projects, management of land and property, control and supervision of facilities with increased technical risk, including hydroelectric power plants etc.

Major responsibilities of the Ministry, within the competence of the legislation are:

- Analysis of economic situation of the country and development of economic policy;
- Development of measures aimed at sustainable development of the country, resource-saving mechanisms and coordination of energy efficiency measures in construction, transport and service sectors;
- Development of policies and programmes for promoting investments and innovations, including measures favouring green economy development;
- Elaboration of policies for standardization, metrology, accreditation and certification;
- State and technical supervision of spatial planning, architectural and construction-engineering activities; supervision of preparation of project documents; and
- Development of construction and design norms and rules.

The Georgian National Energy and Water Supply Regulatory Commission (GNERC) is an independent regulator of the sector. The Commission issues licences in the Georgian electricity and natural gas sectors, regulates activities of the licensees, importers, exporters, the market operators, and suppliers; resolves disputes between licensees and customers, as well as monitors the energy market.

GNERC also develops and adopts methodologies for tariffs and approves tariffs to be applied by licensees, importers, the market operator and suppliers, including the fee payable by customers for their connection to the electricity transmission and distribution networks.

Other administrative bodies involved in the process of authorisation and permitting in energy sector are the Ministry of Environment and Natural Resources Protection (MENRP); Technical and Construction Supervision Agency; the Electricity System Commercial Operator – ESCO; Local Government Authorities; Transmission System Operator (TSO), Distribution System Operators (DSOs) and other institutions.

One of the main priorities of Georgia's socio-economic development strategy "GEORGIA 2020" is energy and, in particular, improvement of energy independence, enhancement of energy efficiency and development of energy infrastructure. Stable and secure energy supply is regarded as an important factor for improving competitiveness of private sector and utilization of Georgia's transit potential. It also calls for greater use

of domestic, particularly hydro and renewable sources, as a tool to reduce energy import dependency and increase energy security. Also, the strategy underlines importance of increasing flow of foreign direct investments (FDIs) through further improvement of enabling environment and regulatory mechanisms in energy sector and Georgian economy as a whole.

In 2017 the Government of Georgia approved a strategic document - the "Ten-year network development plan (TYNDP) of Georgia for 2018-2028". It is a comprehensive time-bound programme designed for reinforcement of national transmission system infrastructure, addressing the existing problems, responding to the future challenges and implementing the opportunities. One of the core objectives identified in the document is the integration of renewable energy sources into the network, which still remains a major challenge for the wind and solar-based electricity generation. The TNYDP is being elaborated and updated annually.

1.4 KAZAKHSTAN

The Republic of Kazakhstan lies in the centre of the Eurasian continent equally distant from the Atlantic and the Pacific Oceans. With its territory of 2,724,900 km² it is the ninth largest country in the world. In the west and the north, it shares borders with the Russian Federation, in the east with China, and in the south with the countries of Central Asia – Uzbekistan, Kyrgyzstan and Turkmenistan. The overall length of the national border is 12,200 km, with 600 km of them passing through the Caspian Sea.

Kazakhstan has an estimated 18.3 million people as of 1 June 2018. The capital is Astana (1.1 mln. people) where it was moved in 1997 from Almaty, the country's largest city (1.8 mln. people).

Kazakhstan's energy sector encompasses five major segments—oil, gas, coal, power generation, and nuclear (uranium extraction). According to the BP Statistical Review of World Energy, as of June 2015 Kazakhstan's total proved primary energy reserves, including oil, gas, and coal, amounted to 21 billion toe. Kazakhstan's proven reserves of uranium, which are also substantial, are estimated at the energy equivalent of over 10 billion toe, bringing total primary energy resources available for production to 32 billion toe. This represents about 3.6% of the world's total.

Kazakhstan is a very large producer of all fossil fuels. In 2016, Kazakhstan was the 10th largest coal producer in the world. It also ranked among the top producers of crude oil (16th) and natural gas (23rd). In total, Kazakhstan's energy production covers more than twice its energy demand. This enables Kazakhstan to be a major energy exporter. In 2016, the country was the 7th largest coal exporter in the world, 12th largest crude oil exporter and 20th largest natural gas exporter.

Total primary energy supply grew from 41 Mtoe at the beginning of 2000 to 78 Mtoe in 2015, growing at an average annual rate of 4.3%. Coal represents nearly half of

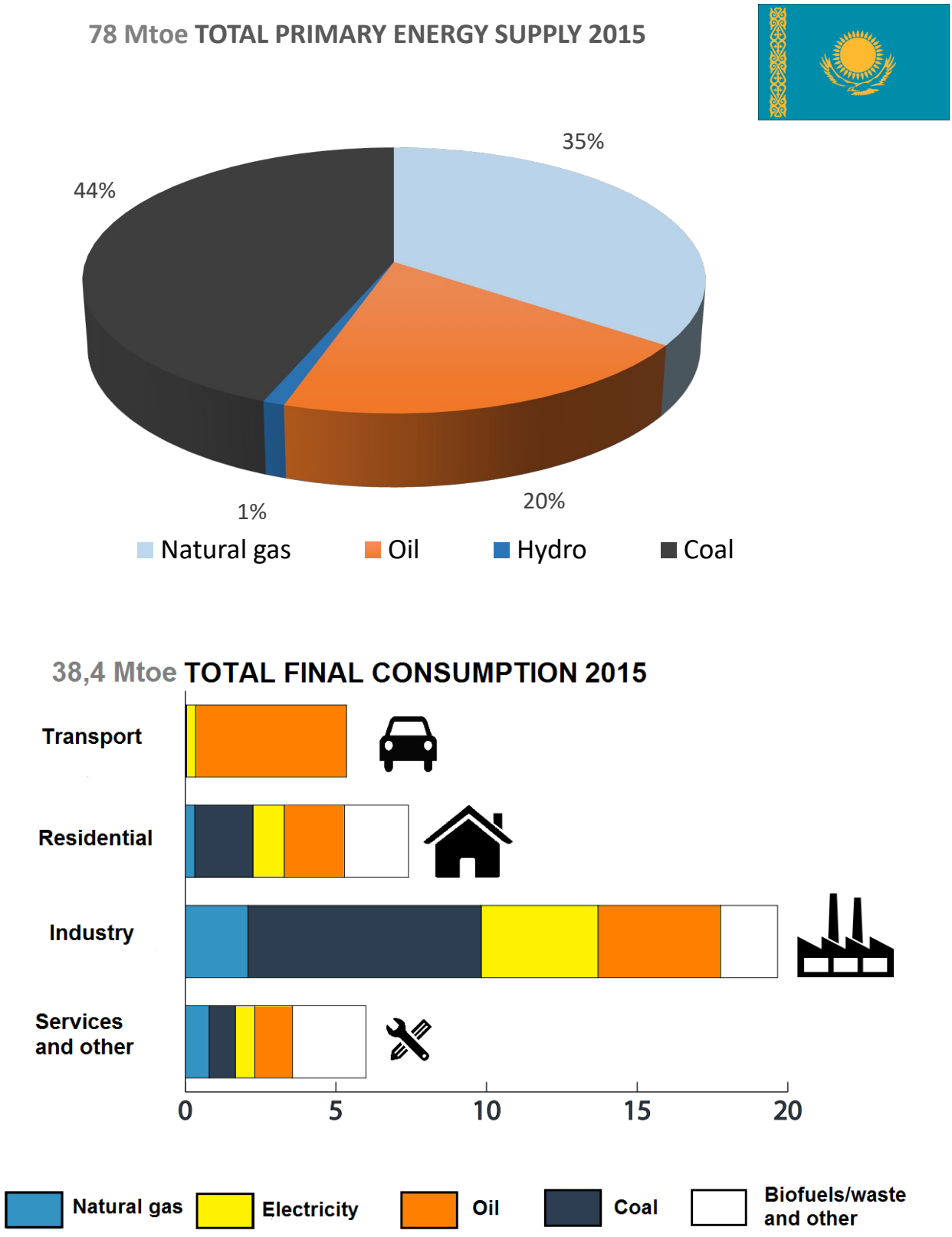


Figure 4. Kazakhstan Energy Mix

(Source: International Energy Agency for EU4Energy. World Energy Statistics and Balances 2017)

Coal had the largest share in Kazakhstan's energy mix in 2015 (44%), followed by natural gas (35%), oil (20%) and hydro (1%) (Fig. 4). Coal accounts for more than 70% of the electricity production (72% of 106 TWh in 2015), followed by natural gas (19%). Renewable energy accounted for 9% of electricity generation (9.3 TWh from hydro and 0.2 TWh from solar and wind together).

Total final energy consumption in 2015 accounted for 38.4 Mtoe. The industry which uses coal as main energy source was a lead sector, followed by residential. Oil is mainly used for transportation purposes.

Kazakhstan is ranked 7th in the world in terms of the proven coal reserves which are estimated at 35 billion metric tons, including about 29.2 billion metric tons of energy coal and about 5.2 billion metric tons of coking coal. These reserves will be sufficient for hundreds of years, even with an active increase in production.

The domestic coal-fired generation will remain the main consumer of the power coal in Kazakhstan by 2030. And the coal demand will continue to grow, even with the planned de-commissioning of the generating capacities: by 2030, the capacity of the new coal-fired power plants will be 20% of the total installed capacity, while the portion of the old plants will decrease from the current 60% to 39%. The total energy coal demand for heat and power generation in Kazakhstan will increase by 2030 from the current 53 to 76 million metric tons, or by 50%.

The oil industry in Kazakhstan is one of the most important branches of the economy and the main exporting industry, which enables the country to capitalize its own mineral resources and receive sufficient capital inflow to use it for fostering the industrial development.

Kazakhstan is ranked twelfth in the world in proven oil reserves, and seventeenth in oil production. Most of the produced oil (about 85%) is exported, mainly to Europe (about 55 million tons): Italy, the Netherlands, France, Austria, Switzerland and others, and to China (11 million tons). The proven oil reserves are sufficient, at a current rate of production, for another 15 to 20 years, mostly due to the development of the 'Big Troika' projects: Kashagan, Tengiz, and Karachaganak. The strategic objective for the oil industry is development of resource portfolio through enhanced geological exploration and production and improved efficiency of operations. The government plans to bring new investments to the sector, liberalize oil refining and petroleum products markets, support integration into international associations, further develop human potential in the sector.

By its proven gas reserves Kazakhstan is ranked 18th in the world and the third among the CIS countries. While geological resources of gas exceed 6-7 trillion cubic meters, the recoverable reserves amount to about 3.8 trillion cubic meters. The country has a developed gas network infrastructure, however new gas pipelines for the domestic market should be built, in particular in the regions of northern Kazakhstan and other remote areas. Special attention is given to the increased production and use of liquefied

natural gas (LNG), deeper gas processing and use of natural gas and liquefied petroleum gas (LPG) in transportation sector.

Kazakhstan has 12% of the world's uranium resources. About 24,580 tU was produced in 2016, but production has been reducing slightly since then. In 2009 it became the world's leading uranium producer, with almost 28% of world production, reaching 41% in 2014, and dropping slightly to 39% in 2015 and 2016. In May 2018 the country's energy minister announced that the production target for 2018 is set at 21,600 tU. All uranium produced in Kazakhstan is exported, primarily to China, with zero import. The main objective of the development of the nuclear industry is to build a full nuclear fuel production cycle, keeping moderate growth in production, and to expand uranium marketing channels.

The Unified Power System (UPS) of Kazakhstan consists of power plants and power grids having common operational mode, single centralized operations and dispatch management and emergency control, ensuring reliable and high-quality electric power supply to consumers. The UPS of Kazakhstan works in parallel with the UPS of Russia and interconnected power system of Central Asia.

Electricity in Kazakhstan is generated by 128 power plants of various forms of ownership. The total installed capacity of power plants in Kazakhstan is 21,673 MW and available capacity is 18,791 MW (1 January 2018). Electricity market is divided into wholesale and retail markets; the heating energy market is retail only. System Operator, regional electric network companies and other entities owning electric networks provide non-discriminatory access to the electricity market for all market players as prescribed by the state authority managing natural monopolies and regulated markets.

Based on the analysis of existing situation, the government of Kazakhstan formulated the goals and objectives for the period up to 2030, ways to achieve them and expected results for all sectors of the fuel and energy complex (coal, oil, gas, nuclear industry, electric power), energy efficiency and energy saving. Among other targets it sets modernization and construction of new facilities for electricity and heat generation and transmission and oil refining; further development of internal energy and fuel markets through liberalization and higher competition; modernization of industry and transport sectors of economy, introduction of modern technologies to improve energy efficiency and reduce negative impact on the environment; development of technologies and infrastructure for engaging renewable/alternative energy sources; processing of associated gas, development of gas transportation networks and coal-chemical industry. It is expected that as a result of these and other measures electricity generation share at solar and wind power plants will raise to 3% by 2020 and 10% by 2030; and the share of electricity produced with natural gas will be 25% by 2030. As well, the carbon emissions from electric power facilities are expected to be 15% of the 2012 level by the year 2030.

1.5 KYRGYZSTAN

Kyrgyzstan, officially the Kyrgyz Republic, is a landlocked country in Central Asia, which borders Kazakhstan to the north, Uzbekistan to the west and southwest, Tajikistan to the southwest, and China to the east. Kyrgyzstan's territory is 198,500 km² and population of 6.1 million inhabitants. Its capital and largest city is Bishkek (around 1 mln.). Kyrgyzstan is situated within the mountain range of Tien-Shan and Pamir-Alai, which occupy more than 80% of the country's territory. Most of the country is located in a temperate zone and only its southern areas are located in the subtropical zone. The climate is continental with relatively low rainfall and wide fluctuations in temperature throughout the year.

Kyrgyzstan has rich water resources amount to 50 billion m^3 per year of mountain rivers' surface runoff, 13 billion m^3 of potential groundwater reserves; 1,745 billion m^3 per year of lake water, and 650 billion m^3 of glaciers. Its hydropower resource potential is 142 billion kWh, however only 10% of it is used. The high availability of hydropower resources has enabled the rapid development of the country energy sector that has become a major electricity producer in the Central Asian region since the beginning of the 1980s supplying the Central Asian United Power System with over 50% of the electricity generated.

In 2015 total primary energy supply in Kyrgyzstan was 4.0 Mtoe. Oil is the first fuel in the energy mix (41%) followed by coal (29%), hydro (24%) and natural gas (6%) (Fig. 5). Total final energy consumption reached 3.3 Mtoe. Kyrgyzstan first energy resource is hydropower (11 TWh, equivalent to 1.0 Mtoe in 2015). It is also a producer of fossil fuels - coal production is the largest (0.7 Mtoe), whereas crude oil and natural gas production is relatively small. In total, domestic energy production covers 45% of the country's needs.

Kyrgyzstan depends on imports to cover fossil fuel demand. It imports large quantities of oil products (1.5Mtoe of net imports in 2015), mostly diesel and gasoline. Kyrgyzstan also needs to import electricity, particularly in winter seasons, depending on variations of hydropower production.

Electricity production in the Kyrgyz Republic is based on a mix of hydroelectric and thermal generators. More than 85% of electricity production comes from hydro. Kyrgyzstan has one of the highest shares of renewables in electricity generation in the world. Most of the hydroelectric system (the Naryn Cascade) is operated using water released from the Toktogul reservoir, located on the Naryn River in the Jalal-Abad Province. Thermal generators include two combined heat and power plants (CHP), which provide electricity, heat and hot water. Electricity consumption per capita

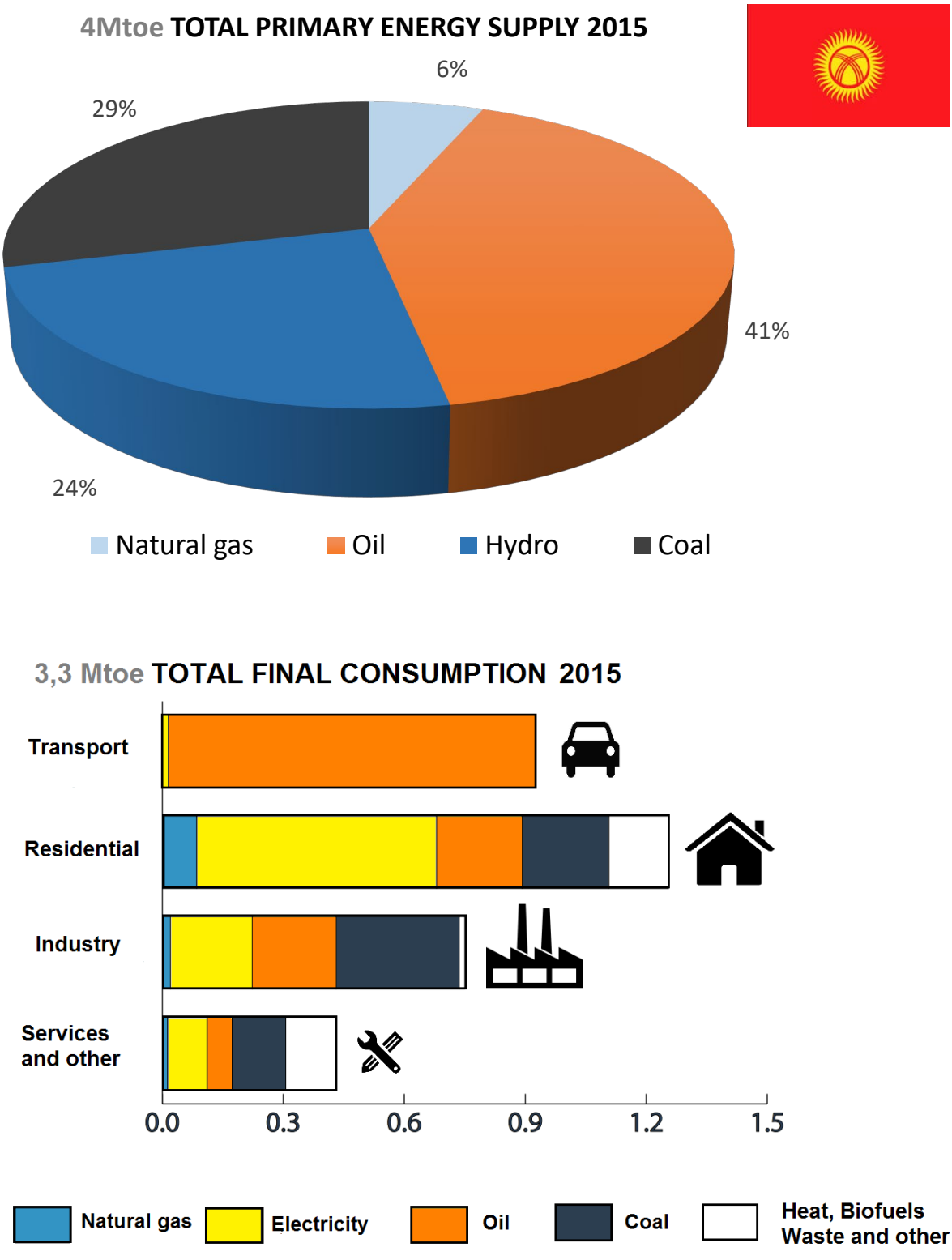


Figure 5. Kyrgyzstan Energy Mix

(Source: International Energy Agency for EU4Energy. World Energy Statistics and Balances 2017)

increased by more than 30% from 2010 to reach 1.8 MWh in 2015. The households are the largest final energy consumers in Kyrgyzstan and the largest consumers of electricity. Oil products are mainly used for transport.

The Kyrgyz Republic imports oil from Russia and Kazakhstan and gas from Uzbekistan and Kazakhstan because its modest petroleum and natural gas reserves are insufficient to meet local demand. Fourteen small oil, gas and gas-condensate fields with total recoverable reserves of 13 mln. tons of oil and 6.5 bcm of gas are located in Fergana basin. Since the beginning of production more than 10 mln. tons of oil and over 7.5 bcm of natural gas have been produced. Further prospects are associated with deeper horizons in Fergana, Alay, Naryn and Aksai provinces.

