UNECE Sustainable Energy Division

Gap analysis between the performance objectives of the Framework Guidelines for Energy Efficiency Standards in Buildings and implementation of current building energy efficiency standards in the Kyrgyz Republic

May 2021

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Acronyms and abbreviations

ADB – Asian Development Bank

CAMP – Central Asian Mountain Partnership

CAPEX – Capital expenditure

CEEBA – Centre for Energy Efficient Construction

CREEED – Centre for Renewable Energy and Energy Efficiency Development

DH – District heating

EAEU – Eurasian Economic Union

EBRD – European Bank for Reconstruction and Development

ECA – Europe and Central Asia

EE – Energy efficiency

EU – European Union

ERIK – Enhancing Resilience in Kyrgyzstan

EPBD – Energy Performance in Building Directive

EPCs – Energy performance certificates

ESCO – Energy Service Companies

GIZ – Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH

HOA – Homeowner association

HOB – Heat only boiler

HR – Human resources

IDA – International Development Association

KR – Kyrgyz Republic

KyrSEFF – Kyrgyz Sustainable Energy Financing Facility (EBRD program)

LCHS - Levelized cost of heat supply

LED – Light-emitting diode

MEPRs – Minimum energy performance requirements

NGO – Nongovernmental Organization

NSCKR – National Statistical Committee of the Kyrgyz Republic

RES – Renewable Energy Sources

SARFEC – State Agency for Regulation of the Fuel and Energy Complex under the Government of the Kyrgyz Republic

SHW – Sanitary hot water

SCIES – State Committee on Industry, Energy and Subsoil of the Kyrgyz Republic

UNDP – United Nations Development Programme

WB – The World Bank

Currency

KGS	Kyrgyz Som
USD	United States Dollar

Signs and Measures

°C	degree Celsius
Gcal	Giga calories
GWh/year	Gigawatt hours per year
kW	Kilowatt
kWh	Kilowatt-hour
kWh/m2	Kilowatt-hours per square meter
m2	Square meter
m3	Cubic meter
MWh/yr	Megawatt-hours per year
t	tonne
W	Watt
W/m2K	Watts per meter square Kelvin

Executive summary

This report provides the analysis of energy performance of buildings, gap analysis between the performance objectives of the Framework Guidelines for Energy Efficiency Standards in Buildings and implementation of current building energy efficiency standards, as well as recommendations on the possibilities to bridge the existing gaps in the Kyrgyz Republic.

The report consists of four main sections: country overview, energy efficiency potential assessment, gaps between Framework Guidelines for Energy Efficiency Standards in Buildings and local realities, conclusions and recommendations.

Country overview provides general introductive information on the country, energy consumption and energy prices, feasibility assessment. A description of the geographical location, topography, climate, population is given in this part. The main types of energy used in the KR are identified and the share of each is shown. Electricity is one of the main sources of energy that accounts for 64 per cent. At the same time, there is an electricity deficit in the country due to growing consumption and the onset of low water periods. This underscores the urgency of energy conservation issues. The main energy sources have more or less the same price making the range from 0.8 to 2.24 Som/kWh. The issue is that most of the tariffs are below cost recovery (e.g. electricity, gas, heat and hot water). The comparison of the low energy prices and costs of energy savings interventions showed that profitability of these measures is questionable at the present energy prices.

The chapter on energy efficiency potential assessment describes the organizational structure of the governmental bodies responsible for development and implementation of energy efficiency policies, led by the Ministry of Energy and Industry. One significant problem is the unstable structure of public institutions, an example being the Ministry of Energy, which has been reorganised and renamed several times over the past 10 years. It also provides an overview of donor organizations and private companies active in this field. A number of projects and big international organizations are working in the Kyrgyz Republic since early 2000. The donor organizations like World Bank, Asian Development Bank, UNDP and many others provide assistance in piloting energy efficiency technologies and development of regulatory and strategic documents. This has provided positive experience in implementing energy saving measures at various sites, but the implemented projects have often proved unsustainable for various reasons. Donor assistance has greatly facilitated the emergence of local non-governmental organizations, many of which are now operating successfully. It provides the examples of documents and projects implemented by these bodies, starting from the Law on Energy Saving (1998). This part also describes the problems identified in implementing energy efficiency programs and projects, including gaps in tender procedures, inability to access material savings arising from energy savings in budgetary organizations and others.

The chapter on gaps between Framework Guidelines for Energy Efficiency Standards in Buildings and local realities describes the challenges in the country in implementing energy efficiency measures and the gaps between the objectives set in the Framework Guidelines for Energy Efficiency Standards in Buildings and the current situation in the Kyrgyz Republic. A number of technical, institutional, financial, regulatory and policy barriers which impede energy efficiency investments in the residential and public building sector in the Kyrgyz Republic were identified, classified and listed. Among the main barriers are low market capacity to prepare, implement and finance energy efficiency investments (e.g. energy auditing companies, design companies, financial institutions, construction companies, etc.); lack of expertise, lack of awareness; lack of access to affordable energy efficiency financing; low financial viability and lack of incentives to invest in energy efficiency due to low energy tariffs and billing practices based on norms rather than actual energy consumption; as well as incomplete regulatory and enforcement framework. The strategic documents adopted in the country mostly correlate with the Framework Guidelines, at the same time,

the mechanisms for implementation of the strategic documents lack sufficient detail and implementation mechanisms, so that such strategic documents are mostly declarative and only partially implemented.

On the basis of the provided analysis the prospective recommendations to promote energy efficiency in the country were developed. The recommendations were divided into two groups: strategic recommendations and technical recommendations. Strategic recommendations were determined as main priority. The main idea of the recommendations is to define and consolidate the position and opinions of the state on energy saving issues in the country. Once these positions have been defined and voiced, it is necessary to identify ways and instruments to solve energy saving problems. It is possible that the country's own resources will not be sufficient, and donor assistance may be needed. The technical recommendations, aimed more at the implementation of specific measures and technical solutions, are the subject of further development, which should take place after the implementation of the strategic recommendations.

Introduction

This report has been prepared within the framework of the UNECE project “Enhancing national capacities to develop and implement energy efficiency standards for buildings in the UNECE region”. The objectives of this study is analysis of energy performance of buildings, gap analysis between the performance objectives of the Framework Guidelines for Energy Efficiency Standards in Buildings and implementation of current building energy efficiency standards, as well as recommendations on the possibilities to bridge the existing gap in Kyrgyzstan.

Certain attention has been paid to energy saving issues in the Kyrgyz Republic since the early 2000s. A number of strategic and regulatory documents in the area of energy saving have been developed and adopted, however, no significant results have been achieved since then. This study attempts to identify the main reasons hindering the development of energy saving in the country, try to find out their nature, classify them and propose ways to solve them. At the same time, this report is strictly linked to the objectives set in the Framework Guidelines, and a gap analysis between the current situation of energy efficiency and energy saving in the Kyrgyz Republic and the Framework Guidelines has been carried out.

Energy saving issues are very relevant for the Kyrgyz Republic as the current energy crisis is growing due to energy shortages caused by increased electricity consumption, limited generation capacity and low water periods, which limit the output of hydropower plants – the main source of generation in the country. Energy saving is one of the key tools for the country to overcome the emerging crisis by meeting all the energy needs through rational use of electricity even without introducing additional generation capacity. Besides, improving energy efficiency is one of the most cost-effective options for meeting growing energy demand in most countries. It contributes to energy security, a better environment, improved quality of life of both men and women, and their economic well-being. Out of all sectors of economic activity, the buildings sector has the largest potential for cost-effective improvement in energy efficiency and emissions reductions.

The Kyrgyz Republic is a member country of the Eurasian Economic Union (EAEU), which requires updating and harmonizing the legal and regulatory framework, including in the area of energy efficiency, between EAEU member countries and other countries. This should result in a legal and regulatory framework that will provide a significant increase in energy savings in the country.

1. Country overview

1.1. Climate

The country is known for its mountainous relief. The relief determines the continental climate with cold winters, often frosty (-49°C minimal, Susamyr), and warm and sunny summers, sometimes scorchingly hot at low altitudes (43°C maximal, Bishkek), but cooler in the mountains. Precipitation is moderate in the west, while the center-east of the country is arid, and even desert at lower elevations.

There are no plains in the Kyrgyz Republic, and the lowest areas are located between 500 and 1,000 meters of altitude. Kyrgyzstan is crossed by several mountain ranges: the highest point of the Tien Shan range is Jengish Chokusu (formerly Pik Pobedy), on the border with China, 7,439 meters high. At high altitudes, above 4,000 meters, there are vast glaciers, which feed rivers, which in turn flow in deep valleys between the mountains.

Climatic conditions determine the high demand for energy for heating in winter and cooling in summer.

Duration of the heating period makes from 140 (Osh) to 292 (Sary-Tash) days, while the number of degree-days ranges from 2365 to 6836 respectively.

1.2. Population

According to the data of National Committee on Statistics, the population of the country excided 6.5 million in 2020 (table 1), the sex ratio of the total population is 0.985 (985 males per 1,000 females).

According to the model (Twidell, 2015):

$$R=EN,$$

Here R is the total yearly energy consumption for a population of N people. E is the per capita use of energy averaged over one year, related closely to the provision of food and manufactured goods. Standard of living relates in a complex and an ill-defined way to E.

Fig. 1 shows a steady growth in population (N) of around 2 per cent a year, that causes an increase in energy consumption. Population growth is projected to accelerate over the next 35 years, pushing the pace of growth in energy consumption. At the same time, population growth is not the only reason for the rise in energy consumption. People are increasingly using home appliances, air conditioners (increase of standard of living), that already caused increase in electricity consumption in summertime, which is the second reason for the increase in electricity consumption. this means that the growth in electricity consumption in the coming years will significantly exceed 2% per year. industrial development can further increase the demand for electricity, given the already existing deficit.

Table 1. Share of Urban and Rural Population and its Dynamics for the Last 5 years

	2016	2017			2018			2019			2020		
Population	Total	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Kyrgyz Republic	**6 019,5**	**6 140,2**	**3 042,5**	**3 097,7**	**6 256,7**	**3 101,8**	**3 154,9**	**6 389,5**	**3 169,6**	**3 219,9**	**6 523,5**	**3 237,6**	**3 285,9**
Urban	2 029,5	2 073,9	984,8	1 089,1	2 121,0	1 007,6	1 113,4	**2 173,6**	**1 034,0**	**1 139,6**	**2 231,0**	**1 062,4**	**1 168,6**
Rural	3 990,0	4 066,3	2 057,7	2 008,6	4 135,7	2 094,2	2 041,5	**4 215,9**	**2 135,6**	**2 080,3**	**4 292,5**	**2 175,2**	**2 117,3**

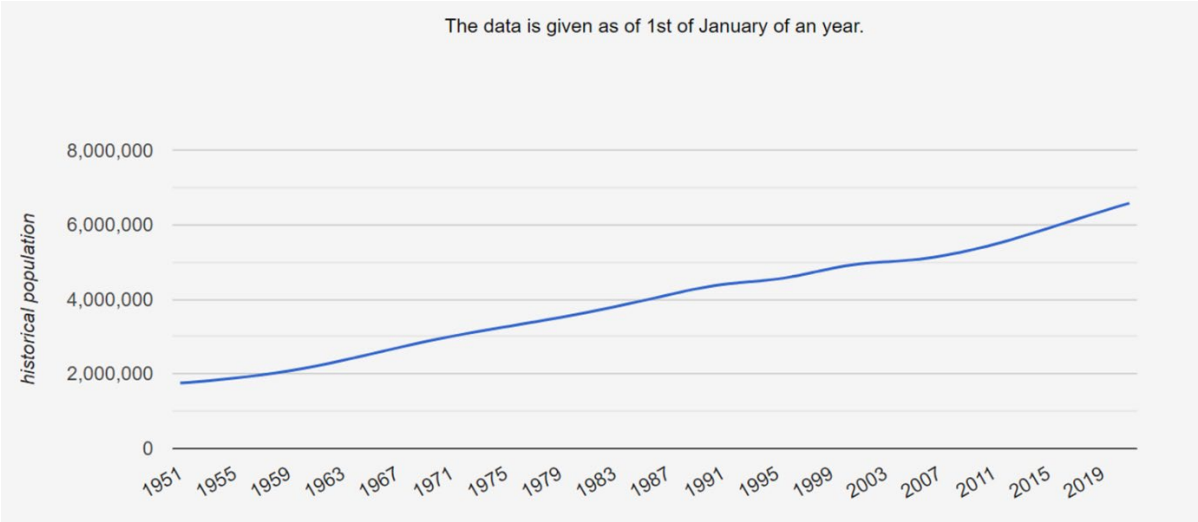
Source: NSCKR http://www.stat.kg

Most part of the population is living in the countryside in private houses. The share of urban population makes 34 per cent, while rural – 66 per cent. Table 2 shows the number of buildings, the floor space and the population for each housing type in urban areas.