The coals of Kyrgyzstan are widely scattered in a geologically complex terrain; they are all of Triassic-Jurassic age. Proven coal reserves are estimated at 1,377 billion tons and are discovered in some 70 deposits of the four basins (South Fergana, Uzgen, North Fergana, and Kavak) and three coal-bearing areas (Alay, Alabuka-Chatyrkul, and South Issyk-Kul).

The renewable energy potential for Kyrgyzstan remains mainly untapped. Solar and wind power could be significant prospective energy sources. With an irradiation of about 1,000-1,700 kWh per square meter, and direct sunlight for about 2,800 hours a year, the estimates of the Ministry of Economy for solar energy are: 490 GWh for heating and 22 GWh for electricity. The potential for wind is 45 GWh; small hydropower - 8 GWh; for solar (heat and electricity) 513 GWh, and biomass has a potential of some 1.3 GWh.

If large hydropower plants are defined as renewable energy sources, the share of installed renewable energy electricity capacity would be around 80 percent. But if only small hydropower plants are defined as renewable energy sources, the installed renewable energy capacity falls to 1.1 percent.

In 2001 the government of Kyrgyzstan completed major restructuring of electric power sector. The OJSC “KyrgyzEnergo”, the vertically integrated state-owned utility, was legally unbundled into one generating company (JSC Electric Power Plants); one transmission company (JSC National Electric Network of Kyrgyzstan) and four electricity distribution companies (JSC SeverElectro, JSC VostokElektro, JSC OshElectro, JSC Jalal-Abad Elektro).

One district heating company (JSC BishkekTeploset) to provide heat to consumers in Bishkek city and a small hydropower company (JSC Chakan GES) were also established. The Kyrgyz government is the major shareholder in all newly formed companies, therefore the sector remains 95% state-owned. There are also 16 wholesale buyers and resellers of electricity, and 21 private companies which operate portions of the distribution network in certain areas of Bishkek.

The energy sector management structure has undergone substantial institutional reforms in the recent years. In 2015 the Ministry of energy and industry was abolished and its

policy making responsibilities were transferred to the newly established State Committee on Industry, Energy and Subsoil (SCIES). In 2014 the government has established an independent sector regulatory agency - the State Agency for Regulation of Power Complex (SARFPC); and in 2016 it formed the JSC "National Energy Holding Company" to which the shares of the principle energy companies were transferred, with the aim to improve the management and effective performance of the industry. The task of the JSC "Kyrgyz Energy Payments Center" (Settlement Center) established in 2015 is to provide transparent revenue allocation mechanism across the energy sector entities, develop and implement an automated system for preparing balances for generation, transmission and distribution of electric energy.

Substantial tariff reforms have taken place in the past four years. Historically, electricity customers in the Kyrgyz Republic have paid one of the lowest residential tariffs in the world and the lowest in the CIS countries. Tariffs are well below the actual costs because of affordability and social considerations. For the first time since 2009 the new Regulator adopted tariff setting methodologies for electricity as well as for heating and hot water services. Effective from 1 August 2015, the residential tariff was Som 0.77 per kWh for consumption below 700 kWh; and Som 2.16 per kWh for consumption above 700 kWh, while the commercial consumer tariff was Som 2.24 per kWh.

A Medium-Term Tariff Policy (MTTP) 2014-2017 has been developed under the principles of cost recovery for the sector in the medium-term, but the policy has not been implemented consistently. The burden of tariff increases for electricity was shifted entirely to a small number of large residential consumers as well as to commercial and industrial users, while below cost-recovery tariffs in the residential segment were left intact. Heating tariffs followed the MTTP in 2014 and 2015, but reforms stalled in 2016. In the fall of 2017 there was an attempt to increase tariffs by 10%, but finally the government decided to put them on hold. The work is currently underway to develop and implement a new MTTP for 2018-2021.

2. ASSESSMENT OF EXISTING BEST PRACTICES IN SUSTAINABLE ENERGY

2.1 AZERBAIJAN

Energy Efficiency

Measures aimed at enhancement of energy efficiency in Azerbaijan are identified in the Strategic Road Map on Utilities Development, including in electricity, gas and heat power sectors. In particular, it aims at reducing the losses in electrical networks of the city of Baku from the current 8.5% to 7% and from 12% to 8% in other regions of the country. The extremely high losses in gas distribution networks should be reduced from 18.6% to 8% by the year 2020.

The road map also sets construction of new generating capacity of 1900 MW from thermal and hydro power plants and 420 MW of renewable energy; raising efficiency of combined-cycle power plants from 47% to 50%; introducing dual tariffs and removal of subsidies in electricity sector; wider use of energy efficient technologies; liberalisation of energy market, creation of a competitive environment for electricity generation and consumption and many others.

Energy-rich Azerbaijan intends to significantly increase its energy efficiency and reduce the amount of energy required to provide products and services until 2020. The objective is reflected in the "Azerbaijan 2020: Look into the Future" development concept, which also envisages the decrease of gas emissions from boilers by 20 percent, as well as increasing the share of renewable energy in the total energy mix to 20 percent. As most of renewable energy in Azerbaijan comes from hydro, its share depends on hydro power plants (HPP) operational mode and varies from 6% in 2014 to 18% in 2010 (for a comparison, the share of RES in the electricity production in 2014 for the world was 30% and in CIS countries 17.2%).

The second largest final energy consuming sector (after residential) is transport, which is also the main driver of oil consumption, especially of motor gasoline. In 1990 there were 400 thousand cars in Azerbaijan and by 2014 the number reached 1,300 thousand, about 60-65% of which operated in the capital Baku. Around 60% of cars were produced in the CIS countries and their gasoline consumption was 30-40% higher than that of the European makes. In order to improve this situation, the Cabinet of Ministers approved in 2014 a special Act imposing Euro-4 ecological standard on all imported cars.

The Government has recently completed work on the development of a draft law "On the Efficient Use of Energy Resources and Energy Efficiency" in the framework of the new EU programme "EU4Energy". The work was carried out in collaboration with the International Energy Charter and currently the document is undergoing interdepartmental approval procedure. The document was prepared in accordance with international standards and is aimed at improving energy efficiency in the process of production, distribution, sale and consumption of electricity.

Azerbaijan has already implemented a number of measures in the field of energy efficiency, including optimization of the operation of power plants, reduction of losses in power grids, development of alternative and renewable sources of electricity. However, the primary task is to prepare a legislative framework and the bill which is aimed to assist in resolving issues in the field of energy efficiency.

The draft law on energy efficiency also includes the principle of energy efficiency in buildings. At the moment, most of the buildings in Azerbaijan do not meet modern standards. An extremely large amount of energy is therefore spent on heating them in winter. An energy audit took place in Baku as part of one of the pilot projects financed by the EU in 2013–2014. Two types of residential buildings were audited, revealing that

proper insulation would help the buildings' residents save over 50% on their energy consumption.

Renewable Energy

Azerbaijan has a huge potential for alternative energy. Its wider use could enhance security of electricity supply, diminish cost of electricity production, save natural resources, create new jobs and improve the environment. Although Azerbaijan has some experience in application of technologies to use wind power, solar electricity and heat generation, hydro power remains the most developed renewable energy source. So far the actual use of RES is just a fraction of potential the country has, except for the big hydropower plants. According to the State Agency on Alternative and Renewable Energy Sources (SAARES) in 2014 about 77% of total RES energy were produced on the large hydro power plants; 12.3% on small HPP; 4.6% on wind power plants; 4% - biogas and remaining 2.1% on solar power plants.

Given that about 90% of all electricity is produced by the three natural gas power plants, there is a high risk of interruption of electricity supply in case of a technical accident or repair works on one of the plants. Therefore one of the immediate tasks is to diminish risks by diversifying sources of electricity production also through further development and wider use of renewable sources of energy, such as wind and solar.

The SAARES is the principle executive body which is responsible for formulating the policy framework and developing a centralized approach to a country-wide and rapid uptake of renewable energies. It also coordinates activities and provides state control on efficient use of alternative and renewable energy sources in Azerbaijan.

The State Agency has developed a national strategy that presents a detailed roadmap towards achieving a significant increase in the share of alternative energy sources in Azerbaijan's energy consumption – the State Strategy on the Use of Alternative and Renewable Energy in the Republic of Azerbaijan for the period 2012 to 2020.

The programme foresees to triple the renewable energy capacity from the current 830 MW to 2,500 MW by 2020. In particular, wind energy capacity from 240 MW to 800 MW and solar photovoltaics will be increased from 290 MW to 600 MW by the year 2020. In other segments, biogas will grow from 25 MW to 125 MW; geothermal from 15 MW to 150 MW, and small hydropower from 80 MW to 150 MW.

Over the period of ten years (2005-2015) Azerbaijan invested around USD 613 million in the development of alternative energy, of which 83 percent accounted for public investment and remaining 17 percent for private sector.

Solar panels installations are widely used for alternative energy production, especially in sunny areas. Azerbaijan indeed is one of those areas where production of electricity and thermal energy from solar energy has a huge potential. In fact, the total amount of sunny hours over the year is about 2,400–3,200 hours, which brings the total estimated potential of solar energy in the country to some 5000 MW. Ones the new legal and

financial incentives in place (including feed-in tariffs) this potential serve good basis for attracting considerable investments, including foreign direct investments in the development of solar sector of the renewable energy in Azerbaijan. Equally, solar installations could significantly help in solving energy problems on a local level in selected remote regions of the country.

Due to its geographical location Azerbaijan is very convenient for the installation of **windmills**. It is particular true for the Absheron peninsula; coastline of the Caspian Sea and islands in the northwestern part of the sea; the Ganja-Dashkesan zone in the west of Azerbaijan and the Sharur-Julfa area of Nakhchivan. In 1999 the Tomen Company (Japan), together with the Azerbaijan Scientific and Research Institute of Power and Energy, installed two wind towers of 30 and 40 meters high in the Absheron peninsula. A feasibility study for the installation of windmills with a total capacity of 30 MW in Qobustan region was prepared. The wind, which blows more than 250 days per year and may generate 2.4 billion kWh of electricity annually, is the country's preferred option because of its lower cost, environmental soundness and unlimited availability. According to the SAARES the total wind energy potential in Azerbaijan is estimated at a level of 4,500 MW.

From ecological point of view **water** is the purest energy in the world. Electricity production from hydropower plants has been steadily increasing since 1990. The Strategy envisages construction of new hydro power plants in the areas where they are not yet developed. Construction of hydro plants has also positive side effects, such as regulated floodwaters, creation of new irrigation systems and overall environmental effect. Many rivers in Azerbaijan have a good potential for small hydropower installations.

There are following sources of **biomass** in Azerbaijan: industrial waste which has ability to burn; wastes from forestry and wood processing; agricultural crops and organic compounding wastes; wastes of household and communal areas; wastes from areas polluted with oil and oil products.

Traditionally waste is composed of biomass products coming from all sectors of the economy. Biomass which may be in solid, liquid or gaseous form can then be used for heat and electricity generation. Every year around 2.0 million tons of solid and industrial wastes are sent to the dumps. Building of waste-to-energy plants could significantly contribute to provide heating to the residential sector in cities. In 2012, the Balakhani Waste-to-Energy incineration plant operating on municipal solid wastes (500,000 tons per year) was commissioned. Its total capacity was 37 MW and production capacity 231.5 GWh per year.

Azerbaijan is also rich of thermal waters which can be used in industry, agriculture, residential sector and in medicine. There is a potential of thermal waters use in regions close to the Caucasus Mountains, the Absheron peninsula, the Talysh mountain zone, the Kura basin and territories around the Caspian Sea and Guba region.

Wider use of renewable energy for electricity production positively effects the **ecosystem**. In particular it diminishes the level of CO_2 emissions to the atmosphere as compared to gas and other fossil fuels. In recent years (2016-2018) emissions of greenhouse gases into the atmosphere in energy sector of Azerbaijan remained stable at a level of 38 mln. tons per year. This was primarily due to a stable share of natural gas in the country's energy mix. By 2030 the Republic of Azerbaijan targets 35% reduction in the level of greenhouse gas emissions as compared to 1990 base year as its contribution to the global climate change efforts.

Azerbaijan is highly vulnerable to the effects of climate change adaptation. National greenhouse gas emissions account for only 0.1% of global emissions. Despite the fact that under Kyoto protocol Azerbaijan has not undertaken quantitative obligations in regard to GHG emissions reductions, a number of significant mitigation measures have been implemented in the country during recent years. Among those measures were introduction of low-carbon technologies, enhanced energy efficiency, wider use of renewable energies, efficient waste management, new and emerging technologies and expansion of forest areas.

In addition to national initiatives on mitigation, Azerbaijan is successfully cooperating with a number of international organizations through implementation of various projects. For example, more than 30 projects related to the introduction of climate change mitigation technologies and capacity building in this field were implemented.

2.2 BELARUS

Energy Efficiency

In 2011 the Council of Ministers of the Republic of Belarus approved a National Programme on Energy Saving for the period from 2011 to 2015 (Resolution No1882, 2011). The Programme set ambitious targets of reducing the energy intensity of GDP by 29-32% by 2015 compared with 2010 and increasing the share of local energy resources in the fuel balance to 28% by 2015. A wide range of measures was envisioned to achieve these objectives. The approach assumes growth in both real GDP and energy demand. The government approved a Law on Energy Savings in December 2014, which stipulates energy efficiency technology implementation and the energy-efficient equipment requirements. The total amount of required funding from all sources was estimated at USD 8.6 billion of which 38% were identified as own resources of enterprises; national and local budgets were planned to contribute 27% and 15% respectively; loans and other resources were planned to account for the remaining 20%.

However, according to the Energy Efficiency Department, the total amount of funds provided from the national and regional budgets for energy saving measures amounted to USD 1,439 million, which is about 40% from what was initially planned for the duration of the Programme. The 2011-2015 Programme's energy efficiency targets have not been achieved either. According to the National Programme on Energy Saving for the period from 2016 to 2020, during the period from 2011 to 2014 the energy intensity

of Belarus' GDP dropped by 8.3% (the GDP grew by 9.8%, but energy consumption practically did not change). Although a figure of 8.3% is a considerable decrease in energy intensity over 2011-2014, it is more than three times lower than the target set in 2011.

The share of domestically sourced primary energy in total energy consumption is planned to reach at least 16% (mainly due to commissioning of a nuclear power plant), including 6% coming from renewable energy sources. The funding for implementation of these energy saving measures is envisaged at BYN 11,064.26 million (USD 5,625 million).

BelEnergo is expected to bring a total of 1.8 GW of capacity on line in the period 2011-2015 including new more efficient technologies. Consequently, about 900 MW of inefficient generation capacity is to be decommissioned in line with the need to reserve capacity for system reliability until the nuclear power plant is operational. Obsolete equipment in electricity grids will be replaced and new intelligent control systems will be developed; not less than 1,500 km of 0.4-10 kV lines will be rehabilitated. These measures are expected to deliver a two-percentage-point reduction in losses compared to 2010 levels.

Major efficiency improvements in heat supply are foreseen in automation of control and metering processes of heat production plants. In order to upgrade assets and improve quality of customer connections, it is required to replace annually 100-120 km of supply pipelines and 550-660 km of distribution pipelines. The efficiency gains are expected to reduce losses by two percentage points in 2015 compared with 2010 (or 8% in total).

Public awareness of energy efficiency in Belarus is relatively high as information is regularly shared through media campaigns, information sessions, publications, educational seminars and other information dissemination approaches.

The **industry sector** has undergone a programme of modernisation over the past decade, with the aim of increasing capacity, improving competitiveness and expanding exports. Under the national programme of modernisation which totalled to approximately USD 1.2 billion, a number of key facilities have been upgraded mainly in wood processing, cement, mechanical engineering and also food and textile sectors of industry.

Targets and measures aimed at improving industry energy efficiency are reflected in the Concept of Energy Security and the National Programme on Energy Savings for 2016-20, as follows:

- Reduction of energy consumption in manufacturing sector by 2% (2015-2020);
- Continued restructuring of state-owned enterprises and process upgrades;
- Closure of the least efficient state-owned enterprises;
- Modernisation and technical upgrade of production/manufacturing processes;

- Wider use of electricity for various purposes, particularly for heating.

Significant progress was made in the implementation of Programme of Sectoral Energy Savings (2016). Out of 511 energy-saving activities envisaged with an expected amount of savings of 36,601 toe, 415 activities were fully implemented (81% of the plan) and some 38 activities were partially implemented. Thus, real saving of fuel and energy resources amounted to 39,260 toe, which exceeds the targeted amount by 7.2%.

The Energy Efficiency Department of the State Standardization Committee is responsible for control and monitoring of energy savings in the industry sector. Each enterprise has a 5-year energy consumption reduction plan and depending on the results an enterprise may be financially rewarded or penalised. Plans are based on compulsory energy audits and take into account previous consumption pattern, forecasted output and indicators of economic activity. The Law on Energy Saving requires mandatory energy audits for legal entities with annual fuel and energy consumption of more than 1,050 toe.

Belarus has established the state system of technical regulations and standards for the construction in **residential sector**. Thermal energy passports for buildings have been introduced and are included in the package of design and certification/acceptance documents. Energy efficiency classification of buildings has been introduced.

According to the World Bank report (2015), more than 80% of the country's residential stock was built before 1996. Building thermal protection standards were significantly strengthened in 1993 and updated in 2010. Pre-1996 buildings consume, on average, nearly twice as much energy per square meter as buildings constructed in the last four years. Deep thermal retrofits in these residential and public buildings could result in dramatic energy savings.

A technical regulation on "Energy Efficiency in Buildings" was developed in 2018 and is currently considered by the government for approval. The regulation aims at further systemic development of energy saving policies in construction; establishment of mandatory technical requirements to improve the energy efficiency in buildings and facilities; development of common principles and approaches for assessing energy efficiency and energy savings.

The **transport sector** is the third largest energy consuming sector in Belarus, and its demand is growing rapidly, compared to industry and the residential sector. Oil products represent over 60% of this sector`s consumption.

In 2010 the government established indicators on the reduction of light oil products (LOP) consumption for Republican governmental bodies. In support of achieving these targets the annual sectoral programme of LOP saving has been developed and is being implemented, which includes 188 measures in a number of areas, including replacement of rolling stock and improvement of the fuel consumption monitoring system. Operating standards for fuel consumption have been developed and approved with respect to all vehicles. A package of measures on the optimization of traffic routes has been implemented, online dispatch control systems are being introduced on a large scale and

fuel consumption standards per traffic routes have been developed. The Belarusian Railway, as the main consumer of LOP, has implemented a programme of locomotive modernization, including equipment with new diesel units. Fuel consumption in the air transportation subsector has been reduced through putting advanced fuel-efficient types of aircraft into operation.

Belarus has established a multi-level system of **education** in energy efficiency and energy saving: educational games in kindergartens, thematic lessons, competitions and energy marathons at secondary schools, the Fundamentals of Energy Saving disciplines at institutions of higher education, the Energy Efficient Technologies and Energy Management specialty in Universities.

Systemic measures implemented in the country include international and national exhibitions, fora and conferences, **awareness raising** and educational workshops and training courses at regional and sectoral levels, dedicated campaigns on energy and energy efficiency, media tours, press conferences, online conferences on the rational use of energy resources and the best practices for introducing energy efficient technologies.

From 2007 to 2010, 129 technical regulations were developed, with more than 80 **norms and standards** harmonized with international and European requirements, based on the Programme for Developing the System for Technical Regulation, Standardization and Conformity Attestation in the field of Energy Saving.

Renewable Energy

The Government of Belarus has identified renewable energy as one of the key priorities for energy sector, as it strengthens the energy security through import reduction and reduces greenhouse gas emissions. A comprehensive National Programme on Local and Renewable Energy Development for 2011-2015 was adopted in 2011 which sets targets and plans for the development of all local resources with a particular focus on biomass and biogas development.

There is no binding target for renewables as a share of the energy mix in the new Concept of Energy Security, however the government is aiming to reach a 9% share by 2035 (up from just under 6% in 2013). Electricity generation from renewables is expected to grow 10-fold to 2.6 TWh by 2035, albeit this is not a key policy target.

In 2015 the Belarusian government amended the regulation on renewable energy that was governed by the Law on Renewable Energy Sources adopted in 2010. In May 2015, the government approved the Presidential Decree on the Use of Renewable Energy and in August 2015 it approved the Resolution on a new methodology for feed-in tariffs. In March 2016 the government approved the Comprehensive Development Plan for the Electricity Sector to 2025 and in April 2016, the National Programme on Energy Savings for 2016-20 was approved.

The new legislation has introduced significant changes in the previous methodology for feed-in tariffs and set quotas on grid-interconnected renewable energy development

(new plants and upgrade/rehabilitation that leads to increased capacity). According to the government, the new tariffs are more likely to attract investors while the quotas maintain the sustainability of renewables development and grid balancing.

While Belarus does not have a very favourable **solar** regime, its potential is significant, mainly in the south and southeast of the country. Most of Belarus only receives between 1,100 and 1,400 kilowatt hours per square metre (kWh/m^2) of global horizontal irradiance (GHI) and around 1,000 kWh/m^2 of direct normal irradiance (DNI). This means that a concentrated solar power (CSP) generation is impractical, but that production by means of solar photovoltaic (PV) is possible. Total solar potential is estimated at 49.7 Mtoe/year.

The energy potential of **wind** is estimated at 1,600 MW, with 1,840 potential wind farm sites in three regions: Hrodna, Minsk and Mogilev. Total wind potential is also estimated at 0.47 Mtoe/year.

The area of the **forest** fund of Belarus is 9,565.8 thousand hectares (39.8 percent of the territory). The total stock of standing wood is estimated at 1.7 billion cubic meters, and the specific weight of mature and over mature stands in the total amount of wood reserves of the Republic is 13.6%. The total annual average forestry stock change is 32.6 million cubic meters.

Today over 5,860 **wood fuel** units with a total heat capacity of more than 6,000 MW (including 3,000 units in the housing and communal services sector with a capacity of 3,800 MW) operate in Belarus. According to the National Energy Saving Programme it is planned to construct by 2030 some 128 additional units with the primary use of wood fuel with a total installed heat capacity of 678.1 MW.

The sawmilling and woodworking industries produce annually some 1.5 million cubic meters of **woodworking waste** which is used as raw material for the production of wood fuel chips and of granulated wood fuel - export products, which are in high demand on the international market. The total annual potential of **agricultural residues** is estimated at 1.46 million tce. Currently 17 **biogas** power plants operate in Belarus with a total electricity production capacity of 25.7 MW and total potential of 330 MW.

Hydropower resources in Belarus are considered to be scarce, albeit with opportunities for small hydro in the northern and central parts of the country (UNIDO and ICSHP, 2013). Hydropower potential in Belarus is estimated at 850 MW, including technically available potential of 520 MW and economically viable potential of 250 MW (0.44 Mtoe/year).

2.3 GEORGIA

Energy Efficiency

Over the last several years the growth rate of electricity supply has been falling behind that of electricity consumption. Over the ten years from 2007 to 2017 average growth

of electricity consumption was 4.4%, however this grows was even more significant in recent years – 14.4% higher consumption in 2017 as compared to 2015.

One of the mechanisms to mitigate the consumption growth rate is energy efficiency. A draft National Energy Efficiency Action Plan (NEEAP) contains a number of policy measures and sectoral mechanisms aimed at enhancing energy efficiency of the economy. One of the efficient measures with a short-term result in the household sector would be a replacement of incandescent light bulbs with energy efficient ones. According to the national Statistics Office of Georgia about 78% of light bulbs in the household sector are incandescent ones.

The estimates show that the replacement of bulbs will cost around USD 12 mln. and it would result in electricity saving of around 500 MW. At the same time the cost of building a new plant with installed capacity of 500 MW would require around USD 600-700 mln. By using energy efficient bulbs, the households will save on average USD 1.8 to 3.0 in the monthly electricity bills. On top of it the replacement of bulbs would result in reduction of some 500,000 tonnes of the CO_2 emissions into the atmosphere.

Therefore, the replacement of incandescent bulbs with energy efficient ones could be a profitable, low-cost and easy to implement energy efficiency measure on a large scale. This measure would also provide a good return on investments to electricity consumers and have a positive effect on the environment.

In addition to energy efficiency measures foreseen by the EU Energy Efficiency Directive, the government of Georgia considers undertaking and implementing a number of alternative policy measures aimed at enhancing energy efficiency in the country.

Financing schemes for energy efficiency (alternative policy measure 1).

The Government of Georgia plans to establish a new Renewable Energy and Energy Efficiency Agency (or Energy Efficiency Agency) to support faster implementation of successful energy efficiency programmes and promotion of investments.

The overall mandate of the Agency will have a broad scope for interventions – the intention is to have the institution independent of a specific ministry. The Agency will initially be funded by the Government allocations but investigate implementation of ongoing revenue streams to allow for grant-making, which will be further elaborated during the development of the Agency**.**

Initial activities of the Agency will focus on project/investment identification, donor coordination, facilitation of grant-making, and facilitation of technical assistance. There are a number of activities and investments planned in Georgia. These activities include numerous current and potential large-scale investment programmes for EE, indicating that access to loan finance is not the barrier either for the public sector or for the industry or transport sectors. Indeed, the barriers related to finance are much more likely to be related to the bankability of the organizations taking a loan, identification of investment opportunities, capacity of organizations to apply for finance or develop projects,

awareness of end-consumers and business leaders, etc. rather than ability to identify concessional finance. A national organization should carry out and coordinate such activities; it will also remain in place during the post-project period to ensure the impact is sustainable and nation-wide.

Incentivising / mandating energy efficiency in industry (alternative policy measure 2).

Incentive programmes to encourage EE in industry can take many forms. Given the relatively small size of Georgia's industrial sector, energy-saving agreements will signal to industry that the Government is supportive of EE investments. Such a mechanism will reward industries that invest in EE. In the coming years this measure will be coupled with steps by the government to allow the energy prices for industry to increase to reflect the market price. All mechanisms and policies which may result in an increase in energy prices will be studied thoroughly to assess the consequences for industry and how any negative consequences can be counteracted with support for energy efficiency.

The introduction of a measure to incentivise and potentially mandate energy efficiency would involve the Georgian government negotiating and then agreeing with key industrial actors and/or sub-sectors on a series of realistic energy performance targets, with interim milestones. Targets will be performance related, i.e. energy or emissions per unit of production.

Training and education, including energy advisory programmes (alternative policy measure 3).

The market of energy efficiency in Georgia lacks capacity of adequate project developers, EE and sustainable energy investment professionals as well as adequate expertise which can help the project owners and beneficiaries adequately initiate dialogue and conclude an EE financing deal between the EE project owner and the financier. The business environment for energy efficiency investments will be accelerated by developing a holistic capacity building programme and implementing it by targeting training project developers and local financial institutions on key aspects of EE project finance.

The three pillars of the energy efficiency investment market are the borrowers (local companies which are energy consumers), the project developers (engineers, auditors, ESCOs, etc.), and financiers (local financial institutions who offer financing for investments). If one or more of these pillars lacks institutional or technical capacity to adequately process decisions on energy efficiency finance, the market will remain underdeveloped.

Standards and norms and labelling schemes in appliances (alternative policy measure 4).

Georgia plans to follow the provisions of the EU Directives and to proceed with the transposition according to the Energy Community work programme. Using the provisions of the Directive 2010/30/EU of the European Parliament and of the Council as the basis for defining labelling requirements, an energy efficiency labelling system

for energy consuming appliances in Georgia will be introduced based on the best practice. This will include drafting, adopting and ensuring enforcement of legislation and its delegated acts on Labelling of energy related products. Implementation will apply a phased approach, with only a limited number of appliances subject to labelling in the first phase. The list of appliances subject to labelling would then be gradually enlarged. To this aim, the corresponding international and European (CEN) standards on testing the energy performance of selected energy-consuming appliances must be translated and adopted. The development and enforcement of the regulatory package for appliance labelling must be accompanied by design and launch of a labelling outreach campaign.

Due to the missing framework and low level of awareness, the appliance labelling programme will require extensive groundwork. In addition, the appliance labelling has a delayed impact on the appliance market due to the slow appliance replacement rate, especially in years of low economic activity. Consequently, this activity will not deliver energy savings within the first three years.

Energy savings will be achieved through the:

- Increased awareness and end-user behaviour;
- Informed decision-making in purchase or replacement of appliances; and
- Enhanced market penetration of energy efficient appliances.

Qualification, accreditation, and certification schemes (Alternative policy measure 5).

This measure involves setting up of officially approved certification and/or accreditation schemes, including suitable training facility and programmes as relates to buildings. This will increase the number and capacity of providers of energy services, energy audits, energy managers and installers of energy-related building elements.

The government will ensure that the proposed schemes provide transparency to consumers, are reliable and contribute to national energy efficiency objectives. The government will also make publicly available the certification and/or accreditation schemes or equivalent qualification schemes and shall cooperate among themselves on comparisons between, and recognition of, the schemes.

Renewable Energy

Although in Georgia there is no dedicated renewable energy law in force yet, selected measures supporting development of renewable energy are included in a number of associated policies. Following the terms of the Protocol on Georgian accession to the Energy Community Treaty, Georgia has assumed obligations to comply with the EU Directive on the promotion of energy use from renewable sources (2009/28/EC) by 31 December 2018 and reflect the latter in the national legislation. Currently the work on the development of Renewable Energy Law and National Renewable Energy Action Plan (NREAP) is underway.

According to the draft NREAP the share of renewable energy in a gross final energy consumption in Georgia should be increased from 27.9% in 2014 to 30% by 2020. The work will start with a comprehensive nationwide renewable energy resource assessment, with particular emphasis on biomass energy from solids, hydro power, solar energy and wind.

In Georgia about 80% of electricity is generated by the hydropower plants (HPP). Their output changes in different seasons depending on water level in the rivers. Period from May to August is a period of high water discharge and high electricity generation when electricity excess goes for export (in 2015 about 4% of generated electricity, or 400 mln. KWh, was exported to Turkey). During the fall-winter period of peak demand the supply gap is covered with electricity produced by thermal power plants or electricity imported from the neighbouring countries.

According to recent estimates, with its 300 rivers suitable for electricity generation Georgia has a total annual potential capacity around 15,000 MW and annual generation is estimated at 50 TWh, however only some 20% of its potential is currently used. In addition to hydro the annual installed wind capacity is estimated at a level of 1,500 MW; annual solar potential of some 110 MW and capacity of middle and low temperature geothermal waters is estimated at a level of 200 to 250 mln. cubic meters.

Ongoing support for hydropower, wind and solar power production is aimed to help integrating these renewable energy sources into country`s electricity network.

The Law on Electricity and Natural Gas (2006) also provides a net-metering policy framework, which brings additional benefits to customers and electricity system as a whole. According to the Law, a micro generator may be included in the net-metering policy only in cases where production takes place at the point of consumption. There is no additional procedure to apply for participation in net-metering policy. All consumers with connected micro generators can automatically benefit from net-metering. The law also contains provisions that exclude small producers of energy (installed capacity below 100 kW) from the obligation to get special construction permits or a production license and are excluded from the entrepreneur activity and other types of taxes.

The procedures for these small-scale decentralized installations are simplified and the owners can apply directly to distribution system operator (DSO) for the connection to network. DSO takes over the application and does all related works without customer`s involvement. The timeframe for micro generator connection after application is strictly defined by the period of 20 to 40 days depending on the capacity and connection voltage level. The final approval is done by the Georgian National Energy and Water Supply Regulatory Commission (GNERC) and the rules of procedure are published and available for customer on the GNERC's website.

Access to Electricity and Energy for Cocking and Heating

Based on the data by the SEAforAll Global Tracking Framework, the Energy Sector Management Assistance Programme (the World Bank) and the International Energy

Agency, the entire population of Georgia (100%) has access to electricity. However, in some rural areas there may be a few villages where households lack direct connection to a distribution grid.

In 2017 the National Statistics Office of Georgia conducted a survey on Energy Consumption in Households. The survey demonstrated that more than half of the households (52.8%) use natural gas for cooking (77.8% in urban and 27.8% in rural areas); 24.7% use firewood and agricultural waste; 16.7% - liquefied petroleum gas (LPG), while 5.8% of households use electricity for cooking purposes.

Firewood is mostly used by rural households in woodstoves for both cooking and heating. However, the efficiency rate of it is extremely low (around 30-35%) and therefore enormous volumes of fuel wood are used also given its low price. As a result, woodlands and forests experienced significant degradation and in certain areas biomass resources have been coming under pressure. Given that fuel wood (along with biofuels, waste and others) represent about 35% of the domestic final energy consumption (mostly in residential sector), this energy source is used in a highly unsustainable way. Ministry of Environment and Agriculture estimates the annually available renewable wood resource at 600,000 m^3, while the total consumption is estimated at 2.5 million m^3.

At the same time significant volumes of available solid wood biomass residues are not yet properly used. Indeed, after processing and upgrading of solid biofuels into briquettes, pellets and chips, they could be of high demand for heating purposes, especially in rural areas. This include agricultural and forestry waste and waste from tree trimming in the cities and from other potential sources. The estimated potential of biomass residues is approximately 1 million m^3. Regarding the residential waste, according to municipal data just two large cities – Tbilisi and Kutaisi – accumulate about 900,000 tonnes of waste per year at the disposal sites. An estimated 90 million m^3 of biogas could be produced through processing these residues, which would be equal to 64 million m^3 of natural gas. Similarly, around 160 million m^3 of biogas could be produced annually from the sewage water cleaning station in Tbilisi (serving 1.1 million inhabitants). A total potential of biogas energy is estimated at 1,000 GWh/year, which would be equal to around 100 million m^3 of natural gas.

2.4 KAZAKHSTAN

The Sustainable Development Goals (the SDGs) are a comprehensive universal set of goals and indicators until 2030 aimed at improving the quality of life of citizens, socio-economic development and environmental sustainability of states.

In many aspects the Kazakhstan's development programmes, such as "Strategy 2050", are consistent with the Sustainable Development Goals, and can serve as a useful and convincing political basis for their achievement, as well as for monitoring and evaluating progress in achieving the SDGs. Implementation of the SDG methodology

and indicators provides an opportunity for systemic adaptation of the system of strategic planning and monitoring of Kazakhstan to the world standards.

The mission of the international experts of UNDP with the aim of rapid integrated assessment of Kazakhstan's readiness for the SDGs' implementation and monitoring, held in November 2016, revealed a sufficiently high degree of inclusion of the SDGs' targets in national and sectoral plans - 61% of the SDGs' objectives are already covered by national strategic documents.

In November 2016 members of the Senate of the Parliament of the Republic of Kazakhstan adopted a Statement, which notes the need to promote the application of the principles of sustainable development and to facilitate the integration of the SDGs in the current legislation in order to create favorable conditions for their implementation.

Along with the implementation of the SDGs, monitoring their achievements is an important task, both at the global and national levels. Countries have the primary responsibility for undertaking follow-up activities and reviewing progress in the implementation of the goals, and for this it is necessary to collect quality, accessible and relevant data (targets 17.18 and 17.19 of SDG 17). Kazakhstan intends to come up with the first voluntary national progress report on the Sustainable Development Goals in 2019.

A specially created interdepartmental working group on the implementation of indicators for monitoring the SDGs is developing a system of indicators, including both global and national indicators, taking into account Kazakhstan's priorities. This is one of the examples of best practices.

Experts believe that this system will yield a positive multiplier effect, such as:

- facilitating the process of becoming one of the 30 most competitive countries in the world by achieving the OECD indicators through the SDGs implementation;
- giving additional impetus to such processes as increase of human potential, attraction of foreign technologies and experience, advanced training in the field of processing of big data sets; and
- enhancing investment attractiveness for large international corporations, for which the model of socially responsible business and its SDGs compliance is an important component of their image.

Since 2012 Kazakhstan has developed and adopted a comprehensive set of programme documents, legislative and regulatory acts, which define country`s development priorities and targets and which are also consistent with the Sustainable Development Goals. Below are extracts from some of the programme documents.

External Policy Concept 2014–2018:

- Expansion of international cooperation to attract investment and latest technologies into strategic sectors of the economy to boost Kazakhstan's industrial and innovative development;
- Gradual transition to the "green economy" is one of the key elements of reaching Kazakhstan's goal in becoming one of 30 leading developed economies in the world.

Strategy Kazakhstan 2050:

- Create investor friendly environment to increase Kazakhstan's economic potential, profitability and return on investments;
- Develop alternative and renewable energy sources (solar and wind) to reach 50% of power consumption by 2050.

The Concept of Fuel and Energy Sector Development by 2030:

- Increase the efficiency of Kazakhstan's power resources in support of economic growth and improving living conditions for the country's population;
- The following strategic priorities to be achieved by 2030: Energy security; Development of the resource base; Lessening of the power sector's negative impact on the environment.

"Green economy" Concept targets:

- Growth of alternative (solar, wind, hydro and nuclear power plants) energy sources' power output: to 3% by 2020 (solar and wind); 30% by 2030 (solar, wind, hydro, nuclear), and 50% by 2050 (solar, wind, hydro, nuclear);
- Growth of gas-fired generation in total output: to 20% by 2020; 25% by 2030, and 30% by 2050;
- CO_2 emissions reduction in the power sector relative to 2013 levels: 2012 level by 2020; to 15% by 2030, and to 40% by 2050.

The concept of Kazakhstan's transition to the "green economy" adopted in 2013 and which is based on the rational use of natural resources and reduction of Kazakhstan's carbon footprint has become the most significant commitment for Kazakhstan's energy sector. It would imply that the electric power and capacity markets' policies would have to incorporate this environmental imperative alongside security of supply and value for consumers as overarching goals.

Energy Efficiency

In recent years special attention was paid to the energy efficiency and energy saving in the Republic of Kazakhstan. At present, a legal framework is in place and the state authorities are actively involved in developing and adopting additional by-laws and

technical regulations and in implementing capacity building and awareness raising activities.

As the first step in development of the state policy in this sector, in January 2012 the Parliament adopted the laws of the Republic of Kazakhstan "On saving energy and improving energy efficiency" and "On introducing amendments and addenda into some legislative acts of the Republic of Kazakhstan on saving energy and improving energy efficiency".

Within the framework of the above laws, more than 22 normative acts were adopted that provide for:

- introducing norms on energy consumption for all types of industrial production and services;
- introducing compulsory requirements on energy efficiency for all types of transportation means, electrical engines as well as buildings, structures and constructions and their design documentation;
- introducing energy efficiency classes for buildings, structures and facilities and rules for their definition and revisions;
- adopting rules for conducting energy auditing at industrial enterprises and buildings;
- introducing requirements on adaptation of energy management systems at enterprises consuming annually more than 1,050 toe;
- introducing mechanisms for evaluation of activities of local executive bodies on energy saving and energy efficiency;
- gradual phasing out of incandescent lamps;
- approving rules for activities of training centers for improving skills of persons conducting energy audit and (or) giving expert advices on saving energy and on the Energy Management System (EMS).

One of the mechanisms for implementing the legislation is the creation of State Energy Register (SER) for entities, consuming 1,500 and more tce (1050 toe) a year and for the companies where the state is a major shareholder. These companies and entities are subject to a compulsory energy audits at least once every five years. All the SER entities should also introduce and implement the Energy Management System. According to regulations 2,203 legal entities conduct energy audit and follow it up with a five-year energy saving plan. As a result, in 2015 the energy intensity of the manufacturing industry, for example, decreased by 4% compared to 2014; and decreased by 12.5% in 2016 compared to 2014.

According to the Law "On energy saving and improving energy efficiency" the compulsory assessment of energy saving and improving energy efficiency is applied to the pre-design and/or project (project-budgeting) documentation on construction of new or enlargement (capital repairs, reconstruction) of the existing buildings, structures and facilities with the volume of energy resources consumption of more than 500 tce (350 toe) for one calendar year.