The centralized heating is available to some urban population, while for rural -not. They use coal, wood and dung for heating, the use of electricity for heating is quite spread as well. Another option is natural

gas, but the network of coverage by natural gas exists more in the cities than in villages. That leads to the difference in the way and type of fuel that people use for heating.

Figure 1. Dynamics of Population Grows from 1951



Source: https://countrymeters.info/en/Kyrgyzstan

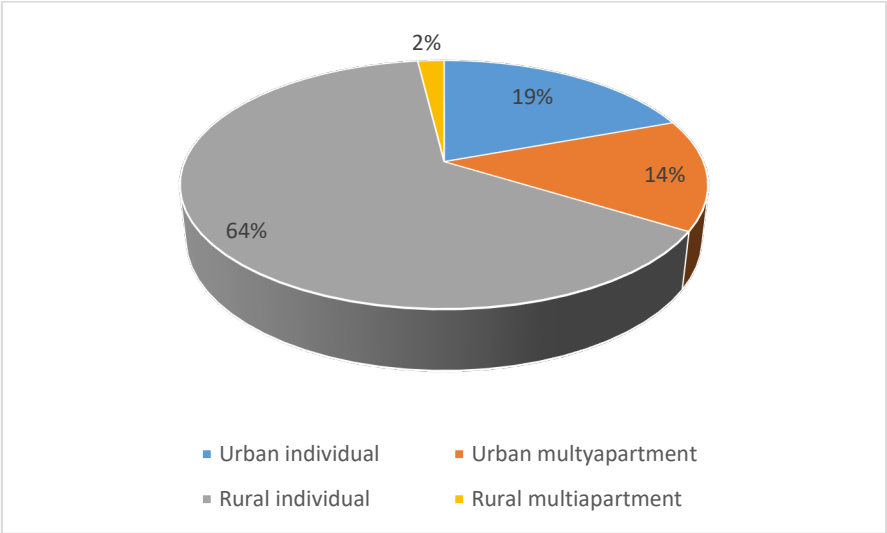
Table 2. Urban Residential Building Statistics

	Buildings		Floor space		Households		Population	
	Number	Share	m^2	Share	Number	Share	Number	Share
Multi-apartment buildings	224,410	41%	13,300,000	34%	237,200	51%	507,100	39%
Individual family houses	320,800	59%	25,405,000	66%	229,400	49%	802,900	61%
TOTAL	**545,210**		**38,704,000**		**466,600**		**1,310,000**	

Source: NSCKR

In the residential building sector, rural individual family houses account for the majority of the residential floor space, while the area of rural multi-apartment buildings in the Kyrgyz Republic is quite small in comparison. In urban areas, multi-apartment buildings represent a much larger portion of the total area, but the majority of the residential area is made up of individual family houses. Fig. 2 shows the share of the total residential area by building type and location.

Figure 2. Residential Floor Space by Building Type and Location



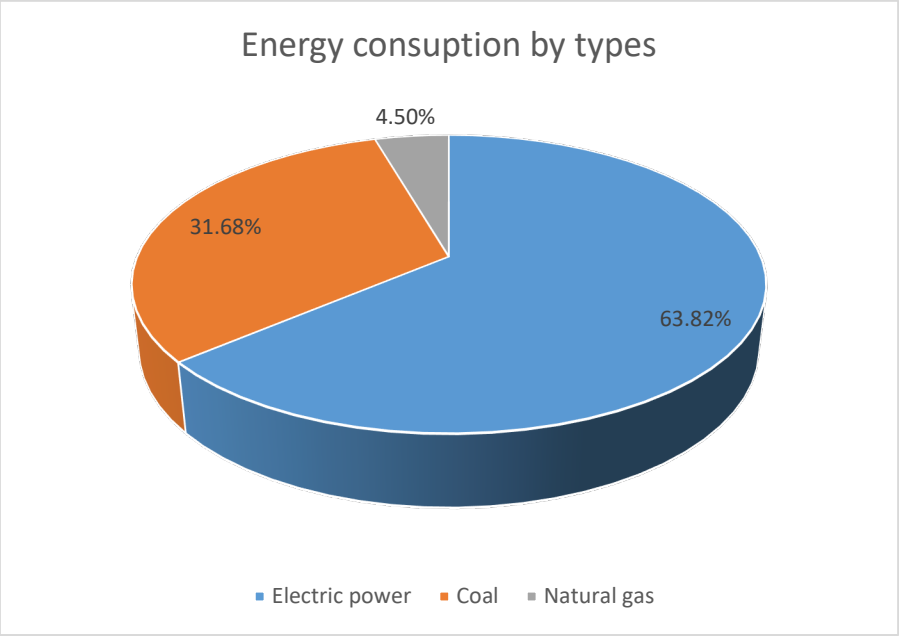
Source: Based on NSCKR Data

It is clear that the majority of the floor space is occupied by rural residential family houses, where people use mainly solid fuels and low efficient stoves and boilers. It means that it is difficult to assess the real amount of fuel that people use in rural areas. On other hand, the solid fuels burned in low efficient stoves harm the environment and health. This outlines the crucial importance of energy efficiency in rural households. A brief analysis of energy use in the country is provided below.

1.3. Energy consumption by types of energy, prices

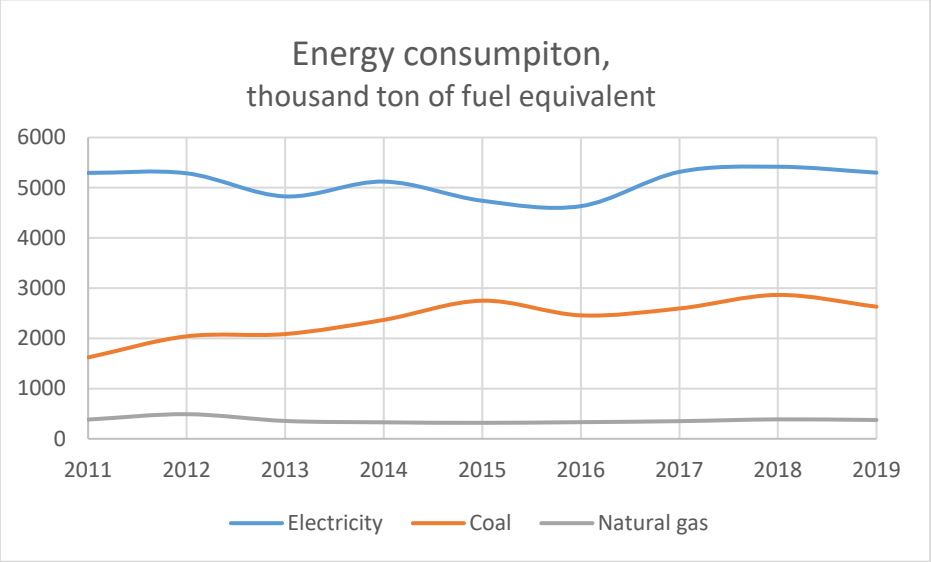
According to the data of National Statistical Committee of the Kyrgyz Republic (NSCKR) the main energy sources used for heating are natural gas, coal and electricity. The share of each source can be seen on the diagram (Fig. 3). Dynamics based on NSCKR data of energy consumption by type over the last 9 years is shown on the Fig.4.

Figure 3. Energy Consumption by Types



Source: Based on NSCKR Data

Figure 4. Dynamics of Main Energy Types Consumption



Source: Based on NSCKR Data

Share of electricity consumption by sector throughout last 9 years is given in the Table 3. Natural gas supplied to the households by region for the same period is indicated in the Table 4.

Table 3. The Share of Electricity Consumption by Sector, mln. kWh

Items	2011	2012	2013	2014	2015	2016	2017	2018	2019
Electricity produced	15 158,0	15 168,3	14 011,4	14 571,5	13 016,6	13 118,4	15 429,5	15 728,0	15 115,2
Electricity imported	6,6	-	29,6	286,2	745,8	385,1	15,2	14,9	269,2
Electricity consumed in:	12 370,4	13 579,8	13 665,8	14 785,3	13 580,2	13 305,5	14 231,5	14 990,1	15 115,0
Manufacturing	4 898,6	5 599,4	5 905,3	7 292,7	5 705,7	5 460,7	5 874,0	6 484,1	6 634,5
Agriculture	2 138,8	2 467,6	2 551,6	2 517,3	3 164,0	3 115,9	3 397,6	3 237,3	3 164,7
Transport	57,8	56,3	51,0	58,6	59,1	63,4	65,0	91,6	91,2
Construction	65,5	77,2	81,1	97,8	108,0	109,6	123,5	180,6	161,6
Other activities	2 135,2	2 137,0	2 235,5	2 187,3	2 111,6	2 247,5	2 398,7	2 561,8	2 725,4
Transmission losses	3 074,5	3 242,3	2 841,3	2 631,6	2 431,8	2 308,4	2 372,7	2 434,6	2 337,6
Electricity exported	2 794,2	1 588,5	375,2	72,4	182,2	198,0	1 213,2	752,8	269,4

Source: NSCKR

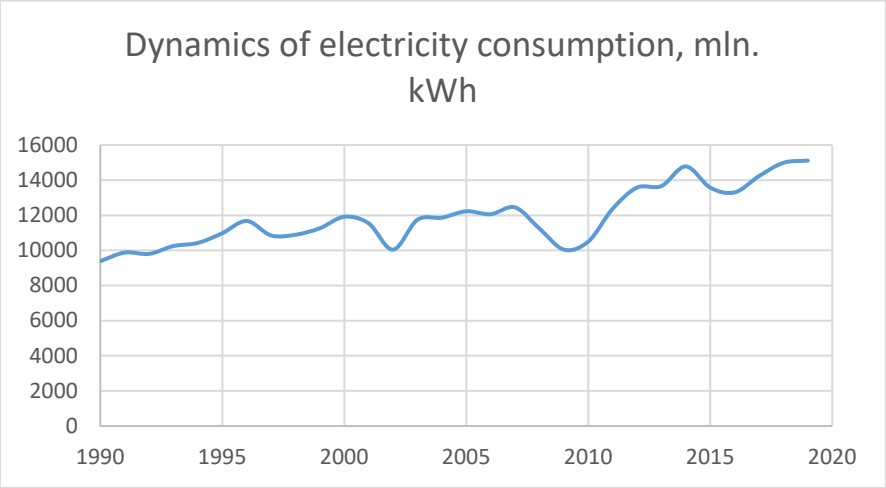
Table 4. Gas Supply to the Housing Stock, thousand m³

Items	2011	2012	2013	2014	2015	2016	2017	2018	2019
Kyrgyz Republic	**14650**	**14188**	**13874**	**13704**	**13323**	**13494**	**14028**	**13652**	**13940**
Batken oblast	942	967	819	819,375	333	332	317	317	292
Jalal-Abat oblast	617	616	613	612,774	594	594	593	66	13
Yssyk-Kul oblast	1193	345	201	198,051	186	186	186	186	186
Naryn oblast	57	57	1	0,805	0	0	0	0	0
Osh oblast	1879	1255	1252	1250,788	1251	1282	1640	1638	1638
Talas oblast	779	791	777	779,379	772	705	696	695	695
Chui oblast	3101	3037	3080	2861,702	2857	2927	2951	2922	2924
Bishkek City	5145	5411	5415	5410,157	5483	5559	5706	5802	5930
Osh City	938	1708	1715,536	1770,836	1848	1910	1940	2027	2262

Source: NSCKR http://www.stat.kg/ru/opendata/category/52/

The figures above show that electricity accounts for not only the largest share, but also the largest increase in consumption, which can be clearly seen in the graph (Figure 5). For the last 30 years the electricity consumption increased for more than 60 per cent, that makes average grows of 2 per cent a year (nearly the same rate as population growth).