Such type of assessment is performed by a developer organization independent from the project and having accreditation in the given sphere for all types of buildings, structures and facilities consuming energy resources in the volume of more than 500 tce a year.

The project documentation should contain a section on energy saving and energy efficiency, energy passport of the building being designed with the calculated energy efficiency class, along with other data on application of energy saving technologies and heat insulation. The result of such expertise should be a summary containing information on the energy efficiency class. It is not permitted to construct buildings with the energy efficiency class below C.

In the course of implementation of the national legislation in the sphere of energy saving and improving energy efficiency amendments were introduced into the Code of the Republic of Kazakhstan on administrative offences providing for levying penalties for non-observance of the legislation requirements. As was mentioned before, the energy efficiency targets set the goal of reducing the GDP energy intensity by 25% by 2020 with reference to 2008.

Hence, Kazakhstan's performance over the past few years in *'doubling the global rate of improvement in energy efficiency'* is significant, and, accordingly, can be attributed to the best practices in sustainable energy.

Renewable Energy

According to the Electric Power Sector Law and the Law on Supporting Renewable Energy Sources (RES Law) the Center of Financial Settlement (CFS) buys all generated renewable power at feed-in tariffs. The choice of having CFS as single buyer of renewable power is driven by the desire to distribute the cost of renewable energy simply and evenly. Interestingly, the buyers of renewable power are not energy supply companies, but conventional power producers who pay for the renewable power in proportion to their output delivered to the grid. This out-of-the market treatment of RES that grants it financial, dispatch, and operational privileges is not uncommon globally, although the payment scheme is unique to Kazakhstan. However, together they have created the highest level of investment stability for developers in renewable generation, as follows:

- The renewable power purchase agreements could be signed three years prior to renewable capacity commissioning;
- Renewable energy tariffs are fixed for every type of RES (wind, solar, hydropower up to 35 MW, geothermal, and bio fuel) for 15 years, and they are subject to annual indexation to inflation and to exchange rate of Tenge. Depending on the RES type,m fixed tariffs are three to ten times higher than those of conventional power producers;
- RES enjoy free of charge connection to the distribution grid and are exempt from existing grid upgrade payments (that might be required for the connection of a

RES), as well as power transmission tariff. However, RES developers take on the full cost of building a line to the nearest connection point;
- RES developers receive tax benefits (corporate tax, property tax, land tax) and investment subsidies (30% of actual costs related to installation and equipment);
- RES developers could be exempt from customs duties and receive state grants (in relation to free use of land, buildings, equipment, and transport).

Conventional power producers reimburse the cost of renewable power by including it into the cost of their power production. In other words, the cost of renewable power is accounted for during the price cap calculation. Essentially, the conventional power plants bear a joint responsibility for the mandatory payment for renewable power.

In many countries of the world, the accelerated development of renewable energy has been accompanied by a shift in financing mechanisms, away from costlier (fixed) feed-in tariffs (FITs) and in the direction of capacity auctions/tenders, which are believed to afford a more cost-effective way of supporting renewable energy development.

At the end of 2017 Kazakhstan introduced a system of auctions for the purchase of electricity generated by renewable sources, to reinforce incentives already in place (feed-in tariffs, purchase guarantees). Given the long lead time required for the turnover of electrical generation capacity, the most acceptable strategy over the near term involves "mixed energy production"—continued reliance on energy generation from traditional sources in parallel with the gradual build-up of renewable capacity.

According to the approved renewable energy capacity plan, the total capacity for 2018 was 1,000 MW, broken down by types as follows:

- 290 MW solar;
- 620 MW wind;
- 75 MW hydro;
- 15 MW biofuel.

As a result of first auctions in spring 2018 the price for various RES types decreased for wind by 20%; solar by 25,5% and hydro by 23%. In 2018 it was planned to build ten renewable energy projects with total installed capacity of 123 MW. Over the last five years Kazakhstan's renewable electricity generation has increased three-fold.

Electricity and Power sectors

Since 2000, electricity generation in Kazakhstan has been growing by an average of 3.8% per year (slightly higher than the growth of consumption (3.4% per year) over the same period). Overall, since 2000 the electricity generation has grown by 83%, and consumption, by 70%. In principle, generation is expected to follow the consumption and grow by 1% per year until 2040. And there is a reason for that: since 2000 Kazakhstan has increased the available capacity of power plants by 40% in total (while the installed capacity has increased by 22%). The sharp increase in the available capacity

of Kazakhstan's power plants over the recent years has become an important achievement, because prior to 2002, Kazakhstan's consumption grew faster than generation. This achievement can safely be attributed to the best practices in sustainable energy.

Towards the end of the 2000s, the vigorous growth in electricity demand and lack of large-scale investments in new generation led to the virtual disappearance of the country's large surplus generation capacity. Kazakhstan faced an impending capacity shortage with the associated risk of an economy-wide electricity shortage. Such a shortage could drag down the economy and trigger a tariff hike and fuel inflation and thereby threaten social stability and reduce the export competitiveness of energy-intensive exports in the external markets. In an inhospitable regulatory environment, the power sector faced a deep challenge in attracting new investors. The generation capacity margin rapidly and steadily shrank from 53 percent in 2000 to a dangerously low 4 percent in 2012.

In 2009 the government introduced an administrative generation tariff regulation. Under this system, tariff caps (also referred to as maximum or "investment" tariffs) were imposed on all major generators (including private ones) to make new investments in modernizing and extending capacity. It is a state-managed investment commitment scheme: "higher tariffs for new investments." It also includes severe restrictions on the use of profits resulting from higher generation tariffs.

The government programme produced a mini-investment boom of 28 percent per year on average between 2009 and 2015 – a steep increase over the previous period. Investments undertaken between 2009 and 2014 amounted to KZT 2,230 billion (about USD 14 billion at the average exchange rate) and resulted in rehabilitation of about 5,000 MW of existing capacity and an additional 1,700 MW of new capacity.

The rehabilitated and expanded generation capacity improved system reliability, thus contributing to meeting Goal 7 of the UN SDG: '*Ensure access to affordable, reliable, sustainable, and modern energy for all'*. Kazakhstan's performance over the past few years in *'Increasing the share of energy from renewable sources in the world energy mix'* is significant and, accordingly, can also be attributed to the best practices in sustainable energy.

2.5 KYRGYZSTAN

Adequate and affordable energy supply is fundamental for economic growth and higher living standards of population. Access to modern energy services helps to improve people`s quality of life, expands business opportunities and helps to create more jobs. Today, the Kyrgyz Republic is not fully using its energy potential. Although virtually all citizens have access to electricity and low prices, the energy sector is facing serious financial problems and most of assets are old and under-maintained.

To reinforce the sustainability of the energy sector, the government of the Kyrgyz Republic has made significant progress in mobilizing external financing for the rehabilitation of existing sector assets. Several large investment projects were implemented in recent years aimed at enhancing the country`s energy security, supply reliability and service quality for the population.

Investments into energy sector

Following the rehabilitation of the Bishkek thermal power plant (TPP) its total capacity increased to 300MW (electricity capacity raised by 18.8% and thermal power capacity by 30.4%) with generation of 1,740 million kWh of electricity per year. Another important outcome of the project was the adaptation of the TPP equipment for the use of local coal as fuel for electricity generation. An automated process of accounting system was also introduced. Financing of the project at the amount of USD 386 million was provided by the China Eximbank.

Rehabilitation and construction of 500 kV electric power lines, reconstruction of electrical networks, construction of new energy facilities and equipment were implemented in southern parts of the country in Jalal-Abad, Osh and Batken regions with the construction of the 500 kV Datka and Kemin substations.

Reconstruction of the At-Bashy hydro power plant (HPP) is underway and is planned for completion in 2021. As a result the capacity increase will be around 1.68 MW or 4.2%, and annual electricity generation will total to 157.5 million kWh. The project is financed by the government of Switzerland at the amount of 19.82 million Swiss francs.

Rehabilitation of the Toktogul HPP is expected to increase capacity by 240 MW or 20%. The operational life of the station will be extended for another 35-40 years, while the electricity generation will be increased up to 4,940 million kWh per year. Financing of the project at the amount of US$ 383.6 million is provided by the Asian Development Bank (ADB) and the European Development Bank (EDB).

Preparatory activities for the construction of the second unit of the Kambarata-2 HPP has started recently and its completion is scheduled for 2021. It is envisaged to increase capacity by 120 MW or 20%, and annual electricity generation of 950 million kWh. The project is funded by the European Development Bank at the amount of US$ 110 million.

The completion of the Upper Naryn HPP Cascade construction, which is also planned for 2021, will enhance its capacity to 135 MW and annual electricity generation of 942.4 million kWh (cost of the project is around US$ 230 million). Completion of construction of 11 small hydro power plants with total capacity of 161 MW placed across the country is expected in 2021; total financial investment will be at least US$ 335 million.

Under the ADB Energy Sector Rehabilitation Project the two systems were developed and introduced – the ASCAEE (automated data monitoring and accounting system) and the SCADA (dispatching control and data collection system). The Act on completion of

works was signed in February 2018 and experts proceeded with final control, adjustment and fine-tuning of the systems.

State programmes

Several programmes aimed at increasing energy efficiency and energy saving, improving tariff policy and institutional and regulatory frameworks have been approved and implemented in recent years by the Government of Kyrgyzstan.

The recent Development Programme of the Kyrgyz Republic for the period 2018-2022 entitled "UNITY. TRUST. CREATION" is specifically focused on the "sustainable development of the energy sector and ensuring energy security of the country; providing the economy and the population with reliable and modern energy supply; and enhancement of the country's export potential".

Key actions for the support and implementation of the Programme are as follows:

- Elaboration of a Concept for the Development of Fuel and Energy Sector by 2030;
- Development of Medium Term Tariff Policy for the period 2018-2021;
- Ensure full collection of payments for supplied electricity for all categories of consumers;
- Reduction of electricity losses in distribution companies;
- Development of Regulation on calculating technical losses in electrical networks;
- Ensure the launch of a domestic production of metering devices;
- Development of a legal act regulating the design of electrical networks;
- Development of Regulation on the re-cultivation of land disturbed due to the subsoil use.

The Energy Sector Development Strategy for 2012-2015 and the Action Plan for Energy Sector Reforms for 2013-2014 outline the essence of the main reforms in this sector. The Development Strategy established the key areas and measures for strengthening the governance, transparency and accountability of the energy sector and its companies. These measures include commitment to cost recovery policies and the development of tariff methodologies. The Action Plan anticipates amendments to the Law on Energy defining the functions of policy development, economic regulation, as well as the introduction of transparent and competitive sector transactions and the creation of targeted deposits for electricity exports.

More recent reforms focused on improving financial viability of the energy sector, as well as improving regulatory systems and transparency. These reforms included changes in the institutional and regulatory framework of the sector, as well as changes in the methodology for setting tariffs, tariff structures and medium-term revenue planning.

3 ANALYSIS OF GAPS AND CHALLENGES FOR IMPLEMENTATION OF SUSTAINABLE ENERGY PRACTICES

3.1 AZERBAIJAN

Oil and gas industry is the largest segment of the economy of Azerbaijan. Energy sector generates about fifty percent of the country`s GDP and therefore the successful development of oil and gas resources has significant impact on the economic growth of the Republic. Efficient use of domestic energy resources, enhancement of energy security, and ensuring reliable and affordable energy services throughout the country for sustainable economic growth are the key pillars of the country`s energy strategy.

Today the energy sector of Azerbaijan is owned and managed by the government, however a number of strategic road maps have been recently adopted which set the restructuring of the fuel and energy complex and actions to be taken. First steps on the reforms in electricity market were taken in February 2015 when the Government decided to unbundle distribution sector from generation and transmission. As a result, all power distribution assets and functions were separated from Azerenerji and transferred to Azerishiq, which operates under the supervision of the Ministry of Energy. As well, several small hydro power plants have been privatized. In February 2015 the government of Azerbaijan issued a Presidential decree which required Azerishiq to take all necessary actions to modernize the distribution network and provide consumers with reliable, safe, and efficient power supply in the country.

There are many challenges and gaps for implementation of sustainable energy practices in the sector which call for improvements. For example, more than 20% of all power plant equipment is well beyond its useful life, and the efficiency of some of plants is as low as 25%. The majority of power transmission and distribution facilities in districts are old, having been in operation for more than 30 years. The equipment has reached the end of its service life and has become unreliable, with frequent outages and increasing losses. The overall distribution system losses at voltage levels below 35 kV are about 16%.

Power utilities supply electricity to approximately 1.5 million customers, 60% of whom are residential. Collection rates from the residential sector were poor during 2006–2008, with an average rate of 50%. Since 2007, Azerenerji initiated the installation of advanced smart meters for residential customers in selected regions. This has resulted in much-improved collection rate to 70%. It has also raised public awareness on electricity consumption and broadened perceptions on energy savings. These efforts including installation of smart meters need to be rolled out in phases nation-wide.

The financial performance of energy utilities is weak. Each year the power utilities receive government budget support to implement part of their capital expenditure programme. To enhance operational and financial performance, the government has

committed to achieving full cost recovery by 2022, by pursuing financial and tariff reform and gradually adjusting the tariff level and structure, taking into account cost reduction, efficiency improvement, and targeted financial support from the government to protect vulnerable groups of customers.

Despite the target objectives of introducing market mechanisms in the energy sector, as envisaged by the strategic road maps, there are still no short-term plans for privatization and unbundling of the state-owned companies in the oil, natural gas and electricity sectors. So far there is no strategy, action plan, or legislation in the field of energy efficiency. The only measures implemented in the field of energy efficiency are those financed by the EU or through the projects financed by foreign investors. The institutional framework in the field of energy efficiency is still at a very early stage of development and require urgent and special attention by the government.

In response to the above gaps and challenges, Azerbaijan has adopted strategic road maps for economic development in all subsectors. The road maps define policy framework and set development goals for various segments of the energy sector, including a package of special measures aimed at achieving those goals in accordance with the established deadlines over the next fifteen years. In particular, the energy sector policy framework features the following:

- promoting efficient use of energy resources and increasing sector operation efficiency;
- establishing a sound regulatory environment to promote competition;
- improving the sector structure to attract more investments;
- promoting sustainable development to ensure environmental protection;
- strengthening financial discipline in the sector and ensuring full payment for energy consumption; and
- increasing the share of renewable energy (solar, wind, and biogas) in power generation.

3.2 BELARUS

Renewable energy sources (RES). While renewables could play an important role in meeting Belarus strategic needs to reduce fuel imports and to reduce energy related greenhouse gases, the current Belarusian policy framework does not provide a strong support for future renewables development. In particular, it lacks clear targets for RES development and it does not have binding goals. As one of the main goals of the governmental policy for the energy sector is providing energy security to Belarus by diversifying its energy mix through an increased use of local fuels, in a number of ways other than investing in renewables, the future of significant investments in RES is in uncertainty.

Indeed, the quota system, which is intended to constrain deployment of some variable renewable generation technologies, will dissuade investors who will be seeking signs

that there will be a substantial market over coming years, in order to justify their investment in acquiring market knowledge and information. Equally, the current monopolistic structure of the energy sector presents limitations to investor confidence and can result in preferential treatment due to monopolistic power.

Within the Comprehensive Development Plan for the Electricity Sector up to 2025 (approved on 1 March 2016), the main changes to the regulatory framework include amendments to the Law on Electricity and the Law on Heat Supply. These amendments include measures aimed at the development of a new nuclear power plant (NPP), enhanced incentives for attracting investment in electricity and heat from local energy sources, and rehabilitation of both systems. These amendments are expected to lead to a more stable and transparent regulatory framework, which in turn should stimulate the necessary investment.

Energy subsidies. From 1992 until now energy pricing in the Republic of Belarus was based on a complex system of cross-subsidization. The legislative framework of this policy is enshrined in the Law "On Pricing" (from 10 May 1999) and Presidential Decree "On some issues of regulation of prices (tariffs) in the Republic of Belarus" (from 25 February 2011). Later, in order to ensure the balance of interests of consumers and power supply companies, the Council of Ministers adopted (March 2014) a Resolution regulating basic procedures for the rates-setting for natural gas and liquefied petroleum gas (LPG), as well as for heat and electricity. The Resolution also regulates the setting mechanism of the so-called "base prices" (tariffs for the full recovery of economically justified costs, reflecting all production and transportation costs, including expenses for repair services, depreciation of fixed assets, wages and social contributions, taxes and insurance premiums, as well as regulatory income). According to the Resolution, investment needs are covered through introduction of special tariffs for selected components, such as depreciation, credit and regulatory income. In addition, the funds from the budget and government extra-budgetary funds can also be used to meet investment needs.

Energy Service Companies (ESCOs). Currently in the Republic of Belarus there is no specific government fund dedicated to providing financial incentives to the energy efficiency programmes or energy service companies. ESCOs provide energy audits and consultation but also finance or arrange financing for EE operations and measures, with remuneration directly tied to the energy savings achieved. Development of an ESCO market could strengthen capacity, address issues related to public procurement and financing, diminish costs, increase potential for bundling of projects, and provide other operational improvements in energy efficiency measures. Unfortunately, the awareness of the ESCOs' role and their benefits for promotion of energy efficiency is still relatively low.

District heating system. There are many shortcomings and problems in the existing heat supply system, which require immediate attention, including:

- lack of a dedicated regulatory framework which would provide efficient mechanisms for interaction between energy/heat producers, transmission and distribution companies/organizations and final consumers;
- discrepancy between actual and projected temperature conditions;
- heat supply to consumers is carried out according to the dependent scheme, which limits the possibilities for creating a competitive market;
- absence of automatic control systems for the district's heat supply complex in general (generation-transmission-consumption);
- high share of the old and obsolete assets (about 60 percent) which often operate beyond the normative service life.

Transport. The number of electric vehicles remains negligible compared to cars with internal combustion engines. Barriers for the operation of electric vehicles are high costs, high taxes, and lack of charging infrastructure. In the period from 1 September 2016 to 1 September 2017, import duties were abolished. During this period, the number of electric vehicles has grown significantly.

Non-discriminatory access to the grid. The key limitation to RES development, as envisaged by the government under its strategy, is grid connectivity and balancing. Third-party electricity grid connection in Belarus has been allowed since 2013, after decades of restricted access to the vertically-integrated monopoly BelEnergo. BelEnergo has indicated potential problems with lack of regulation of grid connections of renewable energy technologies, including problems with overloading, balancing and cost recovery of the connection. However, experience elsewhere indicates that relatively high levels of renewables can be successfully integrated without technical problems or high costs by adopting certain technical and management measures.

3.3 GEORGIA

Over the last several years Georgia has made significant progress in implementing reforms in its energy sector. As a result, operational losses were significantly reduced and energy supply became more reliable. Privatisation and liberalisation of the energy market, along with legal and regulatory reforms resulted in enhanced quality of service and financial viability of the energy sector players. Reforms included the establishment of the independent energy sector regulator and the unbundling and privatization of power generation and distribution assets. Financial viability of organisations in the energy sector has been strengthened with tariff reforms and improved revenue collection.

However, more needs to be done for developing an efficient energy market model and support it with an adequate legal and regulatory framework. The key development challenges are to attract more private sector participation in power generation, increase Georgia’s role in regional electricity trade, and improve the efficiency of energy production and use.

Given the strategic role of the hydro energy development for Georgian economy, further improvements of the current legal, regulatory, and institutional framework needs to be done in order to encourage private sector investment. In particular, a lack of clear environmental regulations, an insufficient public–private partnership framework, unclear off-take agreements for hydropower projects, and the lack of a framework for transmission capacity allocation significantly hinder private sector involvement in hydropower development. While some creditable measures have been taken, further progress is needed on securing long-term off-take arrangements and sharing risks among investors and the government before major investments are likely to materialize.

The generation assets are inefficient because of their old age and poor condition. The average age of existing hydropower plants is over 35 years and the oldest plants have operated for almost 80 years. There is significant potential for greater efficiencies and reduced fuel consumption through rehabilitation of aging generation assets.