Figure 5. Dynamics of Electricity Consumption



Source: NSCKR

The graphs above show that the electrical energy is the dominant energy source. However, generation abilities are limited by the lack of new generating capacity and the dry periods. To address this, in the fall of 2020, the Kyrgyz Republic began to import electricity from the neighboring countries - Kazakhstan and Uzbekistan - due to a lack of water in the Toktogul reservoir. This fact highlights the relevance of implementation of energy saving measures to cover the energy demand with available generation.

For the purposes of this analysis, the prices for the most popular energy types were listed. The price determines the affordability of the energy, on one hand, and the influence on energy efficiency measures feasibility, on another hand. For the comparison reasons, the prices were referred to one kWh (Tables 5, 6).

Table 5. Prices for Main Energy Sources for Residential Consumers

Item	Unit	Som	kWh	Som/kWh
Hot water	1 Gcal	981,76	1162,80	0,84
Heat	1 Gcal	1134,76	1162,80	0,98
Natural gas	m^3	18,06	9,30	1,94
Coal	1 t	4304,00	3600,00	1,20
Electricity less 700 kWh	1 kWh	0,77	1,00	0,77
Electricity over 700 kWh	1kWh	2,16	1,00	2,16

Table 6. Prices for Main Energy Sources for Commercial (Nonresidential) Consumers

Item	Unit	Som	kWh	Som/kWh
Hot water	1 Gcal	1965,10	1162,80	1,69
Heat	1 Gcal	1695,10	1162,80	1,46
Natural gas	m^3	18,06	9,30	1,94
Coal	1 t	4304,00	3600,00	1,20
Electricity	1 kWh	2,24	1,00	2,24

The main energy sources have more or less the same price, for residential consumers it includes a range from 0.8 to 2.2 Som/kWh, for commercial - from 1.2 to 2.24 Som/kWh. It's the price for "primary" energy; the price for useful energy is higher and depends on the efficiency of its transformation and transport (boilers, pipelines, appliances, etc.). Energy tariffs in the country are quite low, but the problem is that most of the tariffs are below cost recovery (e.g. electricity, gas, heat and hot water).

Mean electricity tariff makes 1.37 Som/kWh, when cost recovery rate makes 1.55 Som/kWh.

Depending on the heating source, the residential tariffs cover between 13 and 50 per cent of the cost of heat supply.

The current tariff for natural gas is unprofitable, the deficit of the tariff is 2.2 Soms. Since 2014, the tariff deficit has been subsidized by PJSC Gazprom.

It disturbs the sustainability of the energy complex and often makes use of energy efficient approaches economically unattractive. Tariff policies were approved by the government in the early 2000s but have never been implemented. New (higher) electricity tariffs were suggested lately by the President of the republic and should be introduced in August 2021.

1.4. Energy consumption by individual and multiapartment buildings

Heat in the Kyrgyz Republic is supplied by various systems, ranging in size from large, centralized DH systems to individual portable heating devices. Most of the DH systems and HOBs were designed for gas, but many of them have been converted to burn coal or use electricity. This has reduced the efficiency of the boilers and (where coal is burned) contributed to air pollution.

As gas became more scarce and expensive after the collapse of the Soviet Union, many households that were not served by the DH system began to rely on electricity for heating. Households that are supplied with DH also use electricity for additional heating to supplement the heat supplied by the DH system. This increases demand for electricity during peak hours, which puts stress on the power grid and has contributed to an increase in power outages during winter months.

While the decreasing availability and increasing price of gas has been a major factor impacting the heating situation over the last decade, recent developments in the restructuring of the gas sector in the Kyrgyz Republic suggest that natural gas might again become a more reliable and affordable source for heating purposes.

Nationally, stoves are the most prevalent source of heating for urban households outside Bishkek, followed by electric heating (37 per cent) and DH (9 per cent). By contrast, in Bishkek, 43 per cent of households rely on DH as a main source of heat, followed by electric heating (21 per cent) and stoves (22 per cent). Table 7 describes households' main sources of heating by settlement type.

Table 7. Households' Main Sources of Heating by Settlement Type

	DH	**Electric radiators**	**Stoves/boilers**	**Other electric heating**	**Gas**
Urban (non-Bishkek)	9%	31%	50%	6%	3%
Rural	1%	20%	73%	5%	2%
Poor	4%	19%	68%	5%	3%
Non-Poor	11%	24%	56%	5%	4%
Bishkek	43%	18%	22%	3%	14%

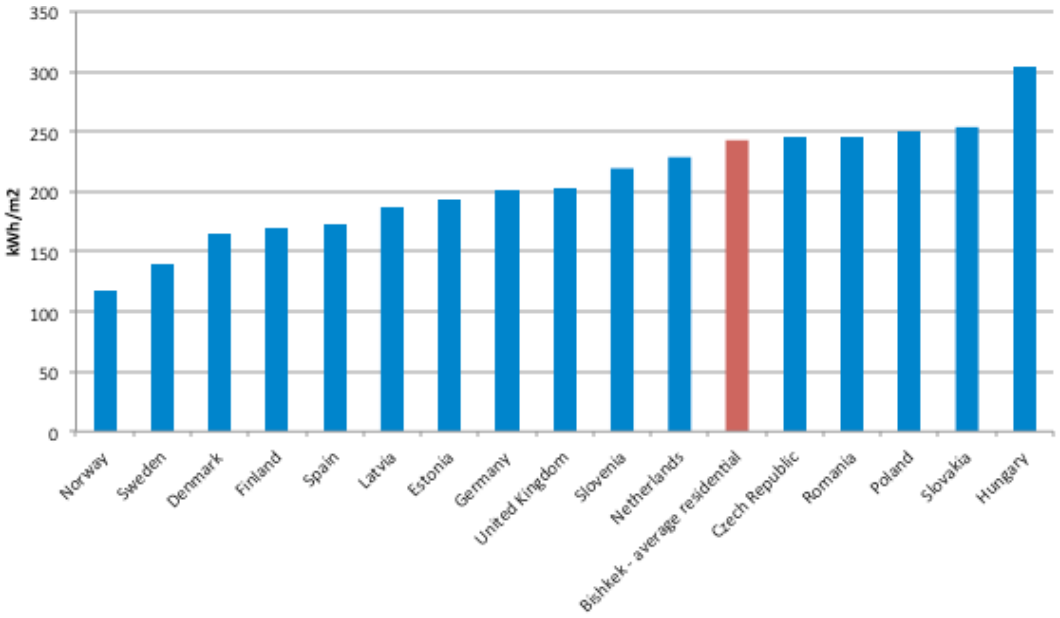
Source: WB, 2015

There are approximately 2,000 public buildings in the Kyrgyz Republic with a total heated volume of 20 million m^3. There are approximately 1.44 million residential buildings with floor space of about 83.7 million m^2. The residential building stock consists of individual family houses and multi-apartment buildings. Individual family houses comprise almost 80 per cent of the households in the country and 85 per cent (or 70 million m^2) of the residential building area. There are 7,725 multi-apartment buildings, consisting of 255,000 apartments and approximately 14 million m^2 of floor space (WB, 2015).

Most of the existing residential and public buildings are characterized by low energy efficiency as the result of old building stock, inadequate maintenance and the absence of proper insulation. Newer buildings are in better condition. However, building codes and laws are not properly enforced, so not all of the new buildings are not built for energy efficiency. Even in accordance with the on Energy Efficiency in Buildings Low, private houses with an area of less than 150 m2 are not required to comply with a regulatory level of energy consumption. While energy demand in individual family houses is particularly high, making this sector the largest consumer of heat energy in the country. The average heat demand for buildings in Bishkek and comparison to European countries is shown on the diagram (Fig. 6).

The graph on Fig.6 demonstrates the best value of energy consumption for Norway, that is slightly higher than 110 kWh/m^2, and that is 20-30 kWh more than the objectives stated in the Framework Guidelines for Energy Efficiency Standards in Buildings (Framework Guidelines). It brings to understanding that the objectives are very ambitious and not obvious to reach in the Kyrgyz Republic, where the consumption is about 250 kWh/m^2. The experience of Norway is very valuable for the Kyrgyz Republic, since specialists from Norway were among the first who came to the country in the early 2000s with a willingness to share their experience in the field of energy efficiency. On the other hand, Norway is in climatic conditions similar to the Kyrgyz Republic in terms of degree days, and the experience of this country demonstrates that in the climatic conditions of the Kyrgyz Republic it is technically possible to achieve the objectives set out in the FGEESB.

Figure 6. Average Heat Demand in Multi-Apartment Buildings in Different Countries and Bishkek, Adjusted to Reflect Bishkek Heating Degree Days



Source: WB, 2015

1.5. Feasibility assessment of energy efficient measures

In 2017, 25.6 per cent of the population of the Kyrgyz Republic lived in poverty, and an estimated 0.8 per cent of the population lived in extreme poverty. It should be noted that in 2013 these figures were 37 and 2.8 per cent, respectively (NSCKR, 2018). The current dire economic situation caused by COVID-19 could cause an increase in poverty.

The population's expenditures on services in 2017 in the total volume of consumer spending amounted to 21.5 per cent. Thus, main part of household expenditures on services were utilities, which accounted for 27.7 per cent of total expenditures on services (NSCKR, 2018). The lack of funds is an additional reason for energy efficiency measures to be economical feasible. Often people cannot afford more energy efficient solution just because it is modern or environmentally friendly – it should be profitable. In the Tables 8 and 9 the assessment of expenditures needed to increase EE in buildings is shown.