In spite of significant efforts made for rehabilitation of domestic transmission lines the reliability of the system in general is low and calls for upgrading of safety and protection equipment. In the medium term, investments will be required to continue strengthening the domestic network and building additional interconnection capacity. These investments will be critical to providing adequate, reliable transmission capacity to meet domestic and export demand.

In the distribution sector technical losses often significantly exceed levels established by the Georgian National Energy and Water Supply Regulatory Commission reaching 25% and above. Despite the ongoing rehabilitation works the distribution assets in general are old and of poor quality. Similar situation prevails in the residential, commercial and industrial sectors of natural gas and electricity consumption where most of equipment and appliances are well beyond their service life and have become unreliable. To reduce these losses the sector needs urgent investments.

The Georgian government works on further strengthening the institutional capacity to develop and implement an energy efficiency policy. Georgia needs to develop energy efficiency standards and labelling regulations for appliances. Significant progress was made in defining a new end-use electricity tariff structure which encourage energy efficiency. However, the government still faces challenges of further deregulation of the power sector and creation of environment favourable for attracting significant foreign direct investments. Privatisation of the energy sector assets is viewed as important step for improving its performance and quality of services.

3.4 KAZAKHSTAN

At present the government of Kazakhstan has formulated and adopted a number of key programme documents which set targets for sustainable development of the energy sector and its power industry. Feasibility of attaining these targets, existing gaps and challenges for their implementation are assessed in both national and international

power industry development researches. The most recent researches were made by the World Bank experts in 2017 (*Stuck in Transition: Experiences and Challenges Ahead in the Kazakhstan Power Sector.* Directions in Development. Washington, DC: World Bank). The study models four development scenarios for the power sector of Kazakhstan, reflecting on the challenges on its way to sustainable energy development.

Base Case scenario. As the most likely scenario, the Base Case optimizes generation and transmission and takes into account the policies, goals, and investment projects already in the process of being implemented or very likely to be implemented. The Base Case scenario optimizes expansion of generation and transmission, considering demand projections and the availability and cost projections for various fuels.

The Base Case scenario assumes the following:

- Demand growth projected at 2.8 percent per year;
- The government's aim to achieve 3 percent of variable renewable energy (photovoltaic and wind) penetration by 2020 and 10 percent by 2030;
- The government's plan for the third North–South transmission line, which will increase transmission capacity for the North–South corridor from 1,350 to 2,100 MW;
- The extension of the Regional State Power Station, GRES-2 (by 525 MW) at Ekibastuz;
- The government's plan to develop capacity for nuclear technology and bring on line 1,000 MW of nuclear power by 2030; and
- KEGOC's Master Plan for rehabilitation/extension/decommissioning of existing generators, as presented in the Green Economy Concept.

Green Case scenario. The Green Case scenario optimizes a path toward green growth, as described in the concept for Kazakhstan's transition to a green economy, approved by the Decree of the President in May 2013 (Green Economy Concept). The scenario aims to identify the power sector's economic costs and benefits that are associated with an aggressive energy efficiency programme to substantially reduce growth in demand (especially peak demand).

In addition to the Base Case scenario assumptions, the Green Case scenario includes the following:

- A target to decrease annual carbon dioxide (CO_2) emissions by 40 percent by 2050 from 2012 levels;
- A target to achieve 50 percent penetration of carbon-free technologies in the energy mix (hydro, PV, wind, and nuclear) by 2050.

Regional Export Case scenario. This scenario shows the economic benefits and costs if Kazakhstan were to invest in additional capacity to increase gradually its export activities while maintaining full electricity independence. Full electricity independence is a key objective of the "Concept of Development of the Fuel and Energy Complex of Kazakhstan till 2030" (referred to as Energy Concept 2030), which was approved by the

government of Kazakhstan in June 2014, and which envisages a considerable net export surplus of about 11–13 TWh by 2030. The scenario assumes that 80 percent of total exported energy will go to the Russian Federation and Belarus (within the Eurasian Union) and the remaining part to Uzbekistan and the Kyrgyz Republic.

Least-Cost Case scenario. As an extreme benchmark, the Least-Cost Case scenario optimizes system capacity expansion and operation, purely on least-cost principles, without any kind of mandatory government policy or targets (which are implemented only if they are found to be economical). The assumptions on demand projections, fuel costs, and supply options are the same as in the Base Case scenario. The same applies to the decommissioning plan and implementation of projects that have already been decided. However, variable renewable energy technologies will compete on the same footing with the rest of the technologies and will only come on line if they reach grid parity. The same applies to nuclear power. Furthermore, conversion of CHPs from coal to gas is subject to optimization. The Least-Cost Case scenario includes transmission projects that fully interconnect and unify Kazakhstan's power system (for example, the North–West and South–West transmission projects) if proven economically justified. Finally, a variation of the Least-Cost Case scenario considers the economic cost rather than the actual cost of natural gas in the calculations.

The KAZENERGY *National Energy Report 2017* outlines the path to future sustainable energy, which relies on domestic resources. The energy sector will become increasingly "green" and efficient, allowing the country to fulfill its international environmental commitments, support and enhance Kazakhstan's economic growth and improve the well-being of its people.

However, to reach this objective the country needs to make certain improvements in its energy sector. As was mentioned before, around 66% of the country's power production (or about 75% of thermal production) comes from coal which will remain major fuel for medium and long-term prospective. This is particularly true for the northern part of the country where most of power consumption (around 70%) and almost all coal-fired production is located. Relatively low cost of coal-fired production in this area over gas leaves little incentive for natural gas to penetrate the market and develop gas infrastructure. Hence, the current regulation and market mechanisms should be adjusted to stimulate gas infrastructure and gas market development.

In terms of the recent data for GDP carbon intensity from the European Commission's Emissions Database for Global Atmospheric Research (EDGAR), in 2015, Kazakhstan along with three other Central Asian Republics (Kyrgyzstan, Uzbekistan and Turkmenistan), ranked among the 10 most carbon intensive economies in the world, emitting 1.44 kg of CO_2 per 2010 USD of GDP.

In order to improve the efficiency of the energy system on the one hand and to maintain high level of its energy security, Kazakhstan must undergo a costly modernization programme, which will help to improve the flexibility of power generation and reduce the carbon impact from coal. The achievement of targets with regards to renewable

energy (3% renewable production by 2020 rising to 30% by 2030 [11% solar and wind, 10% small hydro, and 9% nuclear]) is essential for implementation of the programme. The government should create a favourable climate for investors to attract sufficient flows of capital.

3.5 KYRGIZSTAN

Despite significant positive impact of the recent reforms the energy sector still faces serious challenges. Problems with reliability of supply and quality of service remain major concern of the government, while efforts to increase tariffs may mean that energy becomes unaffordable for an increasing number of customers.

These problems are interconnected and intertwined in a vicious cycle. Energy supply is dependent on old assets that lead to frequent breakdowns, resulting in unreliable and poor-quality supply. Consumers are resistant to tariff increases, in part because of the poor quality and reliability of supply. Decision makers, fearing political backlash or because of concerns about affordability, are consequently hesitant to increase tariffs. Low tariffs, in combination with high losses, limit revenue recovery in the sector. Energy companies are consequently unable to make adequate investments in maintenance and new energy infrastructure, which in turn results in poor supply reliability and service quality.

Without sufficient revenue recovery, the sector requires support from the Ministry of Finance in the form of grants or loans which, if the energy companies cannot service the debt, accumulate and become a fiscal burden that reduces the room for government spending in other sectors.

Listed below are some of the challenges that Kyrgyzstan faces on its way to sustainable energy development and implementation of sustainable energy best practices.

Excess demand for energy over its supply; dependence on natural and climatic conditions. Meeting the growing demand for electricity by ensuring uninterrupted access to energy resources at a reasonable price is one of the main pillars of energy security. Another essential component of energy sustainability is development and implementation of an integrated policy based on reliable balance forecast between power and electricity required to meet the country's economic needs, achieve high reliability, stability, as well as create opportunities for electricity exports.

These measures are important, especially, when facing problems of seasonality, winter supply and demand gap. Recently demand has become more seasonal with winter peaks growing compared to the average load. Energy consumption during winter months becomes three times higher than in summer and accounts for 67% of the total energy demand.

Increase in electricity consumption by households for heating purposes determines the seasonality of demand side. Population without access to hot water supply use other

options to meet their heating needs such as coal-powered systems, electric and gas heaters.

Impact of imports. Dependence on import affects negatively energy sector as cost of imports are added to the total cost of services. Due to internal shortage in energy production Kyrgyzstan was recently forced to import energy from neighbouring countries in order to meet domestic needs. As a result, production and import costs which are main components of tariff-setting for end-users amounted to 43% of the average cost, while transmission costs amounted to 19 % and distribution costs - to 37 %.

Aging assets, lack of operating capital and investments, low payment collection. Today, about 80% of all emergency shutdowns occur due to breakdowns in the networks, while about 50% of available generation capacity is beyond its useful service life, and the similar state of transmission and distribution assets aggravates the risk of network failures. The energy facilities were mainly produced in 1960-1980s and therefore they do not meet modern technical and operational requirements and lead to frequent equipment breakdowns. Local production of power engineering equipment was discontinued, therefore spare parts could be only acquired through expensive imports. In the district heating sector, most assets were commissioned 20 to 50 years ago, and are in poor condition. Generation assets (CHPs and heat-only-boilers) operate at 20-50 percent of their installed capacity and network losses often exceed 25 percent of the generation outputs.

Despite recent growth, sector revenues in 2016 were still 21 percent lower than the cost of energy production. This shortfall is primarily the result of low tariffs, and in particular the low residential tariff for consumption levels below 700 kWh. The energy sector still relies heavily on government support to meet spending requirements, and the sector's debt may even reach about 20 percent of GDP. Given the persistent cost recovery gap and the sector's considerable unmet needs for new investment, repayment of this debt from energy companies to the State is unlikely.

Spending on electricity represents only a small percent of households' total expenditure, nonetheless, energy affordability is a concern for poor consumers and policymakers, and the existing social safety nets are fragmented, offering only modest support to the poorest. Consumers' willingness to pay is also not necessarily aligned with ability to pay, and the desire to have better services.

Unreliable supply and low quality of service. Winter is the most problematic season when there is a significant gap between available generating capacity and the growing demand. For example, during winter seasons of 2009-2012 on average two failures per hour were reported. In December 2012 a breakdown at the Toktogul HPP led to electricity shutdown throughout the country. In 2013 the companies experienced on average one disruption per month. A breakdown at the Bishkek TPP in 2018 caused problems with heat supply to the residential sector, which resulted in low temperatures in the houses, which in turn provoked resentment of the people.

Although almost 100% of the population has access to electricity, the cost of connection to new houses and premises remains expensive compared to other countries of the region and takes much longer period, on average up to 125 days. As well, there may be concerns of consumers in small villages situated in remote mountain areas on the absence of direct connection to electricity networks.

Lack of qualified personnel. The ongoing reform and restructuring of the energy sector in Kyrgyzstan, introduction of market-based mechanisms requires modern qualified personnel and sound human resource (HR) policy. Today the energy sector experiences significant shortage of young qualified personnel. There are two major reasons for that: a small number and insufficient quality of graduates from the local universities which provide just basic knowledge not meeting the requirements of the modern energy sector; and low level of salaries in the energy companies which makes sector less attractive to young people and leads to a high staff turnover.

Training of qualified personnel for the energy sector is one of the immediate tasks of the government on the way to sustainable energy development. The sound HR policy and planning quality are essential to achieve the sustainable development goals, both at a company level and the industry as a whole. The reliability of planning depends on the accuracy of the available data and information, forecasts and scenarios of future development, assessment of external and internal risks and factors and timely response to emerging challenges etc. It requires a wide application of modern information and communication technologies and automation of production processes widely using international experience

Low tariffs and cost recovery gap. Average tariffs for generation, transmission and distribution of energy remain below cost-recovery levels. Future reforms should primarily focus on end-user tariffs, however the low inter-company generation and transmission tariffs also contribute to the sector's financial instability.

Low tariffs combined with high losses limit profit in the energy sector. Therefore, energy companies are not able to provide adequate investments for maintenance and new energy infrastructure that leads to unreliable and poor quality of service.

In 2016, residential tariffs for consumption below 700 kWh accounted for only 39% of the cost-recovery level. At the same time this below cost-recovery tariff covers 53 percent of consumption, representing a huge burden on the sector. Large residential consumers and non-residential consumers are, in part, compensating for these losses with tariffs that are 110 percent and 145 percent of cost recovery, respectively. In fact, large residential consumers and non-residential consumers are paying tariffs that are above cost recovery levels and are cross-subsidizing residential consumers.

Heat and hot water tariffs are far below cost recovery, despite consistent improvement in the past three years. As of 2016, end-user tariffs are between 33 and 63 percent of cost recovery. As with electricity tariffs, residential consumption is much farther below cost recovery than non-residential tariffs.

4. COMPARATIVE ANALYSIS OF REVIEWED CASE STUDIES AND RANKING OF COUNTRIES IN TERMS OF PROGRESS TO ACHIEVE THE SEforALL OBJECTIVES

The five reviewed countries have many common features as well as many differences. All five got their independence as a result of the breakup of the Soviet Union in 1991. Consequently, they inherited parts of the huge economic area within the borders of respective Soviet Republics, with strongly interlinked industries and infrastructures, and fully integrated regional systems. From the economic point of view all five countries were confronted with enormous difficulties – extremely low and declining GDP level, high inflation and unemployment rates, economic recession, and decline of the living standards of population. Ethnic and territorial conflicts in Azerbaijan (1991) and Kyrgyzstan; civil war in Georgia (in Abkhazia, 1992-1993) significantly aggravated the situation.

The similarities between the energy sectors of Azerbaijan, Belarus, Georgia, Kazakhstan and Kyrgyzstan are of a common historical, political, economic, technical and regulatory nature, and therefore many characteristics and challenges that energy sectors of the five are currently confronted with are alike. Successful reconstruction and functioning of the energy sector was the key prerequisite to the governments to commence rehabilitation of their national economies for the benefits and wellbeing of the people.

Azerbaijan and Kazakhstan are energy-rich countries and could use their own fossil fuels resources for rehabilitation of their economies. In 1994 Azerbaijan signed an Agreement on cooperation with a Consortium of eight foreign oil companies ("Contract of the Century") on the development of abundant oil and gas reserves in the Caspian Sea. This new strategy has boosted oil and gas production, strengthened the partnership between national energy companies and multinational enterprises and enhanced knowledge and expertise of local experts. Since 2009, large investments in power generation and transmission facilities have resulted in remarkable improvements in the quality of power supply. It has also raised the country's geopolitical status in the Southern Caucasus and the Caspian Region. The large-scale economic reforms which accompanied the rapid growth of oil and gas production were aimed to integrating the country into the world economy, restructuring of fuel and energy complex, improving legislation for attracting foreign investments.

From the very early days of its independence Kazakhstan pursued a strategy of facilitating multinational enterprises in the development of its energy sector, in particular oil and gas. To this end the government of Kazakhstan elaborated and adopted a national economy reform aimed at establishing a free market economy and privatisation of state enterprises. Particular emphasis was made on the development of appropriate legislation and implementation of institutional reforms in the energy sector.

Significant foreign investments went predominantly to oil and gas industries raising their production, increasing exports and filling up the national budget.

Belarus and Georgia are important transit countries – Russian gas transit through Belarus to Europe and transit of Caspian oil going through Georgia to Turkey and further to European market have raised geopolitical role of the countries in their sub-regions.

The energy sector has played a key role in supporting Belarus' recovery after the collapse of the USSR by providing affordable, reliable, and sufficient energy to the national economy. Belarus is a net importer of energy – over 95% of all primary energy supply comes from Russia. Although development of the country is based on the principles of planned economy, the government welcomes foreign investments (National Investment Agency, 2010) and investors' rights are guaranteed by the state (Investment Code of the Republic of Belarus, 2001). Nevertheless, investments in the energy sector have been hindered by low level of privatization.

Economic recession in early nineties has seriously affected the national power system in Georgia. After stabilization of economy in 1995 the first phase of reforms in energy sector began with creation of Georgian National Electricity Regulatory Commission (GNERC), followed with unbundling of the power sector in 1996 and further privatization with foreign investments. Institutional reforms in power distribution and electricity transmission and dispatch sectors performed in 2000-2002 helped to reduce corruption and improve financial and technical performance by introducing international standards and expertise into energy sector.

In the Kyrgyz Republic a severe economic downturn that has followed the country's independence has brought about a dramatic change in the pattern of energy consumption by sector and by products – sharp decline in industrial sector and increase in residential. Country's demand for natural gas, oil and oil products had to be covered by imports from the neighbouring countries, but at much higher cost than under the previously subsidised prices. In the nineties the government started liberalisation of internal market, however in energy and utilities sectors prices remained regulated. Further restructuring of the electricity sector continued in the late 1990s with privatisation of KyrgyzEnergo and unbundling of the sector by function (generation, transmission, and distribution). Reforms during the 2000s and more recently included changes to electricity tariff level and structure, improvements in financial viability, regulation and transparency of the sector.

Despite the huge challenges that all countries were facing when undertaking reforms and restructuring in their economies, to date they have all invested a lot in improving functioning of the energy sector, its transition to a sustainable development, providing enhanced energy efficiency, wider use of renewable energy sources and better energy access.

They have all undertaken significant institutional/structural reforms and established a framework of bodies and organisations responsible for the development of legislation,

governance and implementation of strategic programmes and documents. They have developed and introduced legislation and policies aimed at opening up and liberalisation of energy markets, improving energy efficiency, wider use of renewable energies and better energy savings.

These efforts in reforming and improving functioning of their national energy sectors have moved them closer to attaining the three key development objectives of the SEforALL initiative, namely:

- Ensuring universal access to modern energy services;
- Doubling the rate of improvements in energy efficiency; and
- Doubling the share of renewable energy in the global energy mix.

In performing a comparative analysis of the five countries' case studies on their progress towards achieving the SEforALL goals, particular focus was put on the status of institutional/structural reforms; existing legislative and regulatory infrastructure and policies related to improving energy efficiency and wider use of renewable energy; status of investment climate to foster financing and application of modern EE and RE technologies; energy intensity of the sector and some others.

4.1 Institutional framework

Azerbaijan

The Government of Azerbaijan is the highest executive authority which is responsible for management and coordination of activities in mining and energy industries. It is also in charge of elaboration and implementation of the state energy policy, including energy efficiency and renewable energy, and it operates through the Ministry of Energy and its Department of energy efficiency, alternative and renewable energy sources.

The energy sector has undergone significant structural reforms in implementing the State Programme for the Development of Fuel and Energy Complex in Azerbaijan for 2005 – 2015. For example, the OJSC Azerenerji which was a vertically integrated and 100% state-owned enterprise in charge of electricity generation, transmission and distribution in the country, was partially unbundled in 2015 with separation and transfer of functions and assets to Azerishig, which operates under the supervision of, and is regulated by the Cabinet of Ministers.

In December 2017 the Azerbaijan Energy Regulatory Agency (AERA) was established following the Presidential Decree. The Regulator is supposed to harmonise the Azerbaijani legislative system with EU practices. It will assist in designing tariffs and market structure through transparent mechanisms and competition, develop unbundling strategy, provide modernisation of system operators (TSO and DSO) and also trainings and capacity building of staff.

However, as a whole the energy sector of Azerbaijan is still fully owned and operated by the government and remains a vertically integrated monopoly. The electricity market represents an incomplete model with one producer and one buyer-seller of electricity,

where wholesale and retail prices are set by the government (Tariff Council). A number of strategic road maps for the development of various segments of the energy sector, as well as a package of special measures aimed at achieving those goals by the established deadlines over the next fifteen years, have been adopted recently.

For example, the Action Plan for 2011-2015 envisaged privatization of enterprises in natural gas and electricity sectors, however there has not been any noticeable activity in this area so far, with the exception of privatization of several small hydropower plants.

The development of an institutional infrastructure in the field of energy efficiency in Azerbaijan is at a very early stage. It is important to improve the structure of the fuel and energy complex to attract more private sector investments needed for modernization of equipment, application of energy efficient technologies and setting up of a market-oriented management system. Currently, there is no strategy, action plan or legislation in the field of energy efficiency. The absence of the dedicated law on energy efficiency (the draft law is still being discussed) resulted in a situation where there is no clear and sound institutional framework in place, which would describe in detail the respective mandates and duties of the state organizations.

Belarus

The state policy and regulation of the energy sector of Belarus is determined by the President. He adopts decrees, directives and other legal acts and signs laws in the energy field. The Council of Ministers adopts strategies for the development of the energy sector, state programmes, ensures implementation of the unified state policies, takes measures and adopts resolutions. It regulates the end-user electricity prices for households.

The Ministry of Energy is responsible for the fuel and energy sector of Belarus. It manages the vertically integrated state-owned natural gas supplier, BelTopGaz, and the vertically integrated state-owned electricity producer, supplier and retailer BelEnergo. The Ministry of Anti-Monopoly Regulation and Trade (MART) is responsible for the regulation of electricity and heat tariffs for industrial customers, independent suppliers and all categories other than residential. The residential energy tariffs are regulated by the Council of Ministers.

The Energy Efficiency Department of the State Standardization Committee is responsible for the development and implementation of national energy efficiency and renewable energy policies. It also monitors and ensures state control over rational use of fuel, electricity and heat.

The National Statistical Committee is responsible for administering the laws on national data services. It collects, processes and publishes national statistics, including energy data. The Statistical Committee is responsible for preparation of energy balances, which it does in close co-operation with the Ministry of Energy and energy enterprises. Local councils, executive authorities and administrative bodies implement state energy policy.

Today the fuel and energy complex of Belarus is a vertically integrated monopoly which is run by the state-owned enterprises in respective energy sectors. It operates in accordance with policies that are elaborated by the Eurasian Economic Union (EAEU) which the country joined in 2014. Although the energy sector governance, legal and policy framework prevailing in the EAEU does not fully comply with the EU *acquis communautaire,* there are many areas where they come together very close. For example, regarding privatisation of the electricity market, unlike transmission and distribution networks which are required to be entirely owned by the state, the foreign investors may build, own and operate new power plants. The state guarantees connection of independent power producers to the state electricity networks as well as purchase of their output. In recent years, the number of independent electricity producers (mini-CHP and small and mini-HPPs) has been increasing, but still represents a negligible share of total electricity supply.

Although the EAEU rules do not explicitly prescribe the unbundling and separation of supply, transmission and distribution activities in the electricity sector, the member-countries are committed to restructure the national vertically integrated companies in order to depict competitive and monopolistic activities. Following the obligations undertaken within the Eurasian Economic Union, Belarus is committed to establish a wholesale electricity market by mid-2019.

The accelerated development of the economy of Belarus would require implementing effective reform measures in its energy sectors. It is beneficial that energy governance of Belarus, which follows the concept of the Eurasian Economic Union is on many occasions compatible with the EU *acquis communautaire.*

Georgia

At the beginning of 2018 the Government of Georgia merged the former Ministry of Energy into the Ministry of Economy and Sustainable Development (MoESD), which became a principal governmental body responsible for elaboration and implementation of the energy policy and for facilitating investment projects. Once developed by the Ministry the national energy policies are then submitted for approval by the Parliament. As well the MoESD is responsible for developing and implementing short-, medium- and long-term strategies and priorities for the power sector of the country and for approval of electricity and natural gas balances, as well as market rules in both sectors.

Over the last 10-15 years Georgia has made significant progress in reforming its energy sector. Regulatory and market reforms, focused on deregulation and privatization, have helped improve service quality in the energy sector and the financial viability of most sector organizations. Reforms include the establishment of the independent energy sector regulator, the Georgian National Energy and Water Supply Regulatory Commission (GNERC), and the unbundling and privatization of power generation and distribution assets.

In July 2017 Georgia joined the Energy Community Treaty as a Contracting Party and therefore is obliged to bring its legislation and policies in compliance with *acquis*

communautaire, including those related to Energy Efficiency. The governmental bodies in charge of drafting, implementing and monitoring compliance with EE related legislation and policies are the Ministry of Economy and Sustainable Development and the Ministry of Environment and Natural Resources.

Under the Association Agreement signed with the European Union (June 2014), 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. The first National Energy Efficiency Action Plan (NEEAP) of Georgia which specifies primary policy measures and includes indicative national energy efficiency targets for 2020, 2025, and 2030 was recently drafted and awaits its approval after governmental consultations.

However, apart from the draft NEEAP Georgia has not yet put in place any particular energy efficiency legislative framework. EE is not well integrated into the broader policy framework of economic development. The institutional structure needs further refinement with potential designation of dedicated autonomous public bodies responsible for enhancing investments in application of advanced EE and RES technologies.

Kazakhstan

The Government of Kazakhstan is the highest state body which is responsible for the performance of energy sector. The Ministry of Energy is the central executive body which elaborates and implements national policies and supervises activities in the areas of oil and gas, petrochemical industry, transportation of hydrocarbons, electric-power industry, coal and nuclear energy, and also renewable energies, protection of environment and natural resources. The Unified Power System (UPS) of Kazakhstan is a combination of power plants, transmission lines and substations, providing reliable and quality power supply to consumers in the country.

Following independence in 1991, Kazakhstan's power sector has undergone a massive transformation, improving substantially with market liberalization and sector regulation. Privatisation and restructuring in the energy sector started in 1997 following a governmental Decree aiming at establishing a liberalized multimarket model. Successful market reforms, improved supply-demand balance and service quality made Kazakhstan a market reform leader among the former Soviet Union countries. The wholesale electricity market was liberalized and operated mainly on the basis of bilateral contracts between generators and large consumers and regional electricity distribution companies for direct sale of power. The government of Kazakhstan established the legislative, technical, and organizational infrastructure for a functioning electricity spot market.

Despite this progress, however, many sector reforms remain unfinished. The excess capacity inherited from the Soviet system masked the need to think long-term about energy generation, while the "energy only" market prices were too low to attract serious investors. In the mid-2000s it became clear that the existing and planned capacity

additions might be insufficient to keep up with continuing strong increases in the demand for power.

The country's power sector faces several challenges today, aggravated by falling world commodity prices and the consequent reduction of industrial production and power demand. Among the most important challenges are high energy intensity and generation capacity tightness, discouraging investment requirements, ineffective regulation and sector reform backtracking. Kazakhstan's government can address the current insufficient investor interest in the sector by improving the investment climate through the establishment of a stable, transparent, and predictable legal and regulatory framework.

Kyrgyzstan

State control in the power sector is exercised by the Government of the Kyrgyz Republic. The power sector Development Strategy 2012-2015 and the Action Plan for Reforming the Energy Sector 2013-2014 outlined the major reforms in the sector. The Development Strategy sets out directions for strengthening the governance, transparency and accountability of the energy sector and its constituent companies. The Action Plan defines the steps the government is taking to implement the strategy and also includes amendments of the Energy Law defining the functions of policy making, economic regulation, and anti-monopoly monitoring. As a result of these reforms the following changes occurred in the institutional framework of the Kyrgyz Republic.

In November of 2015, the Ministry of Energy and Industry, which was responsible for the formulation of policy and development strategies for the fuel and energy complex, was dissolved. Its functions were transferred to the Ministry of Economy (MoE). In summer 2016, the State Committee on Industry, Energy and Subsoil Use was established, which took over responsibility for the development and implementation of the state policies in the industrial, fuel and energy and subsoil sectors.

The State Agency for Regulation of Fuel and Energy Complex was established in November 2014 and put in charge of the economic regulation of the energy sector. The Regulator is responsible for the licensing of activities in the energy sector; development of tariff methodologies and setting tariffs for electricity, heating and natural gas; development and supervision of the performance reporting and monitoring framework for energy sector companies; conducting awareness-raising activities and development of procedures for consumer and sector company complaints and claims.

In August 2016 the state-owned shares of the energy companies were transferred to the National Energy Holding Company (NEHC). Its key function is to serve on the Boards of Directors of the subsidiary companies, holding the position of Chair as well as the majority of Board seats which will help to unify policies and objectives across the sector. The Boards will also approve strategies, set targets and performance indicators, and monitor progress. NEHC will take on the responsibility of internal audits (which was previously held by each subsidiary company).

The JSC Kyrgyz Electricity Settlement Center (KESC) was established in August 2015 with a view to improve transparency of the country's power and associated revenue flows. KESC is an independent company providing services using a centralized information and analytical system for collecting, processing, validating, analyzing data on electricity flows and losses, compiling electricity balances, performing calculations for all participants in the electricity market on the monitoring of mutual settlements among participants of the electricity market.

The reforms in the energy sector were only the first steps aimed at improving the performance of the energy industry and much needs to be done in the nearest future. National Strategy for Sustainable Development for 2013–2017 and the Power Sector Strategy aim at securing reliable and affordable supply of energy to Kyrgyz consumers. Improvement of the system performance should be achieved through the rehabilitation of existing or building of new assets in generation, transmission, and distribution. To improve financial performance, quality of supply and to reduce commercial losses new business models and management reforms should be introduced. Under the tariff reform a medium-term tariff plan that reflects the cost recovery level while protecting poor and vulnerable customers should be developed.

4.2 Regulatory framework

Azerbaijan

Azerbaijan started to develop new legislation governing the energy sector in the mid-ninetieths of the last century. The Parliament adopted a series of laws including Law on Electric Energy (1998), Law on Gas Supply (1998), Law on Electrical Power and Heat Stations (1999). The two most important legislative acts in the energy field were the Law on Use of Energy Resources (1996) and the Law on Energy (1998).

Law on the Use of Energy Resources represents a set of guiding principles governing the state policy on the use of energy resources, including implementation of financial and administrative regulatory measures aimed at reducing energy consumption; establishment of mechanisms to improve EE in energy production, transmission, supply and use; adoption of energy savings' and EE norms and standards; conduct of mandatory energy audits for new and rehabilitated buildings; use of economic sanctions in the event of any breach of obligations; raising of public awareness on the benefits of energy savings; providing education and training in energy conservation matters; promotion of international cooperation in the field of energy savings; and introduction of incentives for the application of new energy saving technologies. The Law also calls on the setting up of a non-governmental EE Fund for financing research and development to promote new EE technologies and assisting EE programmes implementation.

The Law on Energy (1998) stipulates that one of the principal state policies relating to the functioning of the national energy market involves the efficient exploration, production, transport, distribution, storage, and use of energy, as well as the conservation of energy resources and the efficient use of energy, including RES.

In support of the legislation the government of Azerbaijan has developed a series of strategic documents, programmes and roadmaps which set the development goals for various segments of the energy sector and include a package of special measures aimed at achieving these goals. For example, the overall aim of the State Programme for the Development of Fuel and Energy Sector for 2005-2015 was to provide a growing demand of population and the economy for electricity, gas and other energy sources through the continuous development of the fuel and energy complex - and this goal was achieved on time.

The Strategic Road Map on the development of the municipal sector in Azerbaijan has developed a series of measures to improve energy efficiency in the energy sector. It includes reduction of losses in electric power and gas distribution networks; building of new efficient generating capacities and transmission grids; use of differentiated tariffs for electricity and elimination of subsidies; wider application of market principals, including unbundling of the electricity market and its opening to foreign investors.

However, the regulatory framework regulating the energy sector of Azerbaijan is not complete, sometimes obsolete, and requires further development. Despite that the current legislation sets out a general system for promoting energy conservation and energy efficiency, and obligations with regards to energy efficiency are mentioned in various documents, so far there is no specific strategy, action plan or legislation in the field of energy efficiency. A draft Law on Energy Efficiency that was developed with the assistance of EU has not yet been incorporated into national legal order. It is important to improve the sector structure to attract more private sector investments needed for modernization of equipment, application of energy efficient technologies and setting up of a market-oriented management system.

Moreover, the lack of well-elaborated secondary legislation on EE projects compromises proper implementation of the existing legislation and the government did not prepare yet a consolidated National EE Action Plan. The steps aimed at further improvement of regulatory and policy framework should also include introducing a sound system of accounting energy consumption for assessing needs in EE improvements, and a sound verification and reporting system for monitoring progress in implementation of the planned EE policies. This could significantly improve the current investment climate and bring private capital for enhanced development and application of modern EE technologies and foster the uptake of renewable energy by the country’s economy.

Assuring access to modern energy services to the population is a crucial step to improve human wellbeing and stimulate economic and social development. The International Energy Agency (IEA) identifies the lack of access to modern energy services as one of the main obstacles to overcome in order to achieve the UN Millennium Development Goals.

With regards to assessment of Azerbaijan`s progress in attaining the SEforALL objectives, in particular access to energy services, there was no sufficient data available

in the national case study report. According to national statistical data 100% of the population have access to electricity (the percentage of population with access to electricity). To ensure the unified and fair comparison of data on the electricity access by population in the five countries the data was used from one source – the Index Mundi, 2014 (World Bank, SE4ALL Global Tracking Framework). According to this source 100% of population have access to electricity. However, given the geographical landscape of the country it can be assumed that in some remote and sparsely populated areas there are still small villages without direct access to centralized networks and where the off-grid heat and electricity supply, in particular from renewable energy sources, is in demand.

Azerbaijan has made good progress in modernization and rehabilitation of energy sector assets. To a large extent it was possible due to significant and stable hard currency flows coming to the country from oil and gas exports. However, according to national and international assessments much of equipment and infrastructure still needs to be replaced and upgraded in the fuel and energy complex, including application of new energy efficient equipment and technologies. One of the indicators which reflects the state of technological progress and the state (age) of equipment in the country is energy intensity. It is an indication of how much energy is used to produce one unit of economic output.

Again, for the sake of fair comparison one source of data was used, this time from the "Shift Project. Data Portal. Browse Energy and Climate", 2015 (www.tsp-data-portal.org). In this case the energy intensity level of GDP is represented as a ratio of the Total Primary Energy Consumption (TPEC) over GDP measured at constant 2005 prices (Mtoe per trillion 2005 USD).

Over the period of twenty years, from 1995 to 2014 Azerbaijan demonstrated significant (over six-fold) decrease in the energy intensity of the economy from 319 to 47 (Mtoe per trillion 2005 USD) in 2014. Although this figure places him second among the less energy intensive countries of the analysis, it was three times higher than the average index of energy intensity for the EU27 member states.

Belarus

The President of the Republic of Belarus determines the state policy and carries out state regulation in the energy sector. The President adopts decrees, directives and other legal acts as well as signs laws in the energy field. The Council of Ministers of the Republic of Belarus defines policy framework in the energy sector – it adopts strategies for the development, state programmes, ensures implementation of the unified state policies, takes measures and adopts resolutions, develops and implements (through the Ministry of Energy) various normative legal and other legislative acts.

In May 2014 the President of Belarus signed (together with presidents of Kazakhstan and the Russian Federation) the Treaty on the Eurasian Economic Union (EAEUT) which also governs the legal, institutional, organisational and technical issues related to the creation of common energy (electricity, gas and oil) markets and Belarus became a

member of the Eurasian Economic Union (EAEU). According to the Treaty the common electricity market of the EAEU is to be finalized by mid-2019, while the concepts for oil and gas are to be implemented in stages by 2024 and 2025 respectively.

Today in the *electricity sector* there is no specific electricity law or electricity market law in place. The legislative framework consists of numerous acts adopted by the President of Belarus and resolutions of the Council of Ministers, normative legal acts of the Ministry of Energy as well as several other legislative acts.

However, following the obligations of Belarus under the EAEUT the Government currently works on a draft Electricity Market Law in order to provide a legal basis for restructuring the electricity sector and defining competitive and non-competitive electricity activities and their separation. The future Law is supposed to improve the control and governance of the electricity sector, including streamlining the relations between governmental bodies and other sector players and development of the wholesale and retail electricity markets. The new electricity market law shall primarily aim at harmonising its national legislation with the EAEU requirements. According to the EAEU Concept, the rights and responsibilities of electricity market participants shall be established by national legislation in addition to the acts of the EAEU.

The *gas sector* of Belarus is governed by the Law on Gas Supply (2003). It regulates supplier/consumer relations along the gas chain, including residential consumers, as well as the design, construction, repair and maintenance, operation of transportation, distribution and gas supply facilities. The Law defines the state organs that on behalf of Belarus provide supply of gas to final consumers, the scope of state regulation and institutions in charge. It includes articles on organizational aspects and maintenance, industrial, ecological and other security issues and defines the responsibilities of the parties involved.

From the legal point of view gas transportation and gas distribution networks represent a natural monopoly and are therefore governed in accordance with the Law on Natural Monopolies (2002), which defines rights and obligations of natural monopolies and specifies the scope of state regulation of their activities and related issues.

As the existing gas market in Belarus is dominated by the monopolies at both wholesale and retail level the market lacks any competition, and results in a situation where gas customers cannot choose their supplier.

The *renewable energy* sector is regulated by the Law on Renewable Energy Sources (2010). It stimulates wider use of RES and encourages industry for manufacturing of equipment for the production of energy from renewable sources. The Law provides governmental support for RE development and guarantees connection to the state electricity grids in a non-discriminatory manner.

The Law contains policy mechanisms and economic measures providing state support for enhanced RES use, such as pricing policy; tax concessions and customs duties exemptions for modern efficient technologies and equipment; creating favourable

conditions for investors, promotion of efficient technologies and renewable energy installations.

The government also develops nation-wide policy programmes and strategies encouraging the uptake of renewable energy. The Energy Saving Programme for 2016-2020 sets the overall target and defines financial sources for carrying out the planned measures. It lists eventual risks and barriers to implementation of the programme (financial risk, change of tariffs for fuels, climate change), identifies monitoring and evaluation measures such as annual reporting on the progress and the indicators for measuring. The Programme gives priority to the expansion of production and use of biomass, improvement of infrastructure, increase of efficiency and boost of production of electrical and thermal energy by using hydro, wind and solar energy resources. The document also refers to increasing the consumption of biodiesel in the transport sector, which is similar to the binding objectives of the EAEU and Energy Community to ensure that 10% of transport fuels come from renewable sources by 2020.

Overall, Belarus follows the pace of improvements in national legislation which would allow the country to meet the SEforALL objectives. However, with regards to investment climate the current regulatory framework is not strong enough to provide required level of attractiveness for foreign and domestic investors. There is no law specifically governing the electricity sector and the state tariff policies are still based on a complex system of cross-subsidies.

Although the existing Law on RES provides some important instruments to heat-up the investors` interest (feed-in tariffs, green certificates, cadaster and other arrangements), the current policy framework still lacks clear targets for RES development and it does not have binding goals. There is no specific government fund dedicated to providing financial incentives to the energy efficiency programmes or energy service companies (ESCOs) which would significantly improve attractiveness of the market for producers and investors in energy efficient technologies. To create enabling environment for investors to EE and RES projects, a standardized approach to energy efficiency indicators as well as on renewable energy is needed.

As one of the former Soviet Republics Belarus inherited an energy intensive economy. However, economic reforms, restructuring, rehabilitation and modernization of assets in all sectors of the economy enabled significant reduction of its energy intensity. Over almost two decades between 1995 and 2014, energy intensity of Belarus decreased from 140 to 57 Mtoe per trillion 2005 USD. However, this figure is still almost four times higher than the average index of the energy intensity for the EU27 member states which in 2014 was 15.2. The Energy Saving Programme sets the goal to reduce energy intensity of GDP by at least 2% by 2021 compared with 2015.

According to the Index Mundi, 2014 (World Bank, SE4ALL Global Tracking Network), 100% of Belarus population have access to electricity.

Georgia

Georgia has a liberalized regulatory framework governing the energy sector operations. However, it is the only country of the region which has not yet adopted dedicated energy efficiency and renewable energy laws.

The principal legislative document related to energy is the Law on Electricity and Natural Gas (2006). Other relevant legal acts are laws on Environmental Protection (1996) and on Energy Performance in Buildings (2018).