Table 8. Energy Savings Potential in Public Buildings

Building type	Estimated number of buildings for EE retrofit	Building stock floor area for retrofit (m^2)	Energy savings potential (MWh/yr)	Average energy savings ratio (%)	CAPEX for energy savings retrofit (USD, millions)
A: Education (schools, kindergartens, higher and other education facilities)	3,350	3,270,322	280,225	60-65	458
B: Healthcare (hospitals, policlinics, other small health facilities)	400	210,668	18,637	55-70	344
C: Other (Administrative buildings, social protection, other)	1,250	1,811,347	191,501	60-75	283
Total	**5,000**	**5.3 million**	**490,363 (i.e. about 500 GWh/year)**	**55 -75**	**1,085**

Source: WB, 2019

Table 9. Costs and Expected Results of Energy Savings Interventions in Public Buildings

Technology type	Specific annual energy saving (kWh/m^2)	Specific Investment (USD/m^2)
Standard/ conventional EE technologies	80-110 (~ 50% EE)	80-100
Building envelope: Insulation of external walls, roof and floor ceiling, replacement of windows and doors		
Room ventilation system		
Heating system: New heating boilers, retrofit of heating network, hydraulic balancing, radiators, thermostatic valves		
Energy-efficient lighting (LED) indoor + outdoor		
Innovative technologies	35-55 (additional ~ 20% EE)	70-100 (additional costs)
Ventilation system with heat recovery		
Heat pumps for space heating		
Sanitary hot water (SHW): Solar collectors or SHW heat pumps		
Building energy management systems and lighting control		
Overall (conventional + advanced technologies)	**100–160 (60-70% EE)**	**140-190**

Source: WB, 2019

The comparison of the energy prices (see tables 5, 6) and costs of energy savings interventions (see tables 8, 9) shows that the profitability of these measures is questionable at the present energy prices. This is why it is very important for ordinary homeowners in these conditions to have access to reliable and understandable information about energy efficiency measures and their economic feasibility. A catalogue of possible energy efficient solutions showing their costs, energy savings and profits should be developed and kept updated by a government agency (but budgeting is an issue) or a private company with good proven track record (which is not obvious due to weak engineering capabilities and conflicts of interest). Creating and updating such a catalog containing all or many of the technologies is a very difficult task for a small country like the Kyrgyz Republic. One of the options can be the creation of a software product that would contain databases on existing materials and technologies, prices. This software product can be used in any country just need to be adapted and updated with prices for each country, while the main content of technical solutions can be updated centrally – by the developer. With the help of such a computer program, it is possible to calculate the energy savings from a particular energy efficient measure, the cost of such measure and its profitability. Known powerful software products for the design of systems using the solar energy (Polysun, PVsyst), which could serve as analogue. Additionally, within the framework of the IFC project (Housing Microfinance Project) a "calculator" was developed for microcredit companies, which allows calculating the costs of improving the energy efficiency of a building and the potential energy savings.

2. Energy efficiency potential assessment

There is a significant potential for energy savings in buildings, which on average values of specific energy consumption, could be up to 80 per cent, approaching the objectives outlined in the Framework Guideline.

Work to improve energy efficiency in the Kyrgyz Republic has begun in the end of the last century. It has started from the development of norms and legislation (the Law on Energy Conservation was developed and adopted in 1998). Implementation of energy efficiency measures started at the same time. The pioneering companies including the limited liability companies “Demo-Zona”, “CAMP-Alatoo” and some others that arranged and started their activity in collaboration with the governments of Norway, Switzerland, Germany and other donors. The first pilot projects were implemented that time, including the pilot projects on energy efficiency in public and multi apartment buildings using thermal insulation, heat meters, heat control and balancing tools.

2.1. State of the art in the field

2.1.1. Governmental institutions working in the field

There is an institutional structure responsible for development and implementation of policies and technical solutions in energy efficiency. Main institutions responsible for energy efficiency are listed below.

The Ministry of Energy and Industry: (prior to 2021 named the State Committee on Industry, Energy and Subsoil of the Kyrgyz Republic (SCIES), prior to 2016 named the Ministry of Energy and Industry). it includes a department of Renewable Energy and Energy Efficiency (3 people).

The governmental authority responsible for the development and implementation of state policies in the following sectors: industry (except food processing), fuel, energy and subsoil. The regulation of the Ministry assigns specific responsibility to this authority for the development of the country's EE policy but does not assign any responsibility for the control and implementation of EE measures and the achievement of the targets. The structure of the Ministry includes a department responsible for renewable energy and energy efficiency that mainly deals with the development of small hydro projects and the improvement of energy efficiency on the supply side, that is, upstream, generation, transmission and distribution.

The Research Institute on Energy and Economics under the SCIES (prior to December 2015 under the Ministry of Economy). There is a department of energy efficiency (2 people).

An energy think tank producing research and analysis on the Kyrgyz energy markets and economy. According to the legal provisions relating to the Research Institute, the organization is responsible for the scientific support of decision-making processes in the energy and economic sectors.

The State Agency for Regulation of the Fuel and Energy Complex under the Government of the Kyrgyz Republic (SARFEC) is the energy sector regulator of the country, which is directly accountable to and not independent of the Government. In accordance with the statute of the SARFEC, the institution is required to regulate the energy sector through licensing and tariff setting for electricity, heat and natural gas.

The State Agency for Architecture, Construction, Housing and Communal Services (Gosstroy) is responsible for the implementation of energy-savings and energy-efficiency policies in the construction and building sectors. Institutionally, agencies under Gosstroy are separate entities coordinated by the general management.

The structure exists and has potential and some human resources. At the same time, recourses are quite limited, the overall amount of specialists involved in aspects of EE is about 10 people, who are not responsible only for energy efficiency but for other sectors as well. This leads to lack of resources and expertise.

The issue is existence of unstable structure. The Ministry of Energy has undergone major reforms several times over the past decade, which leads to change of structure, links, people and makes extremely difficult to follow the track. A lot of activities are initiated and getting support by donors, while local institutions are often not able even to coordinate the activity. Thus a lot of local documents were developed with the great support of donors. The main current documents in the field of energy efficiency are given below (Chapter 8).

2.1.2. Programs/projects/companies working in the field

With help from donor agencies, the government has piloted EE projects using purely grant or budget financing. These projects have generally demonstrated high levels of energy savings and reasonable payback periods. In addition, such projects provide substantial co-benefits including building modernization, improved comfort, and increased awareness. Notable examples are as follows:

- ADB Toktogul Rehabilitation Phase 2, 3 Project. Energy public awareness program financed by ADB.
- Heat Supply Improvement Project by IDA(WB) from 2019.
    - Component 1: Improving supply efficiency and quality of the DH system in Bishkek. Installation of new substations and smart meters.
    - Component 3: Demonstrating the benefits of energy efficiency improvements in public buildings
- EBRD's Kyrgyz Sustainable Energy Financing Facility (USD 55 million) to finance the implementation of equipment to save energy and water and dispose of waste from homes and enterprises in the Kyrgyz Republic (since April 2013, more than 1,415 energy-saving projects have been supported, resulting in annual energy savings of 128 GWh);
- Housing Microfinance Project (2012-present) helps improve housing conditions for low-income Kyrgyz households by introducing an innovative housing microfinance lending product to local financial institutions, enabling them to provide funding for home improvements to low-income residents. Donor partner is the government of Switzerland.
- World Bank "Urban Development" project (2000-2005) for the rehabilitation of four schools and two kindergartens to improve their energy efficiency and seismic resilience, strengthen the building structure, and renew the heating system and building insulation;
- UNDP project "Improving the Energy Efficiency of Buildings" (2010-2014) to build an energy-efficient school in Osh and design an energy-efficient school in Bishkek;
- World Bank "Enhancing Resilience in Kyrgyzstan" (ERIK) project (2018-present), which aims to improve the safety and functional conditions of schools (including energy efficiency improvements) in the areas of highest seismic hazard.

A number of local organizations, including public foundations, NGOs, private companies, etc., were established in the country. Among them are BIOM, CAMP Ala-Too, CEEBA, CREEED, UNISON and others. Some of them were established with assistance from donor organizations and continue collaboration with them. Each of these companies has successful experience in energy efficiency projects implementation.

However, the main lesson learned from these projects indicate that there can be a very limited replication of donor pilot programs and grant financing without substantial investments; a sustainable, scalable financing mechanism; and the participation of the private sector. At the same time, energy efficiency investment in large public buildings or bundles of investment projects could generate cash flows from cost savings that can be used to repay the initial investment costs.

Various countries have implemented a range of sustainable financing and implementation options to enhance the financial leverage of public funds and/or to better transition to commercial funding for public sector EE projects by involving the private sector. In the Kyrgyz Republic, however, there are currently no financial products offered by commercial banks targeted at EE rehabilitation in the public buildings sector. But the lack of finance is not the only problem. It happens that projects implemented with donor investments have not been sustainable due to: (i) low understanding by the users of the benefits of the technology provided; (ii) low energy prices and, as a result, low (but not always, some projects demonstrate very attractive results and savings) financial savings; (iii) lack of intention or ability to build a sustainable financial model - to accumulate part of the savings to maintain the system. As a result, when the system requires input (repair, tuning, updating, etc.), the owner / organization cannot allocate funds for this. As a result, the system degrades, loses its efficiency, then stops and collapses.

A number of impediments limit the feasibility of commercial financing in the sector, including the following:

- Public buildings do not generate income;
- Public buildings are state property and cannot be used as a real estate collateral;
- For any work or service involving a public building, building managers must obtain permits from the relevant line ministry representatives (Ministry of Education, Ministry of Health, etc.);
- The budgeting code does not allow a public agency to retain energy cost savings; and
- Alternative obligations to increase a public borrower's performance under a loan agreement (such as bail, guarantees, or penalties for late payments) are considered complex procedures by local commercial banks and usually not applied.

That is the reason why sustainability of the implemented projects often is an issue.

2.2. Driving forces for introduction of EE measures

Energy conservation issues are not new or only recently emerged. Dozens of books were published in the 80s-90s of the last century and earlier. Nevertheless, explanatory work with the population about the importance of energy conservation and resource conservation was stopped around the beginning of the 1990s and has not actually been conducted to this day. Some people (most of them are owners of the private houses, small hotels) have already understood the profitability of energy saving and follow the recommendations, that are mostly developed and disseminated with donors support. That refers mostly to energy efficient lighting (bulbs) and thermal insulation of buildings, windows. Thus, the KyrSEFF program has supported energy efficiency improvements in approximately 3,000 households, 24 multiapartment buildings and 163 businesses in the form of loans and grants. Energy efficient boilers and other equipment are used less.

Another issue is a poor quality of the energy efficient equipment – a good example is the LED lamps. There was a big information campaign on energy efficient lighting. Owners of private houses and small business like cafes, restaurants, and hotels started to introduce fluorescent lamps at the beginning and the LED lamps latter on, and understood the benefits of the technology. However, the local market is mostly filled with the goods manufactured in China. Suppliers from China having understood the local mentality (prefer to buy the cheapest goods) provide cheap goods that are usually of poor quality. It creates a bad image of the technology as poor quality products usually have poor efficiency and lifetime. The same picture is with any other equipment (windows, boilers, etc.). It becomes a challenge to find a product of really high quality.

New multi apartment buildings have good thermal insulation. But at the same time, the calculated electrical load is very high and can reach 10 kW per apartment with electric stoves and 6 kW for others with average total area 70 m^2. According to the norm SP 31-110-2003 on Design and installation of electrical equipment in residential and public buildings, the design load for apartments with increased comfort should be determined in accordance with the design assignment or in accordance with the declared capacity, that usually exceeds loads given above. This conflicts with the principles of energy conservation and reduction of specific energy consumption.

2.3. Legislation and policies

The Kyrgyz Republic has developed and adopted a number of laws and government decrees as well as strategic documents in the field of energy efficiency. At the same time energy efficiency legislation is based on two primary laws – the Law on Energy Saving (1998) and the Law on Energy Performance of Buildings (2011) – and on sparse related secondary legislation, such as government decrees, technical norms and regulations. It should be noted that as a cross-cutting issue, energy efficiency is addressed by

several other laws, the most relevant of which are: The Law on Energy (1996), The Law on Electricity (1996), The Law on Renewable Energy (2008), The Law on Oil and Gas (2004).

Most of these documents are outdated or not effectively implemented. Currently, at the initiative of the President of the Kyrgyz Republic, the entire regulatory and legislative framework of the country is being revised, this process should be completed in the fall of 2021.

- Energy Efficiency in Buildings Law 137, dated 26 July 2011 (updated on 20 June 2019). As amended by the Laws of the Kyrgyz Republic of October 18, 2013 No. 194, June 20, 2019 No 74.

The law governs the energy performance of buildings in the Kyrgyz Republic during design and construction (for new buildings) as well as for major renovations (existing buildings). The law is aligned with the EU best practice and based on the key requirements of the EU's Energy Performance in Building Directive (EPBD). The Law on Energy Efficiency of Buildings contains a number of important provisions for establishing effective institutional and general regulatory frameworks, such as:

- Assigning a governmental authority, the responsibility for improvement of buildings energy performance;
- Minimum energy performance requirements (MEPRs) for new and renovated buildings;
- Regular inspection of heating and hot water supply systems;
- Issuance of energy performance certificates (EPCs);
- Display of energy performance certificates (EPCs);
- Accreditation of experts, independent control and awareness raising.

- Law on Energy Conservation No 88, dated 7 July 1998.
  As amended by the Laws of the Kyrgyz Republic from December 24, 2008 No. 269, June 15, 2013 No. 96, July 30, 2013 No. 175, July 18, 2014 No. 144, July 6, 2016 No. 99, July 8, 2019 No. 83.

The law aims to increase energy efficiency in the production, transmission and distribution of energy. The law includes a number of important provisions for establishing effective institutional and regulation frameworks for energy efficiency.

- Law on Energy No 56, Dated 30 October 1996.
  As amended by the Laws of the Kyrgyz Republic dated May 16, 2008 No. 85, May 23, 2008 No. 93, January 23, 2009 No. 14, May 18, 2012 No. 60, October 10, 2012 No. 170, June 24, 2013 No. 99, July 19, 2014 No. 145, January 14, 2015 No. 10.

The primary objective of the law is to enhance the economic efficiency and reliability of the energy sector as well as to protect the interests of producers and consumers. The law also envisages that energy efficiency and energy conservation should be taken into account in process of development of the national energy programs.

There are several decrees of the Government and regulations related to energy efficiency improvement, including:

- Decree of the Government of the Kyrgyz Republic "On the preparation of sectors of economy and population of the Kyrgyz Republic for the autumn-winter period 2020/2021." Decree No. 228 dated 30 April 2020.
- Decree of the Government of the Kyrgyz Republic "On approval of the Medium-term tariff policy of the Kyrgyz Republic for electric and thermal energy for 2020-2022." Decree No. 188, dated 27 March 2020.
- Decree "On approval of the Action Plan of the Government of the Kyrgyz Republic for 2019 for implementation of the Plan of the Government of the Kyrgyz Republic for 2019-2023 for the implementation of the program of activities of the Government of the Kyrgyz Republic", approved

by the Resolution of the Jogorku Kenesh of the Kyrgyz Republic dated April 20, 2018 No. 2377-VI. Decree no. 141, dated 29 March 2019

- Regulations "On the procedure for energy certification of buildings", approved by the Resolution of the Government of the Kyrgyz Republic dated August 2, 2012 No. 531 (updated 17 January 2020, No. 13).
- Decree "On the Rational Use of Energy", Decree No.255, dated 2 June 2005.

There is a number of building codes and norms, such as:

- Building norms of the Kyrgyz Republic / System of regulatory documents in construction / Single apartment residential buildings. Date of introduction - December 27, 2018. Contains paragraph on energy performance.
- SNiP 23-01:2013, "Building Heat Engineering (Thermal Protection of Buildings)."
- SP 23-101-2013, "Design of Thermal Protection of Buildings."
- Method for Calculating the Energy Efficiency of Buildings and Determining Energy Efficiency Class for Energy Certification of Buildings. Gosstroy order, 26.05.2013.
- Methodical instructions for conducting periodic monitoring of the energy efficiency of boilers, heating systems of buildings, and hot water supply of buildings. Gosstroy order 26.05.2013.
- Guide to the settlement application for energy certification of buildings. Gosstroy order 26.05.2013.

It should be noted that there are a number of gaps and contradictions (between each other and international documents) in the existing documents, while a number of issues related to energy efficiency, in general, and in buildings, in particular, is not covered at all.

Local NGOs are working on the similar tasks without coordination with each other based on different approaches. As a result, they are developing documents (like draft building codes, decrees, or laws) that are not directly linked to each other and have a lot of contradictions. Some of them can be oriented more on the EU documents and norms, some - on Russian or Soviet or also on the Eurasian Economic Union (EAEU), which is more relevant, as the Kyrgyz Republic a member of EAEU. Some of these documents are then adopted by government or public bodies without proper expertise. This fact highlights the necessity of clear, well-structured governmental program and policy as well as control on legislation and norms in the field of energy efficiency (and not only in this, but in any field).

2.4. Existing challenges in the field of energy efficiency

All budget organizations procure goods and/or consulting services in accordance with the Law of the Kyrgyz Republic on Public Procurement of April 2015. Tender procedures are conducted through the official web portal for public procurement and according to the procurement methodologies to determine price and quality. There is no mandatory energy efficiency performance requirement of the purchased goods by law, but the procuring entity can add energy efficiency requirements to the tender specifications. Most tender procedures select the winner by choosing the lowest-price offer; in other words, restrictive procurement rules are biased towards lowest-price procurement and do not reflect the full cost of ownership (i.e. lifecycle cost). The contracting authority must state in the tender documentation the criterion of the most economically advantageous offer as well as sub-criteria for evaluation in accordance with the nature and purpose of the specific procurement subject. The current public procurement regulation does not consider criteria for reduction of building-operation or energy-supply costs (this refers for all spheres, when wins the lowest price, not the quality). With respect to energy efficiency, the criteria for lowest life-cycle costing could be applied to reflect this, but the concept remains theoretical due to (i) a lack of life-cycle cost-benefit assessment, (ii) insufficient capacities to

establish an EE project investment case, and (iii) a lack of detailed analysis for the evaluation. Consequently, the lowest initial price remains the decisive criterion.

More or less the same situation is with private sector – often home-owners and the family members don't understand the benefits of energy efficiency, as they do not have access to understandable reliable information. This leads to unwillingness to invest in the energy efficient technologies.

Another challenge for scaling up energy efficiency through procurement is that budgets in the public sector are submitted and approved on a single-year basis rather than on an extended (e.g. five-year) basis. This makes multi-year planning for facility upgrades quite difficult and, in general, can impede the multi-year contracting. An annual budget over one year is too short for adjusting expenditure priorities. This is particularly problematic for energy performance contracting, since such contracts require several years of energy savings before the investments are recovered. Multi-year budgeting could ensure that commitments made by governments are consistent with the medium-term fiscal outlook. Multi-year budgeting would also allow for better connections between policies, planning and budgeting. At the same time people, who are directly involved in the process – who are managing and using the buildings (doctors, teachers, clerks, etc.) should feel their responsibility and enrolment in the process of energy conservation by introduction of penalties and incentives, that is not the case at the moment. Budget organizations do not have access to the funds saved due to energy savings.

3. Gaps between the Framework Guidelines for Energy Efficiency Standards in Buildings and local realities

There are a number of technical, institutional, financial, regulatory and policy barriers which impede energy efficiency investments in the residential and public building sector in the Kyrgyz Republic. Among these barriers are the low market capacity for preparing, implementing and financing energy efficiency investments (e.g., energy auditing companies, design companies, financial institutions, construction companies, etc.); lack of awareness; lack of access to affordable financing for energy efficiency; the low financial viability and lack of incentives to invest in energy efficiency due to the low energy tariffs and norm-based billing practices; incomplete regulatory and enforcement framework for energy efficiency (e.g., standards for energy efficient appliance and materials; enforcement of building codes); etc.

In addition, a specific barrier to energy efficiency in the residential sector is a non-conformity or absence of incentives and responsibilities within multi-apartment buildings. Common spaces in residential buildings and centralized building-level heating systems often account for a large portion of energy savings potential. Simple repairs to doors, windows and hallways in common areas as well as heating system upgrades can yield substantial savings in heating costs to individual apartments. Experience from other countries, such the Russian Federation, Tajikistan and others in the ECA region, indicates that low-cost heat insulation, like radiator reflector can raise the indoor temperature by three to five degrees Celsius. More elaborate measures can save up to seven degrees Celsius.

HOAs in multi-apartment buildings could facilitate the implementation of energy efficiency improvements. However, even where HOAs exist, the contributions of tenants to repair funds are generally very low. A large proportion of tenants refuse to make any payments into these funds. Furthermore, although HOAs are legal entities, it is very difficult for them to gain access to financing for improvements. Banks are reluctant to lend because they cannot foreclose on residents if they do not repay their loans (WB, 2015).

It necessary to take into account the poverty and energy poverty in the country that is a challenge.

At the present moment people, including representatives of companies or institutions, are mainly not ready to pay for consulting and design services that usually accompany the energy efficiency improvement process. At the same time there is a lack of specialists and reliable sources of information/consulting.

3.1. Gap analysis between performance objectives of the Framework Guidelines and the requirements of existing energy efficiency standards in buildings

The principles formulated in the Framework Guidelines, are as follows:

- Low-carbon technologies oriented to encourage clean and potentially renewable energy-based technologies utilization to lower greenhouse gas emissions;
- Low energy consumption targeted to encourage energy efficiency increase in buildings leading to lower greenhouse gas emissions generally correlate with the governmental programs and strategies.

The objectives stated in the governmental programs are listed in very general terms, they are less detailed than in the Framework Guidelines. Specific mechanisms for the implementation of these objectives have not been developed. As a result, programs are only partially implemented at best. Another difficulties are unstable institutional structure; lack of continuity, lack of understanding and absence of real governmental or state program. Most of activities are promoted by donor organizations and they are not sustainable without local support. The market lacks specialists, goods, and services. It is difficult to develop the market because of low economical reasonability. As a result, none of governmental programs or strategies was fully implemented.

There is a number of recommendations and norms for heat conservation, but there is a lack for other aspects, such as electricity, water conservation, ventilation.

The positions of science in the country are very weak. The old scientific schools are degrading, the new are weak, and young people are not interested in scientific work. That is why it is extremely difficult to provide a scientific background for the process. There are institution and universities that have some scientific potential, but much to be done in order to arrange the scientific schools and assistance to EE.

Some measures on heat conservation, mainly by means of heat insulation, found understanding and application in private housing and in newly constructed multiapartment buildings. These technologies have found a certain spread thanks to assistance by donor organizations (such as UNDP, EBRD-KyrSEFF, WB). For the moment, no financing mechanism was established by the state.

There is no legislation and technical requirements on microgeneration that does not allow to consider buildings as energy consumers and generators (prosumers);

In order to provide high technological support by means of monitoring, real time energy performance and efficiency assessment, proper infrastructures like smart buildings and smart grids should be developed. Development of such systems should be included into the governmental program, including preparation of human resources capable to design, install and maintain such systems.

Education should become a sustainable basement for understanding, dissemination of the strategy and provide resources for its implementation.

3.2. Gap analysis between the requirements of existing energy efficiency standards in buildings and their actual implementation

The previous chapters provided information on the state of relevant sectors and areas affecting potential energy efficiency gains in the Kyrgyz Republic, and identified specific gaps and barriers to improving energy efficiency in buildings in the Kyrgyz Republic. This chapter summarizes and categorizes these gaps. Some of the gaps are interrelated to each other or between groups, that is why, some of them may be duplicated.

Legislative and regulatory gaps:

- Limited implementation of the Law on Energy Performance of Buildings due to incomplete secondary legislation.
- Lack of instruments and responsible entities/staff for monitoring the implementation of and enforcement of current energy savings legislation and programs.
- Public procurement regulations do not specify energy performance and quality criteria for equipment and materials.
- Outdated construction design standards (SNiPs) that do not cover all aspects of energy efficiency. There is a mismatch between the international and local norms. There are contradictions between different internal-national documents.