In addition to national laws the Government has elaborated and adopted a number of development strategies, sector development plans and other regulatory documents. Ten-year network development plan of Georgia for 2018-2028 (TYNDP) considers the ways of solving the existing problems and challenges, including RES integration into the network and rehabilitation and development of the national transmission system infrastructure.

Socio-Economic Development Strategy of Georgia till 2020 is focusing on rational use of natural resources, ensuring environmental safety and sustainability and avoiding natural disasters during the process of economic development. Main Directions of the State Energy Policy of Georgia (Rev. 2015) aims to develop a long-term comprehensive state vision and strategies for short-, medium-, and long-term energy sector development till 2030, with a special emphasis on the RES use.

National Energy Efficiency Action Plan (NEEAP) of Georgia is being finalized. It has been elaborated in accordance with the provisions of the EU Energy Efficiency Directive and specifies major policy measures and indicative national energy efficiency targets for 2020, 2025, and 2030.

After joining the Energy Community Treaty in 2017 Georgia has assumed an obligation to comply with the EU Directive on the promotion of the use of energy from renewable sources (2009/28/EC) and on energy efficiency (2012/27/EU) and reflect the latter in the national legislation. However, apart from the draft NEEAP Georgia has not put in place any particular energy efficiency legislative framework, although in a number of existing laws and other legislative acts there are references calling for the EE improvements in the country`s economy. The references, however, do not specify the national EE policy objectives and instruments, and are of a very general nature.

Likewise there is no dedicated law on renewable energy sources and only short and limited definition of RES is mentioned in the Law on Electricity and Natural Gas. All types of energy sources are treated similarly in the current legislation, there are no specific provisions or definitions for different RES, nor sustainability criteria or financial support schemes as it is required by the EU Directive.

In the electricity sector the transmission system operator unbundling and certification requirements of the *acquis* have not been transposed yet. Electricity distribution and supply activities in Georgia are not separated. The retail customers are supplied by the

electricity distribution companies and are not eligible to switch suppliers, except when purchasing electricity directly from small power plants (up to 13 MW).

Hence, it is crucial that the government fosters the preparation of the primary energy efficiency and RES legislation in order to comply with obligations of the Energy Community Treaty and the EU Association Agreement. It should finalize and adopt the Law on Energy Efficiency and NEEAP and complement them with the adoption of appropriate secondary legislation, which would enable further elaboration of legal, regulatory and financial mechanisms to improve the investment climate. The institutional structure needs further refinement with potential designation of dedicated autonomous public bodies responsible for enhancing investments in application of advanced EE and RES technologies.

As the share of electricity generated by hydropower is around 80%, Georgia cannot double the rate of RES improvements as one of the SEforALL objectives calls for. However, there is a potential of further development of wind and solar generation. Moreover, the government is committed to the development of county`s renewable energy resources to enhance its energy security and sustainability. There is little domestic expertise in wind, solar and biomass, therefore foreign knowledge and expertise is needed along with significant investments in the development, production and application of EE and RES technologies. Georgia has yet to develop a special law dedicated to renewables in order to overcome the existing barriers to foreign investment and development.

According to the Index Mundi, 2014, 100% of Georgian households had access to electricity. However, according to the former Ministry of Energy of Georgia there were still villages in the high mountainous and remote areas which had no direct connection to the centralized grid. Renewables could provide interesting off-grid opportunities, for example solar energy generation seems especially promising in the Georgian case.

Although energy intensity of the Georgian economy in 1995 was not too high as compared to other countries of analysis (76 Mtoe per trillion 2005US$), the government continued to decrease it and brought it down to 33 in 2014, thus placing the country on the first rank among the less energy intensive countries of the project. Nonetheless, this is still about two times higher than the average index for the EU27 member states (15.2).

Kazakhstan

In recent years Kazakhstan has significantly increased emphasis on energy efficiency, energy saving and wider use of renewable energy sources. The government has put in place a legal framework and works further on developing and introducing appropriate secondary legislation, technical regulations and other legislative acts, including capacity building and awareness raising activities.

In 2012 the Parliament adopted two laws: Law on Energy Saving and Improving Energy Efficiency and Law on Introducing Amendments and Addenda into Some Legislative Acts of the Republic of Kazakhstan on Saving Energy and Improving Energy

Efficiency. These two laws included more than 22 normative acts, rules and EE policy mechanisms that were gradually introduced and implemented.

One of the mechanisms resulting from this policy was setting up of the State Energy Register (SER) listing consumers exceeding annual energy consumption of 1,050 toe. All entities listed in the SER must introduce and implement the Energy Management System and those which do not belong to the state are also subject to a compulsory energy audit every five years.

According to the Law on Energy Saving and Improving Energy Efficiency all project documentation on the construction of new and rehabilitation of existing buildings (exceeding 350 toe annual consumption) is subject to a compulsory expertise performed by an independent developer organization. The project document should contain a section on energy saving and energy efficiency, indicating EE class, data on energy saving technologies and heat insulation (energy passport). In the course of implementation of the legislation in the sphere of energy saving and improving energy efficiency amendments were introduced into the Code of the Republic of Kazakhstan on administrative offences providing for levying penalties for non-observance of the legislation requirements.

Significant progress the country has made in increasing the share of renewable energy in the energy mix. Following the adoption of the Electric Power Sector Law and the Law on Supporting Renewable Energy Sources (RES Law), the government set up a Financial Settlement Centre (FSC) which, as a single buyer, performs procurement of all generated renewable power at feed-in tariffs. This out-of-market treatment of RES that grants it financial, dispatch, and operational privileges provides high level of investment stability for developers in renewable generation.

Following a proposal of the President of Kazakhstan (June 2017) the Government developed and introduced a system of auctions for the purchasing of electricity generated by renewable sources in order to enhance incentives already in place (feed-in tariffs, purchase guarantees) that support the growth of the industry. The electronic auction system is managed by a dedicated operator to select new renewable projects, define electricity prices based on the national renewable location plan.

The laws supporting the renewable energy sources and the measurable targets are an example of the best practices, which tripled renewable generation over five years. The transition to market arrangements, such as auctions, have reduced renewable electricity price and fostered further development of these sources in accordance with the established targets.

Although Kazakhstan’s economy has been progressively developing following national priorities to achieve the set targets, which coincide with the Sustainable Development Goals, there are still problems and barriers to be solved. The government clearly identified problems, including those that are directly related to sustainable development, i.e. shortage of generation capacity to cover the growing demand for fuel and energy, low level of energy efficiency and low environmental performance of technologies.

This calls for modernization and construction of new facilities for oil refining, electricity and heat generation and transmission; development of competition in the domestic fuel and energy markets; introduction of modern technologies to improve energy efficiency and reduce negative impact on the environment, and further uptake of alternative energy sources.

Other challenges that the power sector is facing today are high energy intensity and generation capacity tightness, ineffective regulation and sector reform backtracking. Kazakhstan's government can address the current insufficient investor interest in the sector by improving the investment climate through the establishment of a stable, transparent, and predictable legal and regulatory framework.

Although Kazakhstan has made good progress on the way to meet the SEforALL objectives, many essential elements are still missing. While country considers that 99% of its population have access to modern energy services, there are still problems of access to the centralized power systems in some rural areas. Some villages in remote areas are not connected to the grid because of poor state of transmission lines and other power equipment which is obsolete and highly deteriorated. The problem of restoring secure energy supply to the remote and sparsely populated areas could be resolved by introducing renewable energy sources (wind, solar, hydro) but this has not happened yet.

Kazakhstan's economy is highly energy-intensive. According to the "Shift Project. Data Portal. Browse Energy and Climate" the energy intensity level of Kazakhstan decreased from 141 Mtoe/trillion 2005 USD in 1995 to 67 Mtoe/trillion 2005 USD in 2014. This makes it second most energy intensive project country. With coal dominating its energy sector, Kazakhstan is also the largest emitter of greenhouse gases (GHGs) in Central Asia and its GHG emissions per capita are among the highest in the world. Upgrade of the country's aging infrastructure and introduction of renewable and modern energy efficiency technologies are amongst the immediate priorities on the list.

Kyrgyzstan

The legal framework regulating activities and operation of the energy sector of the Kyrgyz Republic consists of a series of dedicated laws and legal acts. The first Law on Energy adopted in 1996 contained basic principles of the regulation of economic activities in the fuel and energy complex with a view to enhance its efficiency and reliability and also to protect the interests of producers and consumers of energy. According to the law due attention should be given to energy efficiency and energy conservation measures when preparing national policy and development programmes.

Regulatory framework got further development with adoption of laws of the Kyrgyz Republic "On Electric Power Industry" (1997), "On Oil and Gas" (1998), "On Coal" (1999), "On Energy Saving" (1998), "On Renewable Energy Sources" (2008), "On Energy Efficiency in Buildings" (2012) and other relevant by-laws regulating the activities of the sector.

The 1998 Law on Energy Saving had a direct focus on the increase of energy efficiency along the whole chain starting from production, transmission, distribution and use of energy by final consumers. It also contained concrete provisions for setting up an efficient institutional and regulatory EE framework. For example, the law envisaged the creation of the Energy Conservation Fund which was supposed to be financed from the savings resulting from the introduction of energy efficiency measures and mechanisms. However, the fund has never been created and some other similar provisions have never been enforced or adopted in the form of by-laws or other secondary legislation.

From the time the Law on Energy Saving was adopted (1998) until today there were little improvements in energy efficiency in the country. It could be mainly explained by the gap between the provisions of the law and the enforcement of the secondary legislation for its implementation. The legislative framework is not supported by the adequate institutional structure and, therefore there is no clear understanding of the distribution of responsibilities, strategies and incentives for the implementation of the energy efficiency measures in the country.

One of the most recent laws related to EE came into force in 2012 – the Law on Energy Efficiency in Buildings. It follows the EU best experience, specifically the EU Building Directive. The law defines the overall legal framework including the definition of legal responsibilities and the instruments to foster energy efficiency in buildings. The secondary legislation provides detailed procedures for implementation and introduces necessary EE requirements and methodologies, however the pace of implementation of provisions of the law in practice is still very slow.

There are two major programmes related to energy efficiency and approved by the government of Kyrgyzstan – Programme on Energy Conservation and Energy Efficiency Policy for 2015-2017; and the Programme on Transition of the Kyrgyz Republic to Sustainable Development for 2013-2017. The first one establishes a short-term EE target to ensure the GDP growth of the country without a significant increase in energy consumption by 2017. The second one aims at achieving energy security for the country and develop export potential.

Energy Service Companies (ESCOs) do not exist in Kyrgyzstan as there are no specific provisions for ESCOs in the current legislative framework. There are also no incentives for governmental and municipal authorities to reduce their energy consumption, as the state and local budget allowances cover energy bills based on the actual energy consumption. The budgetary policy of Kyrgyzstan does not allow state and local authorities to use achieved energy savings for the repayment of investments in energy efficiency measures.

Old and poorly maintained assets in the energy sector which often operate beyond economic life is one of the reasons Kyrgyzstan has the highest energy-intensive economy among the five countries under review. Most of power generation assets and transmission lines were designed and built in the 1970s and not much has been rehabilitated so far. Although the governmental policies and measures have resulted in

a decrease of energy intensity from 160 to 97 Mtoe/trillion 2005 USD in the period 1995-2014, Kyrgyzstan remains the most energy intensive of the five project countries. With regards to the objective of SE4forLL to achieve universal access of population to modern energy services, Kyrgyzstan reports 100% access of households to electricity, however there are still challenges for the population, especially in remote and mountainous areas, which have no connection to the centralized power services. In this case wider use of renewable energy sources could be the best solution, both from the point of view of reliable access to energy services and from environmental prospective. Currently solar installations and mini hydro installations are the most popular solutions for the consumers in remote areas of Kyrgyzstan

The abovementioned obsolete assets are also the reason for the poor reliability of supply (measured by frequency and duration of outages) and quality of service (instability in voltage and frequency harmful to equipment) in the residential buildings and public facilities in the regions and areas with centralized power supply networks. Emergency shutdowns of transmission and distribution facilities also occur regularly to avoid overloading of the aging key equipment. This is unlikely to be changed without substantial investments.

However, due to low electricity tariffs which are below production level cost (because of affordability and social considerations), the revenues from consumers are not sufficient to cover all costs, and the companies are unable to invest in new capital or undertake regular maintenance and replacement of equipment. Insufficient cost recovery and cross-subsidization between different types of fuels and different groups of consumers are among the primary explanatory factors that keep a private investor away from the country`s energy sector.

Therefore, without rehabilitation and restructuring of the power sector and profound reform of inefficient and poorly implemented tariff policy private investors will not have sufficient appetite to provide badly needed capital streams to energy efficiency and renewable energy projects in Kyrgyzstan.

4.3 Progress ranking

The analysis of the case studies showed that all five countries of the project consider objectives of the Sustainable Development Goals when developing their national strategies and programmes for economic development. However, the progress made on the way to achieving the SEforALL objectives differs from country to country.

The review demonstrated that not a single country out of five has to date a required level of institutional, policy and regulatory infrastructure necessary to achieve the SEforALL objectives within a set timeframe. Consequently, no country has developed an attractive investment climate for foreign and domestic businesses to employ advanced energy efficiency and renewable energy technologies. In some countries, lack of relevant information and data on access to modern energy services, energy efficiency and renewable energy hindered accurate assessment.

Tables 1 and 2 outline a comparative level of progress in selected areas of reforms of the power and energy sectors of the five countries. The colour of the flags reflects the pace of the progress. The green colour does not mean that a country has reached a required level of reform or objective, but it demonstrates that a country has an advanced level of progress compared to other countries marked with yellow or red colours. Therefore, the yellow colour corresponds to a medium level of progress and the red colour to the low level of progress in achieving the reforms goals or attaining objectives.

Azerbaijan, Belarus, Georgia and Kazakhstan have made significant progress in introducing structural reforms in their energy sectors, but more efforts are needed to build a sound institutional framework. Kyrgyzstan demonstrated moderate progress and reforms in the energy sector were only the first steps aimed at improving the performance of the energy industry and much needs to be done in the near future.

All countries have significantly improved their regulatory frameworks by introducing legislation and undertaking policies aimed at improving their investment climate for wider application of energy efficiency and renewable energy technologies to move closer to the SEforALL objectives. While Kazakhstan looks more advanced and has higher level of progress, a solid current policy framework of Belarus still requires further development. Georgia is the only country in the region which has not adopted EE and RE laws, but substantial improvements are expected shortly. Both Azerbaijan and Kyrgyzstan still need to improve their legal basis to secure investments into energy efficiency and renewable energy projects.

None of the countries has a perfect investment climate to foster further modernization and development of their energy sector and application of new EE and RES technologies. To a large extent the attractiveness of the investment climate is characterized by the state of institutional and regulatory frameworks in place. All countries demonstrated medium level of progress in creating and improving their investment climate, however Azerbaijan, Georgia and Kyrgyzstan still have more to do on this way.

Energy intensity, which indicates how much energy a country spends to produce one unit of economic output, could also be regarded a factor reflecting the progress in energy efficiency deployment, and consequently progress on the way to meet the SEforALL objectives. In this regards Georgia has an advanced level of progress with the energy intensity[1] level in 2014 of 33 Mtoe per trillion 2005 USD of GDP, followed by Azerbaijan (47), Belarus (57) and Kazakhstan (67). Kyrgyzstan has the most energy intensive economy - 97 Mtoe per trillion 2005 USD.

[1] Energy intensity is measured as Total Primary Energy Consumption (in Mtoe) divided by GDP (in trillion 2005 USD in constant prices). Source: "Shift Project, Data Portal, Browse Energy & Climate Data". www.tsp-data-portal.org).

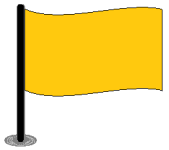
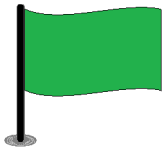
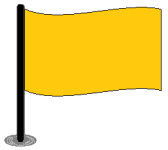
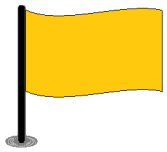
COUNTRY / SECTOR REFORMS	AZERBAIJAN	BELARUS	GEORGIA	KAZAKHSTAN	KYRGYZSTAN
INSTITUTIONAL FRAMEWORK					
REGULATORY FRAMEWORK					
INVESTMENT CLIMATE					
ENERGY INTENSITY, 2014* (Mtoe per trillion US$2005)					

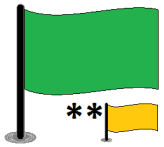
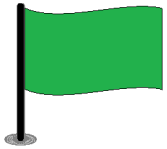
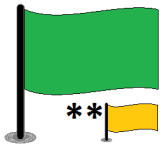
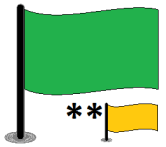
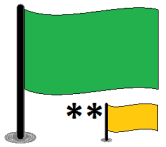
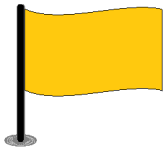
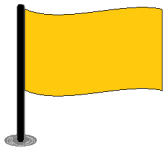
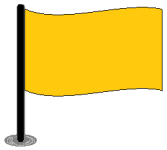
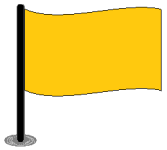
Table 1. PROGRESS IN REFORMS OF THE ENERGY SECTOR, by country

(* Source: "Shift Project, Data Portal, Browse Energy & Climate Data". www.tsp-data-portal.org). EU27 average = 15

Assuring access to modern energy services to the population is a crucial step to improve human wellbeing and stimulate economic and social development. According to the Index Mundi, 2014, 100% of population in all five analysis countries have access to electricity, which is also confirmed by official national statistical data. However, due to geographical landscape and presence of mountains in Azerbaijan, Georgia, Kazakhstan and Kyrgyzstan there are remote areas where direct connection to a centralized grid is not always feasible. In these cases, the off-grid mechanisms of power/electricity supply is a solution, less reliable than direct electricity supply however, therefore small yellow flags are added to these countries. Apart of reliability of power supply the quality of service (fluctuations in voltage, frequency, or harmonics that can damage equipment) is of utmost importance. There are cases in Kyrgyzstan where obsolete equipment and inadequate maintenance often lead to emergency shutdowns of transmission and distribution facilities, which impairs the quality of service (marked in red colour). Doubling the rate of energy efficiency improvement is a uniform challenge for all five countries therefore they got yellow flags in Table 2.

However, Belarus and Kazakhstan moved faster in application of modern equipment and energy efficient technologies in the energy sector and their comparative advantage is marked with a green stripe. The red colour in case of Kyrgyzstan reflects important challenges and amount of work the country faces, and the current low level of progress in upgrading its power and energy sector assets and improving efficiency of operation.

Development of renewable energy sources is listed in programme documents, national strategies and sometimes in the legislative acts of the countries of analysis. Azerbaijan, Belarus and Kazakhstan have a high share of fossil fuel-based generation in their energy mix, therefore they consider renewable energy sources as a means to reducing the fuel dependence. It is more difficult to do for Azerbaijan and Kazakhstan as countries rich in oil and gas resources, than for Belarus which is a net importer of expensive fossil fuels and, therefore is more incentivised on a wider uptake of RES and made comparatively higher level of progress. Both Georgia and Kyrgyzstan produce annually more than 80% of electricity from hydro power plants. Similar to the abundant fossil fuel resources in case of Azerbaijan and Kazakhstan, the huge hydropower potential of Georgia and Kyrgyzstan is a source of low-cost electricity, which does not stimulate investments in increasing the RES uptake for other alternative sources. Solar and wind power could potentially be large energy sources for Georgia and Kyrgyzstan, therefore yellow and red colours in the Table reflect the moderate level of progress both countries have made so far in investing in solar, wind and biomass renewable energy sources.

COUNTRY / SECTOR REFORMS	AZERBAIJAN	BELARUS	GEORGIA	KAZAKHSTAN	KYRGYZSTAN
ACCESS TO ELECTRICITY*					
IMPROVING ENERGY EFFICIENCY					
DOUBLING RES SHARE					

* source: Index Mundi : World Bank, SE4ALL Global Tracking Framework

**- For remote areas

***- For the RES other than Hydro

Table 2. Progress on the way to meet SEforALL objectives

5. ANALYSIS OF POSSIBLE SOLUTIONS AND RECOMMENDATIONS FOR APPLYING BEST PRACTICES

The analysis of the case studies demonstrated that all considered countries develop energy policies and practices which have many features in common; at the same time each country pursues its specific path considering a prevailing local context. In reforming their energy sectors countries pay particular attention to building and implementing enabling regulatory and institutional frameworks, issuing laws and regulations supported with secondary legislation and norms-setting mechanisms; designating the state and public authorities in charge of planning, executing and monitoring energy policies; developing strategic programmes and documents; promoting appropriate fiscal policies conducive to attracting foreign and domestic investments and others. However, the emphasis on various policy types and maturity of energy efficiency policies and programmes varies from country to country.

Some countries in designing their energy policy pay particular attention to a supply side and set their development targets along production chains in various segments of the fuel and energy complex, without putting them into an overall frame of the country's committed sustainable development goals, including the SEforALL objectives. For example, Azerbaijan has adopted strategic road maps for economic development of the energy sector and its subsectors, along with a package of special measures aimed at achieving those goals in accordance with the established deadlines over the next fifteen years. However, they have little interface with strategic development goals of Azerbaijan and therefore the current sector development policies should be reviewed and aligned with the principle strategic development documents.

Other countries, like Kazakhstan for example, elaborated energy sector development policies, which are aligned with general economic development goals set in strategic national programmes, for example "Strategy 2050", and aim to ensure balanced and sustainable development of the power industry to support economic growth, improve living standards and energy security in the country. Moreover, the Senate of the Parliament, noting that the UN Sustainable Development Goals (SDGs) and targets fully coincide with priorities and tasks of Kazakhstan, has adopted a Statement calling for a facilitated integration of the SDGs in the national legislation.

The main priority of energy policy and strategy in Belarus is providing a reliable and sustainable energy supply for the national economy, while reducing dependence on energy imports, energy intensity of economy and improving the financial stability of the sector. The government is looking at diversifying fuels for power generation sector, including more coal and renewables, but also nuclear power, however their development strategy is based and managed on the planned economy principals.

Another common feature is that most of considered countries (with the exception of Georgia) have already put in place a solid set of energy sector legislation, but the lack

of supporting by-laws, normative acts and other secondary legislation hinders its proper implementation. In addition, when revising the existing legislation governments do not always introduce amendments in related legal acts, which creates confusion and sets barriers to an efficient sector governance, particularly in the countries lacking a clear institutional structure and division of responsibilities between energy sector players.

Furthermore, unlike economies with extensive experience in energy efficiency policies implementation, in most of the project countries the energy efficiency governance related to coordination mechanisms throughout the cities and regions of the countries is still at an initial stage of development. Therefore most of the governments have yet to establish dedicated governmental or public authorities responsible for the control and supervision of the energy efficiency policy implementation using coordination mechanisms. There are also cross-sectoral gaps in energy efficiency governance of the revised countries noted. While energy efficiency is an obvious target in the energy and power sectors, other branches often lack attention of the governments, notably construction and transport sectors which consume significant volumes of energy, and fossil fuels in particular. In the transport sector Azerbaijan is improving its car market with replacement of outdated vehicles fleet and introducing strict fuel efficiency standards. In buildings and construction sector all countries have appropriate legislation and normative acts in place which are being gradually enforced and implemented into practice.

Virtually all of the project countries have made significant progress in promoting renewable energy and some of them have developed dedicated strategies and financial support mechanisms. However, none of the countries have reached a sufficient level of renewable technology deployment or significantly approached a SEEforALL target to double the share of renewable energy in their energy mix by 2030. Similar to barriers in the EE policy implementation, the absence of secondary legislation and lack of dedicated institutions responsible for RES promotion hinders their development, application and integration in the grid. The governments should elaborate their RES development policies on a basis of a country-wide cost-benefit analysis considering all renewable sources of energy and available technologies with competitive advantages.

The reviewed countries have not developed an attractive market for significant foreign and domestic investments for employing advanced energy efficiency and renewable energy technologies with all related benefits. The energy sector in the reviewed countries also requires immediate investments for the rehabilitation, upgrade and maintenance of the power sector assets which are often old and run beyond their operational life. One of the major obstacles in attracting investments are the tariff structures and subsidies which keep energy tariffs below cost-recovery levels and therefore diminish investor`s appetite for deployment of EE and RES technologies.

On a more positive note, the governments in all project countries have succeeded in developing and implementing national legislation conducive to liberalization of fiscal

structures, streamlining lengthy licensing and permitting procedures, introducing various types of fiscal holidays for energy-related investments. Most of the countries have been moving up the World Bank's rankings for "Ease of Doing Business" – in 2017 Kyrgyzstan was ranked 77; Azerbaijan – 57; Belarus – 38; Kazakhstan - 36; and Georgia has made outstanding improvements and was ranked 9 among the 190 countries of the World. Indeed, this contributed to improving the investment attraction of the countries.

The analysis of case studies provided by the five countries has shown that in addition to the similarities in problems and barriers that countries are facing on a way to meet the SDGs and the SEforALL objectives, there are country-specific issues which require special attention by the governments in order to improve attractiveness of the market for investments to foster employment of advanced energy efficiency and renewable energy technologies.

As was demonstrated in previous chapters, **Azerbaijan** has developed and enforced energy sector legislation which provides a general system for promoting efficient energy use, including renewable energy sources. However, there is no dedicated EE strategy at policy level or effective regulatory structure for the implementation of EE investments. Although the state privatization programme aims at wider implementation of market mechanisms in the fuel and energy complex, including privatisation in the electricity and gas sectors by foreign investors, little progress has been achieved so far. The existing monopolies in the gas and electricity sectors limit the competition and there are no official deadlines for electricity market opening. The current legislation does not provide for electricity sector unbundling at the accounting, functional or managerial levels – there is no legal basis for separation of transmission and distribution from the generation activities. The only exception was privatisation of several mini power plants and establishment of a regional electricity distribution company. The enforcement of the legislation currently in place remains challenging – for example, the principles of non-discriminatory access to network infrastructure are established by the law, in practice, however, this is not (and cannot be) implemented because of the current market structure. All entities of the natural gas sector are state-owned and there are no plans for the change in the near future. Consumers cannot buy natural gas directly from the producer (SOCAR) but have to go by the Azerigaz, which controls access to the grid and does not allow access by the third parties.

Based on the case study analysis it is suggested that the governmental authorities undertake a revision of the present *regulatory framework* with a view to updating it and consolidating the existing EE related laws, into a single legislative act which would serve as the basis and is closely interrelated with the secondary legislation. The existing institutional structure should also be revised and adjusted in accordance with the new consolidated energy efficiency law. The new *institutional structure* should include dedicated governmental bodies in charge of development, execution and control of EE policies and programmes implementation at national, regional and municipal levels. The

policies should also include or tied to various *fiscal and tax benefits* which, together with setting up of a dedicated EE fund would hit up the investor`s interest. The policies and measures to be effective need to be closely *monitored and evaluated*. Given the significant level of Azerbaijan`s energy intensity, national programmes and strategies promoting energy efficiency deployment should first of all focus on highly consuming and polluting sectors of economy (transport, industrial and residential). Capacity building and training activities along with dedicated educational programmes should be coordinated on both national and regional levels to achieve better results in fostering *public awareness* of the benefits of energy efficiency and renewable energy employment.

Since its independence in 1991 **Belarus** has put in place a solid system of institutional and legal/policy frameworks assisting the efficient governance and regulation of the fuel and energy complex. The Concept on Energy Security defines the long-term energy policy objectives, such as: diversification of energy supply sources; improving energy efficiency, reliability and management of the energy system; integration into the world energy system; development of international cooperation with the EAEU and the EU; creating a wholesale national electricity market; and developing the Law on Electric Power Industry. To implement the objectives of the Strategy the government adopted a Programme for the electricity sector for 2016-2020 and other strategic policy documents which contain specific indicators and targets. A Comprehensive Development Plan for the Electricity Industry until 2025 prescribes concrete activities and timeframes for their implementation, such as removal of cross subsidies in electricity tariffs (by 2020); unbundling (until 2025) and creation of the wholesale and retail market of electricity. The government also approved strategic goals in the area of energy efficiency and energy saving to ensure energy security and improve the living standards of the population and the competitiveness of the national economy.

To achieve these goals the government should foster the implementation of the energy sector reform, which would introduce selected market mechanisms to enhance the potential for investments in energy efficient technologies and RES. As part of the energy sector reform, the Council of Ministers is elaborating a set of laws, including adoption of an Electricity Market Law governing the ownership structure of the electricity and heat industry, role of the state in electricity and heat tariff setting and the basic principles of the wholesale electricity market.

Belarus, as a member of the EAEU and a potential Observer to the Energy Community should provide for the adoption of market-oriented principles and a regulatory framework based on international experience when developing electricity sector legislation (the draft Electricity Market Law). For example, the current legislation permits foreign investors to build new power plants and guarantees connection to the state electricity networks as well as purchase of their output. However, the legislation does not provide requirements or specific rules for unbundling and separation of transmission from distribution and supply activities, neither do they contain specific

requirements on independent transmission system operator, as prevails in the market environment. Equally, the legislation does not provide for a non-discriminatory third-party access to transmission electricity networks, or for customers eligibility to have a choice of supplier. The government should consistently pursue the policy of restructuring energy tariffs to remove cross-subsidies and to achieve a level of prices that reflect the costs of production. A revised legislation should also encourage deployment of ESCOs and other market mechanisms conducive to attracting investments in EE and RES technologies.

The governance of a renewable energy sector is supported with a solid legislation – the comprehensive 2010 Law on Renewable Energy Sources regulates activities aimed at promotion and use of renewable energy and stimulation of development, manufacturing and employment of efficient modern RES technologies and equipment. Inter alia, the Law guarantees a non-discriminatory access to the grid; determines state support for RES development through a dedicated mechanism of fiscal and tax policies, encouraging foreign investments in the sector. In order to improve the efficient implementation of the Law, a dedicated National Renewable Energy Action Plan along with supportive secondary legislation should be developed, which would be in consistence with prevailing international practice. The government should promote grid integration of renewable energy, ensure attractiveness of green tariffs to the grid operators/electricity distribution branches; establish detailed, clear and transparent rules for the third-party access to electricity grids.

Energy security is one of the main objectives of the energy policy of **Georgia** since the country is highly dependent on imported fossil fuels. Although economic development is steadily improving, the environmental issues still remain challenging. Hence, improving energy efficiency and further increasing the use of renewable energy sources would contribute to a more sustainable development pattern of Georgia, enhance its energy security, and improve environmental sustainability.

Out of five project states Georgia is the only country with a Contracting Party status to the Energy Community (EnC) and has also signed the EU Association Agreement, and therefore has a commitment to transpose and implement all EnC *aquis* related to energy efficiency to its national legislation, including the EU third Energy Package. However, up to date there is no EE Law in place. The work on the National Energy Efficiency Action Plan (NEEAP) is being finalized. Although Georgia has put in place several Laws which relate to energy sector operation and governance, so far this is the only country in the region without any primary or secondary energy efficiency legislation. Hence, the current framework limits the building of new (or adjustment of existing) appropriate institutional structure with clear division of responsibilities and governance.

In view of the above one immediate recommendation would be the improvement of existing regulatory framework by soonest adoption and enforcement of the Energy Efficiency Law and appropriate secondary legislative acts. This will help the government to comply with EnC commitments, improve the institutional framework

and further elaborate legal, financial and fiscal mechanisms enabling the increase of the EE investments in the Georgian economy.

In particular, the focus should be put on selected key issues that were identified in previous chapters as "gaps" for implementation of sustainable energy practices, as follows:

- Development and timely implementation of policy and regulatory framework for energy efficiency;
- Improved institutional capacity building and effective coordination for monitoring and enforcement of relevant regulations;
- Establishment of a Renewable Energy and Energy Efficiency Agency;
- Fiscal and financial incentives to encourage the use of energy efficient appliances and technologies by households, commercial and industrial sectors;
- Innovative financing schemes for energy efficiency and conservation programmes;
- Improved efficiency in the operation and maintenance of machinery and equipment, and adoption of technological improvements and upgrades;
- Establishment of standards and norms and labelling schemes in appliances;
- Promotion of awareness raising, consumer research and business development, taking account of consumer preferences and behaviour.

Analysis of the **Kazakhstan**'s case study showed that over the years the government has put in place a comprehensive system of legal, policy and institutional frameworks which undergo revision and adjustments as required. In most of the cases primary legislation is supported with subordinate legal and normative acts and their enforcement and implementation is performed through national strategies and development programmes. The sectoral and other development programmes include indicators and targets that allow assessing the country's progress towards the achievement of set goals. The adopted laws and regulations relating to power industry, energy efficiency, and renewable energy facilitated practical implementation of the best practices in specific development areas.

However, the fuel and energy complex of Kazakhstan has problems, including those that are directly related to sustainable development. Among others, the government listed shortage of generation capacity to cover the growing demand for energy and fuel, high energy intensity of the economy, low level of energy efficiency and low environmental performance of technologies. Large investments are needed to upgrade the country's aging infrastructure. Reducing energy intensity is another key challenge. Tariffs for power and heat are still too low to encourage private financiers to invest in modernization of the sector infrastructure, particularly in the heating segment which requires substantial resources for its rehabilitation.

In response to these challenges the Government elaborated a set of legal and policy documents which set priorities and objectives for the period up to 2030, including to:

modernize and construct the new facilities for electricity and heat generation and transmission, and oil refining; further develop domestic energy and fuel markets through enhanced liberalization and competition; modernize industry and transport sectors, introduce modern technologies to improve energy efficiency and reduce negative impact on the environment; develop technologies and infrastructure for engaging the alternative energy sources: renewable and nuclear energy, associated gas processing, gas transportation, and coal-chemical industry. In support of these policy documents, the government formulated concrete goals and objectives for the period up to 2030, ways and mechanisms to achieve them, and expected results for all branches of the fuel and energy complex (coal, oil, gas, nuclear industry, electric power), energy efficiency and energy saving.

Based on these priorities and taking into account the key development goal - to ensure balanced and sustainable development of the power industry to support economic growth, improve the living standards and energy security in Kazakhstan, the main areas of development are to:

- maintain electricity supply and demand balance given the trend of growing consumption;
- modernize and construct priority energy facilities, decrease the number of the aged equipment;
- increase energy efficiency and environmental friendliness of heat and electric power generation;
- effectively engage alternative and renewable energy sources in the energy mix;
- develop RES technologies and integrate them into the national power system;
- increase the industry's investment appeal and bring large-scale investments in the industry;
- keep the prices down for the national industry to remain competitive on the global market;
- remove cross-subsidies in electric and heat power generation at CHPP.

Since the early 1990s **Kyrgyzstan** has been implementing the state policy aimed at the socio-economic development of the country including increasing the efficiency of the energy sector by building up of appropriate regulatory framework, institutional infrastructure and implementation of relevant governmental programmes and action plans. A set of legal documents together with sector development strategies provide a sound basis for elaboration of a best practice development policy, however lack of political will and poor governance put on hold the process of further reforms. It was particularly true with regards to a failure in implementing tariff reforms policy aimed at achieving full cost recovery through cost-effective tariffs and removal of cross-subsidies. The government should further elaborate its energy sector development concept by strengthening existing institutional arrangements, improving EE legislation and securing reliable and consistent sources of funding.

With regards to legislation, Kyrgyzstan faces problems similar to other project countries, namely the absence or insufficient character of the secondary legislation required for implementation of the law. Some laws are not entirely specific in terms

attribution of authorities responsible for implementation of provisions, which results in delays or suspension of the law enforcement. There are also cases (2012 Law on Energy Efficiency in Buildings) where despite the adoption of the secondary legislation, the provisions of the law have not been enforced or implemented in practice, because the responsibilities were not properly assigned to appropriate governmental bodies.

Clearly, there are a number of key challenges in the energy sector which relate to country`s sustainable development and which are barriers on the way to attaining the SEforALL objectives. These include the outdated regulatory framework; inefficient heat and electricity tariffs structure; lack of investments for rehabilitation and upgrade of the aging sector assets; insufficient utilization of the country`s significant hydropower potential.

The above listed problems outline major priority directions to overcome the barriers:

- improvement of existing regulatory and institutional frameworks;
- designation of an independent regulatory authority;
- improving sustainable development of the fuel and energy complex;
- implementation of the tariff reform aimed at removing subsidies and setting cost-reflecting tariffs for enhanced financial stability of the sector;
- setting of a dedicated governmental authority responsible for the development and promotion of energy efficiency;
- enhancing the RES uptake through development of various incentive mechanisms.

5.1 Best policy practices

Various international organisations, agencies and research institutions dealing with energy, and energy efficiency in particular, reviewed progress in and results of the application of EE policies and practices in different countries and regions of the world with a view to identify the "success stories" that could be offered for replication elsewhere. Among those agencies are the World Energy Council ("Energy Efficiency Policies – What Works and What Doesn`t", 2013); International Energy Agency ("25 Energy Efficiency Policy Recommendations" 2008 and Rev. 2009 and 2011); the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA); INOGATE and some others.

The United Nations Economic Commission for Europe (UNECE) has a long-standing experience working with its 56 member States on energy issues and for the last thirty years particular attention was devoted to promotion and development of energy efficiency in countries of the region. In implementing the UN Development Account project on "Promoting Energy Efficiency Investments for Climate Change Mitigation and Sustainable Development" the UNECE, in collaboration with the other four UN Regional Commissions, prepared publication "Best Policy Practices for Promoting Energy Efficiency" in 2015, which highlighted best policy practices in countries of the UNECE region and beyond.

Given the success and appreciation of the publication by the policy makers and expert community, the UNECE constituency requested to prepare an updated version with particular emphasis on the countries of the region, and the second edition of the "Best Policy Practices for Promoting Energy Efficiency" was published in 2017. Both editions present a structured framework of policies and measures to promote energy efficiency investments for climate change mitigation and sustainable development.

The publication provides a menu of options of best practice energy efficiency policies and measures which could be considered by the UNECE member states for implementation in their national strategies aimed at attaining the Sustainable Development Goals. At the same time the report emphasizes that there is no "one size fits all" solution and best practices could be effective only in cases where local conditions are taken into consideration along with national development goals and priorities.

The analysis of the five case studies demonstrated a number of challenges that apply to virtually all project countries, however on a different scale, and require immediate action on the part of the governments. First of all, it relates to revision, update and improvement of existing regulatory and institutional frameworks. The "Best Policy Practices" publication summarizes the energy efficiency best practice policies based on the best practice attributes framework. It also defines six Policy types: Cross-sectoral: governance; Cross-sectoral: finance; Policies for utilities; Policies for households/homes and appliances; Transport; and Business/industry/commerce sectors. Each Policy type comprises a set of best practice policies that are recommended for consideration and possible application in the UNECE countries.

Based on the case studies analysis and using the above classification, the following Policy types and the best practice policies are recommended for consideration by the policy makers of the five project countries:

- **Cross-sectoral: Governance**:
    - Enabling regulatory and institutional frameworks;
    - National strategies, plans and targets;
    - EE operational agencies;
    - Coordination mechanisms;
    - Cities and regions;
    - Data, statistics and evaluation.
- **Cross-sectoral: Finance**:
    - Public-private finance, including ESCOs;
    - Fiscal policies: tax incentives, rebates;
    - Government grants;
    - International climate finance.
- **Policies for Utilities**:
    - Cost-reflective pricing;
    - EE regulatory mandates;
    - Utility ESCOs;

    - IFI finance for utility energy efficiency.
- **Policies for Households/Homes and Appliances**:
    - Existing homes insulation/weatherization;
    - New and existing homes MEPS, codes;
    - Energy efficiency certification;
    - Efficient lighting.
- **Transport**:
    - Fiscal policies for transport;
    - Public transport and low energy modes.
- **Business sector, Industry and Commerce**:
    - Energy management, incl. ISO050001;
    - Energy management capacity building.

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