Institutional gaps:

- General lack of institutional focus and commitment to save energy, especially energy different from heat.
- Poor institutional memory due to high staff fluctuation and general lack of staff, as well as insufficient follow-up of failure to comply with commitments and acts.
- Weak inter-ministerial cooperation and coordination on energy efficiency targets, initiatives, projects and instruments.
- Limited communication and exchange between governmental agencies, NGOs and market players with regard to equipment and financing.
- Weak donor coordination on energy efficiency (the same in the other fields).
- Governmental strategies and institutions have lack of implementing mechanisms and agencies/specialists. There is also lack of expertise, and weak scientific support.
- Lack of dedicated investment programs for energy renovation within the budgetary organizations.
- Restrictive regulation preventing access to retained energy cost savings, for example to exploit cost savings for energy efficiency investments and reward employee engagement.
- System of certification of quality of goods exists but is not effective– it does not provide the control of quality and does not guaranty the quality.

Economic gaps:

There are a number of interrelated gaps, including low energy prices, low income of population, high interest rates on loans, low cost effectiveness. This leads to:

- Low financial profitability of EE investments (high payback period) at current energy prices and by neglecting economic costs;
- Lack of customized financial products for EE;
- Absence of ESCO and other possible services;
- Poor applicability of commercial financing (loans) due to high interest rates and long payback periods.

Capacity gaps:

- Limited awareness and understanding of energy efficiency opportunities, solutions, and benefits among public sector decision makers leading to lack of incentives to promote energy efficiency;
- Lack of information on EE of different types: general information (introductive), specific information (norms, standards, manuals);
- Limited access to existing information (documents, norms, methods local and international);
- No focus on other aspects of energy efficiency, except heat conservation;
- Low level of responsibility, including social responsibility;
- Insufficient utilization and promotion of results of past and ongoing EE demonstration projects and maintenance of these projects;

- Weak domestic market capacity and experience (e.g. energy auditors, design institutes, construction companies);
- Missing guidelines, instruments and specific capacities for conducting energy audits and energy performance certification by trained and qualified experts;
- Lack of a domestic laboratory for certification of materials and equipment to confirm their EE performance;
- Lack of consultants working in the area of energy efficiency. Weak scientific and educational potential;
- No reliable reference point – absence of the center of expertise.

Market gaps:

- Weak and fragmented market capacities for energy service caused by low demand;
- Limited presence of equipment and service providers in rural areas/regions;
- Low quality of installation services due to missing requirements and expertise for procurement, installation and supervision of contractors;
- Weak product quality which affects the market, and reducing demand;
- Low market capacity.

4. Conclusions and recommendations

4.1. Conclusions

The statistical data analysis demonstrates permanent growth of the population of the Kyrgyz Republic. This fact, in parallel with introduction of modern but not very efficient home appliances, leads to growth of power consumption. Commissioning of new housing and large shopping and entertainment centers leads to an additional increase in energy consumption. One of the main energy sources is electricity (about 60 per cent), while electricity generation is limited due to lack of new generating capacities and its dependence on river flow. This led to a shortage of electricity in the country.

Most of the energy prices are below the recovery costs, which leads to economic difficulties in the respective industries and organizations, disrupting their sustainability.

The average specific energy consumption in buildings is quite high, making 250 kWh/m2year, that roughly twice more than in the European countries and almost 5 times exceeds the objectives stated in the Framework Guidelines. This demonstrate the sufficient potential for energy conservation in the KR.

Low income in a number of households (about a quarter) is a challenge for energy accessibility and introduction of energy efficiency measures.

The reliable sources of information are of a great need. This includes the necessity to provide truthful reliable information on quality, approaches, investment needed, and cost effectiveness of energy efficiency measures. It is of great importance to make every inhabitant of the country understand the necessity and importance of energy conservation in the current conditions.

Most of the flats connected to district/centralized heating don't have heat energy meters and a technical ability to control the heating. That may cause overheating.

There are good examples of energy efficient technologies introduction, when the owners of the private houses and small hotels have already understood the profitability of energy saving and follow the recommendations. That refer mostly to energy efficient lighting (bulbs mostly) and thermal insulation of buildings, install more efficient windows (mainly prefer the cheapest options, but not the best in quality). Energy efficient boilers and other equipment are installed less.

New multi apartment buildings have good thermal insulation (in accordance with the Law on Energy Performance of Buildings). But the calculated electrical load is very high and can be more than 10 kW per apartment.

Most of the energy efficient equipment is quite expensive, while the loans are expensive too.

Poor quality of the energy efficient equipment is an issue. A good example of this is LED lamps which are quite cheap but not reliable. The same picture is with other equipment such as windows, boilers, etc.

There is also lack of information and expertise. A lot of people are still not aware of the approaches and technologies on energy efficiency. Some of the people who have basic knowledge of energy conservation have no access to reliable understandable information on its technics and benefits. There are a lot of cases when consumers get the technology, but cannot maintain it because of lack of technical and financial knowledge.

There is also no entity responsible for raising awareness and providing reliable information on energy efficient equipment and measures, actual prices, certificates, methods, and profitability. Here a software product could assist much.

Low awareness of the population about the energy efficiency classes of home appliances and equipment is another reason for people not to choose the more expensive goods.

There is non-conformity or absence of incentives and responsibilities within multi-apartment buildings. People living in the flats are not ready to invest in energy efficiency, poverty is an additional challenge. …

People are not ready to pay for consulting and designing. As a consequence, the market for consultancy services is not developing.

The objectives stated in the governmental programs correlate with the Framework Guidelines, but do not have mechanisms for implementation. The situation is complicated by the lack of sustainability and continuity of the state structure.

The market is not sufficiently developed, not only in terms of the availability of goods but also of services.

The main focus in energy conservation is on heat conservation, while other aspects of energy conservation are neglected, with insufficient information and scientific support.

As a result, a number of legislative, institutional, economic, capacity and market gaps were identified.

The overview and analysis of the situation have shown that a lot of norms and strategic documents were developed and approved in the Kyrgyz Republic. A lot of pilot and demonstration projects were implemented with the help of donor organizations. It pushed the introduction of energy efficiency performance requirements. People became aware of some EE technologies, understood their benefits and started to implement them. On another hand, for the past more than 20 years too little has been done to build a sustainable self-regulating system managing the energy efficiency issues. The system is not existing because of many gaps, most obvious and crucial of them are described above.

4.2. Recommendations

Based on the provided analysis, the prospective recommendations to promote the energy efficiency in the country were developed. The recommendations were divided into two groups: strategic recommendations, and technical recommendations. Strategic recommendations were determined as main priority. They aim to determine and consolidate the position and views of the state on the problems of energy conservation in the country, as well as determine the ways and tools for solving these problems. Technical recommendations are a subject for further development that should take place after the strategic recommendations are implemented. Implementation of technical recommendations can be initiated by the private sector.

The recommendations are arranged in a logical and chronological order, they can be summarized as follows:

Strategic recommendations

- At the highest governmental level, to determine the need for development and implementation of measures to improve energy efficiency as a necessary and urgent mechanism for development of the country.
- Assign the governmental entity (presumably, the Ministry of Energy and Industry) responsible for the policy and coordination of activity in the field.
- Establish an entity responsible for international collaboration and certification of materials, goods, solutions, equipment, and suppliers.
- Identify key areas of energy conservation and publicize them.
- Identify prospective funding sources.
- Increase capacity with skilled specialists and empower the RES and Energy Efficiency Department of the Ministry of Energy and Industry. At the first stage, there is a great need for effort to be done to build a sustainable institutional system. The help of donors could be extremely valuable in this process.
- Make critical analysis of existing local documents related to energy and energy efficiency (including the National Sustainable Development Strategy for 2018-2040, Concept of Green Economy in the Kyrgyz Republic "Kyrgyzstan is a country of green economy", Green Economy Development Program for the period 2019-2023, Development program for the Kyrgyz Republic for the period 2018-2022 "Unity, Trust, Creation", Concept for the development of the fuel and energy complex of the Kyrgyz Republic until 2030, Master Plan for energy sector of the Kyrgyz Republic up to year 2040), review them and adjust in accordance with the principles set forth in the Framework Guidelines.
- Develop institutional structure responsible for the EE, mainly from the existing organizations, outline additional structural elements. Split the responsibilities (research, education, economy, technical implementation, legalization, norms, etc.) and fix the links between the institutions, provide with funds.
- Develop/adopt a Program on EE aiming at net-zero consumption, which is focused on the conservation and rational use of all energy resources, not only on heat conservation, highlighting other benefits of energy conservation like climate change mitigation and more visible for the people result - impact on air quality. Among others, it should be aimed to freshwater and hot water conservation, energy efficiency equipment and technologies, energy efficiency in lighting, ventilation and air cooling, as well as use of RES.
- Provide a detailed description of the Program on EE, in particular:
    - Review existing, and develop new legal norms and technical requirements (building codes, rules, standards, etc.) in accordance with the program and international standards.
    - Provide ecological, health, industrial and fire safety of the approved and developed technical solutions and materials.
    - Review the Law on Public Procurement to consider EE performance and lifecycle costs;
    - Provide access to financial savings to the heads of budgetary organizations to give a bonuses to stuff involved and responsible for energy efficiency;
    - Implement the tariff and social assistance reforms;
    - Introduce incentives for entities and private sector that introduce renewable energy and increase energy efficiency, establish competitions with significant prizes;
    - Develop and keep updated the roster of EE measures and technologies with detalization:
        - Develop/adopt manuals on implementation;
        - Assess the feasibility of each measure (and keep updated). Create a database, catalogues of approved materials, equipment, solutions, and suppliers.
        - Assess the potential profits (including economic feasibility) of introduction ESCO or determine (monitor and promote) conditions that ESCO becomes functional.

    - Disseminate the reliable information – create an online platform as well as a consulting structure for live communication and interaction. The universal tool, like software product, can be used to allow performing calculations of energy savings and profitability.
- Popularize the Program, develop long term awareness program and start implementation of the awareness program.
- Popularize successful results and good practices, including involvement of educational institutions not only for information but also for research and education.
- Correct the program, as necessary.
- Provide continuous monitoring of the situation, as well as the necessary updates

Technical recommendations

- For individual family houses currently using coal stoves, the option with the lowest levelized cost of heat supply (LCHS) is the use of more efficient and cleaner coal stove. One of the possible solutions could be use of pyrolysis ovens/boilers. Gas stoves could become economically viable options as gas becomes available and affordable for use in individual family houses with more widespread access to gas networks.
- For individual family houses currently using electric boilers and radiators, switching to gas-fired heaters and boilers or electric heat pumps would be more economically viable. This assumes that the house is connected to the gas network. If gas is not yet available, heat pumps still make much more efficient use of electricity for heat production, and therefore have much lower operating costs, though their capital costs are higher than the capital costs of electric radiators. But introduction of heat pumps should be very limited at the first stage only to change traditional electric heating in order not to make an extra load for the electric network.
- For apartments with centralized heating the main focus should be made on:
    - efficiency of boilers and pipeline networks;
    - promotion of individual heat meters and transition to consumption-based billing;
    - (automatic) balancing of the heating systems (with weather compensation) and technical means of individual regulation of the amount of heat supplied to apartments;
- In any building, it is necessary to promote introduction of heat recuperators, renewables as well as solutions for heat control and automation.

References

Arkhangelskaya, 2014: A. Arkhangelskaya, Energy Efficiency in the Kyrgyz Republic: State, Objectives, Problems and Investments, Bangkok, 2014

Hydromet, 1989: Scientific and applied reference book on the climate of the USSR. Series 3. Long-term data. Parts 1-6. Issue 32. Kyrgyz SSR. Hydrometeoizdat/Leningrad, 1989. 375 p.

NSCKR, 2018: LIVING STANDARDS OF THE POPULATION OF THE KYRGYZ REPUBLIC 2013 - 2017, National Statistical Committee of the Kyrgyz Republic, Annual publication, Bishkek, 2018: -132 p.

NSCKR, 2011: Population and Housing Census of the Kyrgyz Republic 2009. Book IV in tables. Housing stock and housing conditions. National Statistical Committee of the Kyrgyz Republic, Bishkek, 2011: -464 p.

OECD, 2016: Financing Climate Action in Kyrgyzstan, Country Study, OECD, 2016.

SNIP 23-02: SNiP KR 23-02-00 “Construction climatology”, State inspection for architecture and construction under the government of the Kyrgyz Republic. Bishkek, 2000. 34 p.

Rodina, 2015: E.M. Rodina, K.B. Baktygulov, T.V. Pavlichenko, IMPROVING ENERGY EFFICIENCY OF BUILDINGS, Вестник КРСУ. 2015. Том 15. No 9

Twidell, et. al, 2015: Renewable Energy Resources By John Twidell, Tony Weir 3rd Edition, ISBN 9780415584388, Published January 26, 2015 by Routledge, -816 p.

UNECE, 2018: Mapping of Existing Energy Efficiency Standards and Technologies in Buildings in the UNECE Region, UNECE, 2018

WB, 2015: Ani Balabanyan, Kathrin Hofer, Johua Finn, Denzel Hankinson. KEEPING WARM: Urban Heating Options in the Kyrgyz Republic. Summary Report. The Word Bank. IBRD. IDA. 2015, 121 p.

WB, 2019: Roadmap for the implementation of energy efficiency in public buildings of the Kyrgyz Republic, ESMAP, The World Bank, 2019, Washington DC

Consulted websites:

https://countrymeters.info

http://donors.kg/en/

https://gpss.worldbank.org/en/projects

http://minjust.gov.kg

https://www.climatestotravel.com

https://www.kg.undp.org/

https://www.kyrseff.kg/

http://www.stat.kg

https://unece.org

Annex: Country profile

POLICIES ADDRESSING ENERGY EFFICIENCY IN BUILDINGS	
Framework legislation **Programs / strategies**	**Master Plan for energy sector of the Kyrgyz Republic up to year 2040. (in the elaboration)** The elaboration of the Master Plan was initiated by the State Committee for Industry, Energy and Subsoil Use of the Kyrgyz Republic, the Master Plan will analyze the electric sector as well as other energy carriers and important related topics such as, among others, energy efficiency and tariff policy. **Concept for the development of the fuel and energy complex of the Kyrgyz Republic until 2030** The draft. The main goal of the Concept is the sustainable development of the fuel and energy complex, the energy security of the country and regions, the energy efficiency of the real sector of the economy, the availability of energy for each consumer with a decrease in man-made impact on the environment. **Development program for the Kyrgyz Republic for the period 2018-2022 "Unity, Trust, Creation"** The Program contains a number of cross-cutting priorities - gender, environmental and technological dimensions, which should be closely integrated into each of the Program areas. The leading benchmark for the Program is a long-term vision until 2040, allowing to maintain a clear framework, taking into account global challenges and opportunities and national interests. The program is focused on maintaining continuity and consistency on those results of the NSDS 2013-2017 that remain important and / or have not achieved the desired result. It states the necessity of reforms of product markets in key sectors to attract private capital, and names energy sector among them. Indicates measures to resolve the full range of issues related to this sector, in particular, on tariff policy and management system. **Green Economy Development Program for the period 2019-2023** 14 November 2019 **Concept of Green Economy in the Kyrgyz Republic "Kyrgyzstan is a country of green economy"** Approved by the resolution of the Jogorku Kenesh of the Kyrgyz Republic dated June 28, 2018 No. 2532-VI The Concept puts priority on development of 10 Green sectors including green industry and green education, Green energy and energy conservation – is the second sector.

	National Sustainable Development Strategy for 2018-2040 Adopted October 2018 It defines energy as one of five critical sectors. The strategy foresees the scaling-up of energy-savings and energy-efficiency programs for the existing building stock and net-zero-energy buildings (NZEBs) for new construction. **The Program on Energy Conservation and Energy Efficiency Policy for 2015– 2017** Governmental Decree 601, dated 25 August 2015 (null and void – Decree no. 49 from 22 January 2018) The 2015–2017 EE Programme establishes a short-term EE target for the Kyrgyz Republic, namely to ensure the GDP growth of the country without a significant increase in energy consumption by 2017. **The Programme on Transition of the Kyrgyz Republic to Sustainable Development for 2013–2017** Government Resolution 218, dated 30 April 2013 The main energy-related objective of the Programme on Transition of the Kyrgyz Republic to Sustainable Development for 2013–2017 is to achieve energy security for the country and develop export potential. The programme proposes four priority directions: 1. The improvement of the regulatory framework, including the independence of the energy regulator and the enhancement of the financial stability of companies through tariff reform; 2. The development of incentives for EE, including the establishment of a governmental body responsible for EE and the promotion of EE measures; 3. The development of RESs by increasing the RES share in the energy balance and enhancing the utilisation of small hydropower potential; 4. Sustainable development of the energy sector (improving the reliability and security of the supply, improving metering discipline, etc.) **The Mid-Term Power Sector Development Strategy for 2012-2017** Government Resolution 330, dated 28 May 2012. The Strategy recognised the importance of tariff reforms and envisaged a gradual move towards achieving full cost recovery through tariffs by 2016. However, as of June 2017, the electricity tariffs for households still recover only 63% of the real costs. The development of the energy conservation policy was mentioned as one of the tasks of the Mid-Term Strategy. To achieve this task, the document set out the following measures: - the development of incentive programmes for the reduction of electricity and heat losses; - the establishment of limits and mandatory energy conservation requirements; - the enhancement of awareness among the local population; and - the establishment of a monitoring group to monitor the implementation of this energy conservation policy. **Note:** As of June 2017, none of the above activities have been implemented in practice.

	The National Energy Programme of the Kyrgyz Republic for 2008-2010 and Fuel and Energy Complex Development Strategy until 2025 Government resolution 47, dated 13 February 2008. The main priority of this energy strategy is to achieve the rational and efficient use of energy resources and scientific and human potential for enhancing energy security, economic development and improved quality of life for the population. The main objectives of the long-term strategy can be summarised as follows: - The development of generation and network capacities in such a way as to ensure energy security and the self-sufficiency of the power sector of the country; - The provision of a reliable supply of electric and heat energy for domestic consumers; - The development of a fully fledged competitive electricity market; - The enhancement of the efficiency of electricity and heat generation, transmission and distribution to the level of the world's developed countries; - The development of new generating and transmission capacities for electricity exports; and - Integration into the pan-Eurasian competitive electricity market. **Long-term strategy for Heat Supply in the Kyrgyz Republic (2004-2015)** The strategy plans for: -The introduction of a new tariff system; -The commercialization of HOBs and the creation of decentralised heating market -Support of condominium associations -Technical rehabilitation of the existing assets. **Decree of the Government of the Kyrgyz Republic on the preparation of sectors of the economy and population of the Kyrgyz Republic for the autumn-winter period 2020/2021** Decree no. 228 dated 30 April 2020 In order to provide the sectors of the economy and the population with electric, thermal energy and fuel resources, timely preparation of ministries, state committees, administrative departments and regions of the republic for the autumn-winter period, in accordance with Articles 10 and 17 of the Constitutional Law of the Kyrgyz Republic "On the Government of the Kyrgyz Republic »The Government of the Kyrgyz Republic issues a resolution annually. **Decree of the Government of the Kyrgyz Republic on approval of the Medium-term tariff policy of the Kyrgyz Republic for electric and thermal energy for 2020-2022** Decree no. 188, dated 27 March 2020 It defines the tariffs for electric and thermal energy for the years 2020-2022.

Framework legislation **Laws / Decrees**	**Decree On approval of the Action Plan of the Government of the Kyrgyz Republic for 2019 for the implementation of the Plan of the Government of the Kyrgyz Republic for 2019-2023 for the implementation of the program of activities of the Government of the Kyrgyz Republic, approved by the Resolution of the Jogorku Kenesh of the Kyrgyz Republic dated April 20, 2018 No. 2377-VI** Decree no. 141, dated 29 March 2019 Claims the plans on development of incentives for energy efficiency measures introduction (para.52). **Decree on the Rational Use of Energy** Decree no.255, dated 2 June 2005 "On the Approval of Limits for the Consumption of Heat, Electric Energy, Natural Gas, Water and the Intake of Wastewater for 2005-2006 for Public Organizations and on Measures for the Rational Use of Funds Allocated to Budget Organizations for Utilities Cost" With this regulation the government annually determines the supply limitations of energy consumed by regions and responsible agencies. As a result, many public buildings operators reduce energy supply in order to comply with the government order, which leads to lower and often sub-standard comfort levels (in such areas as indoor temperature and lighting). The order is provided either in physical terms (e.g. electricity amount in kWh or fuel amount in liters) or monetary terms (the cut in the energy supply budget, in KGS) and often forces building operators to switch to lower-cost types of energy (coal, for example) to maintain a certain level of heating. **Energy Efficiency in Buildings Law 137** Dated 26 July 2011 As amended by the Laws of the Kyrgyz Republic of October 18, 2013 No. 194, June 20, 2019 No 74. The law governs the energy performance of buildings in the Kyrgyz Republic during design and construction (for new buildings) as well as for major renovations (existing buildings). The law is aligned with the EU best practice and based on the key requirements of the EU's Energy Performance in Building Directive (EPBD). Kyrgyzstan's Law on Energy Efficiency of Buildings contains a number of important provisions for establishing effective institutional and regulatory frameworks: -Assigning a governmental authority the responsibility for the improvement of buildings energy performance -Minimum energy performance requirements (MEPRs) for new and renovated buildings -Regular inspection of heating and hot water supply systems -Issuance of energy performance certificates(EPCs) -Display of energy performance certificates(EPCs) -Accreditation of experts, independent control and awareness raising

	Law on Energy Conservation 88 Dated 7 July 1998 As amended by the Laws of the Kyrgyz Republic from December 24, 2008 No. 269, June 15, 2013 No. 96, July 30, 2013 No. 175, July 18, 2014 No. 144, July 6, 2016 No. 99, July 8, 2019 No. 83. Aims to increase the energy efficiency in the production, transmission and distribution of energy. The law includes a number of important provisions for establishing effective institutional and regulation frameworks for energy efficiency **Law on Energy 56** Dated 30 October 1996 As amended by the Laws of the Kyrgyz Republic dated May 16, 2008 No. 85, May 23, 2008 No. 93, January 23, 2009 No. 14, May 18, 2012 No. 60, October 10, 2012 No. 170, June 24, 2013 No. 99, July 19, 2014 No. 145, January 14, 2015 No. 10. The primary objective of the law is to enhance the economic efficiency and reliability of the energy sector as well as to protect the interests of producers and consumers. The law also envisages that energy efficiency and energy conservation should be taken into account in the development of the national energy programs.
Building energy codes	**Building norms of the Kyrgyz Republic / System of regulatory documents in construction / Single apartment residential buildings** Date of introduction - December 27, 2018 Contains paragraph on energy performance. **SNiP 23-01:2013, "Building Heat Engineering (Thermal Protection of Buildings)"** **SP 23-101-2013, "Design of Thermal Protection of Buildings"** **Method for Calculating the Energy Efficiency of Buildings and Determining Energy Efficiency Class for Energy Certification of Buildings** Gosstroy order, 26.05.2013 **Methodical instructions for conducting periodic monitoring of the energy efficiency of boilers, heating systems of buildings, and hot water supply of buildings** Gosstroy order +26.05.2013 **Guide to the settlement application for energy certification of buildings** Gosstroy order 26.05.2013

Compliance mechanism	Requirements for regular inspection of heating and AC systems: periodic monitoring of energy efficiency of boilers, heating systems and hot water supply. According to the Methodical instructions for conducting periodic monitoring of the energy efficiency of boilers, heating systems of buildings, and hot water supply of buildings the boilers should be monitored every 2-7 years depending on fuel and capacity. Penalties, incentives and other mechanisms for improving compliance with building energy codes in your country: - Penalties: According to the low on Energy efficiency in buildings there is an administrative liability for violation of the law, but there is no article in the Administrative code. - Incentives: Incentives are not available. One of the key issues is that the state entities (such as schools hospitals, ets.) are not interested in any economy of funds as they cannot get or redistribute the savings. Energy performance monitoring requirements: carried out at least once a year **(UNECE, 2018)** According to the Guide to the settlement application for energy certification of buildings energy certificate is valid for 10 years. All the inspections are to be done by certified specialists.
Institutions	**The State Committee on Industry, Energy and Subsoil of the Kyrgyz Republic (SCIES)** Governmental Decree 401, dated 15 July 2016 (prior to 2016 named the Ministry of Energy and Industry) A governmental authority responsible for the development and implementation of state policies in the following sectors: industry (except food processing), fuel, energy and subsoil. The regulation of the State Committee assigns specific responsibility to this authority for the development of the country's EE policy but does not assign any responsibility for the control and implementation of EE measures and the achievement of the targets. The structure of the committee includes a division responsible for renewable energy and energy efficiency that mainly deals with the development of small hydro projects and the improvement of energy efficiency on the supply side, that is, upstream, generation, transmission and distribution. **The Research Institute on Energy and Economics under the SCIES** Governmental Decree 687, dated 16 December 2015 (prior to December 2015 under the Ministry of Economy) An energy think tank producing research and analysis on the Kyrgyz energy markets and economy. According to the legal provisions relating to the Research Institute, the organisation is responsible for the scientific support of decision-making processes in the energy and economic sectors. **The State Agency for Regulation of the Fuel and Energy Complex under the Government of the Kyrgyz Republic (SARFEC)** Governmental Decree 650, dated 14 October 2014

	It is the energy sector regulator of the country, which is directly accountable to and not independent of the Government. In accordance with the statute of the SARFEC, the institution is required to regulate the energy sector through licensing and tariff setting for electricity, heat and natural gas. **The State Agency for Architecture, Construction, Housing and Communal Services** Governmental Decree 385, dated 14 July 2014 It is a governmental authority responsible for the development of policy in the construction sector. The regulation relating to the role and responsibilities of the agency[60] stipulates that the agency should consider EE parameters while developing the state policy in the housing sector. The agency has been also assigned responsibility for the improvement of the energy performance of buildings according to the Law on Energy Efficiency in Buildings adopted in 2011. The only institution that is consider the energy efficiency issues, trying to introduce norms and measures on EE. In the same time NGOs play a crucial role in promoting the strategies, norms and necessity of EE, that carry out the main work in this direction (UNDP, WB, ADB, EBRD, UNISON, PF "CREED", CAMP Ala-Too).
Energy performance certification	**The Law on "Energy Performance of Buildings"** The aim of the law is to establish a legal basis for the evaluation of energy efficiency and the reduction of energy resource consumption in buildings as well as regulating the legal and institutional relationship between the owners of buildings regardless of ownership, certified specialists, and state enforcement authorities. However, the new law and regulations apply only to new buildings and private house above 150m^2 which are considered big compared to houses built in rural areas. (IEA,2017) **The Republic Center for Certification in Construction,** It monitors the compliance of the technical characteristics of construction and energy-efficient materials with the requirements of safety standards in use and other standardized parameters. **The State Department for the Examination of Design Estimates** It monitors the compliance of design estimates with current standards and regulations (including energy efficiency requirements) **"Regulation on Energy Certification of the Buildings" and Regulation on Regular Inspection of Boilers, Heating and Hot Water Systems"** Governmental Decree 531, dated 2 August 2012 **Energy performance certificates**

	The Law on the Energy Performance of Buildings obliges residential, public, administrative and multifunctional non-industrial buildings building owners to prepare energy passports and energy certificates for the buildings. Due to the absence of certified energy efficiency specialists, very few new or retrofitted buildings have been certified up to now. Despite the existence of a legislative basis for energy performance certification, a responsible state institution for implementation and enforcement as well as a pool of qualified experts is not yet available. (World Bank,2019)
Utility-demand-side management programmes	**Kyrgyzstan Sustainable Energy Financing Facility (KyrSEFF)** EBRD and EU supported project with a loan amount of EUR 55 million by EBRD as credit lines for two phases and a grant of 9.24 million by EU. (OECD,2016)??? **Heat Supply Improvement Project by IDA(WB) from 2019.** Component 1: Improving supply efficiency and quality of the DH system in Bishkek. Installation of new substations and smart meters. Component 3: Demonstrating the benefits of energy efficiency improvements in public buildings The project was approved October 27, 2017, it became effective on April 25, 2019. The Project Development Objective (PDO) is to improve the efficiency and quality of heating in selected Project areas. The project supports the Government's objectives in the heating sector and helps to address recurrent winter energy shortages. Specifically, improving the efficiency and quality of heating supports the Government's sector strategy in the following ways: (i) helping to mitigate a further increase in electricity consumption for heating by improving DH services in Bishkek and by reducing the electricity consumption in selected public buildings through EE improvements; (ii) complementing the recent modernization of the combined heat and power (CHP) plant by network improvements of the DH system to ensure that the expected benefits of the investment reach end-users; (iii) ensuring that future heat and hot water tariff increases are accompanied by improvements in heat supply quality and reliability as well as by introducing the concept of consumption-based billing; and (iv) reducing fuel consumption, expenditures and health costs associated with the use of inefficient and polluting heating technologies for vulnerable households.
Energy pricing measures	**Decree of the Government of the Kyrgyz Republic on approval of the Medium-term tariff policy of the Kyrgyz Republic for electric and thermal energy for 2020-2022** Decree no. 188, dated 27 March 2020 The document declaring the policy was updated, but the policy and the tariffs in general were saved as before. By the current policy the increase of tariffs for electricity and heat is not supposed to be. **The official Mid-Term Energy Tariff Policy for 2014–2017** Government Decree 660, dated 20 November 2014 The policy scheduled gradual price increases to achieve cost-reflective electricity and heat tariffs by the end of 2017.

	Residential district heat (DH) and hot water tariffs for the period 2020-2022 Residential consumers DH: 1134.76 Som/Gcal Hot Water: 981.76 Som/Gcal / 64.38 Som/m^3 / 309.03 Som/(person*month) All other consumers, including public institutions DH: 1695.1 Som/Gcal Hot Water:1965.1 Som/Gcal / 97.19 Som/m^3 Electricity tariffs for main categories of consumers **Residential consumers:** Consuming less than 700 kWh/month - 0.77 Som/kWh, Consuming more than 700 kWh/moth – 2.16 Som/kWh **Other consumers**: 2.24 Som/kWh In the Kyrgyz Republic, prices and tariffs for electricity and heat energy do not cover the costs of energy companies, which led to their unprofitableness, and also did not stimulate consumers to take measures to save energy and improve energy efficiency (Arkhangelskaya, 2014) **Natural gas tariffs** The natural gas cost is pegged to the US dollar rate and makes 0.23\$/m^3 and 0.28\$/m^3 for residential and other consumers respectively. In national currency tariff for residential consumers changed from 13.8 Som/m^3 in the beginning of 2015 to 18.06 Som/m^3 in the end of 2020. For other consumer the tariff changed from 16.57 Som to 21.79 Som for the same period. Coal The price for coal is permanently increasing. According to the data of National Committee for Statistics for the last 10 years it changed from 3575 Som/t in 2010 to 4304 Som/t in 2020.
Financial incentives	There is a lack of financial resources allocated for large-scale energy efficiency rehabilitation in the public buildings sector. Funds allocated to the renovation of buildings usually do not include measures for improving energy efficiency and most renovation programs entail replacing only windows, lighting and heating systems. Building operators can tap into different funding sources for building renovation, such as municipal or regional budgets and central government funds (partly through the Community Development and Investment Agency of the Kyrgyz Republic, ARIS). At the request of local authorities, schools can apply for “stimulating” grants provided by the Ministry of Finance. These funds are provided by the national budget on a competitive basis that requires co-funding from local budgets. Funds can also be allocated from the District Development Funds, which are formed as a 2% share of the total tax paid by the country’s

	mining companies. Usually, funds are allocated for urgent repairs of buildings, but mainly the funds are allocated to the needs of social facilities through village or district administrations. The Kyrgyz government also has a program called "Safe Schools and Pre-School Educational Organizations," which aims to build or rebuild more than 2,000 schools and kindergartens in 2015-2024 at an overall cost of almost 50 billion KGS (World Bank,2019) There is no determined strategy or practice on support of energy efficiency measures introduction. As was stated above some incentives can me provided by international organisations as consultancies, grants, preferential loans for introduction of energy efficient measures. While in governmental plans, decrees, etc. some incentives may be declared (eg. Decree On approval of the Action Plan of the Government of the Kyrgyz Republic for 2019 for the implementation of the Plan of the Government of the Kyrgyz Republic for 2019-2023 for the implementation of the program of activities of the Government of the Kyrgyz Republic, approved by the Resolution of the Jogorku Kenesh of the Kyrgyz Republic dated April 20, 2018 No. 2377-VI para.52).
Promotion of ESCO	There were some projects, starting 2004-2006 promoting ESCO. Development of ESCO was mentioned in The Program on Energy Conservation and Energy Efficiency Policy for 2015– 2017, but no practical result was achieved. At least one ESCO was created in 2004, but doesn't exist from 2006.
Awareness programmes	There was a project financed by EBRD and supported by the government in 2009-2015 The initiative of transparency of the fuel and energy complex of the Kyrgyz Republic. Energy public awareness program financed by ADB. Both projects are mainly focused on energy sector in general, the second one is very weak. From the side of the government no work in progress.
Assistance for development and implementation of energy efficiency projects	**Heat Supply Improvement Project by IDA(WB) (2019 – present $43 million).** Component 1: Improving supply efficiency and quality of the DH system in Bishkek. Installation of new substations and smart meters. Component 3: Demonstrating the benefits of energy efficiency improvements in public buildings. **Housing Microfinance Project (2012 – present)** The project helps improve housing conditions for low-income Kyrgyz households by introducing an innovative housing microfinance lending product to local financial institutions, enabling them to provide funding for home improvements to low-income residents. Donor partner is the government of Switzerland. The project promotes energy efficiency in residential buildings by means of insulation, use of RE.

	Kyrgyzstan Sustainable Energy Financing Facility (KyrSEFF) (2013 – present) EBRD and EU supported project with a loan amount of EUR 55 million by EBRD as credit lines for two phases and a grant of 9.24 million by EU. **EBRD's Kyrgyz Sustainable Energy Financing Facility** ($55 million) to finance the implementation of equipment to save energy and water and to dispose of waste from homes and enterprises in the Kyrgyz Republic (since April 2013, more than 1,415 energy-saving projects have been supported, resulting in annual energy savings of 128 GWh); **A World Bank "Urban Development" project** for the rehabilitation of four schools and two kindergartens to improve their energy efficiency and seismic resilience, strengthen the building structure, and renew the heating system and building insulation; **A UNDP project, "Improving the Energy Efficiency of Buildings"** (2010-2014), to build an energy-efficient school in Osh and design an energy-efficient school in Bishkek; and **A World Bank "Enhancing Resilience in Kyrgyzstan" (ERIK) project**, which aims to improve the safety and functional conditions of schools (including energy efficiency improvements) in the areas of highest seismic hazard.

ENERGY PERFORMANCE OF NEW RESIDENTIAL BUILDINGS	
	Residential
Design envelope	**Requirements for U-value of building structures for New Buildings (not specified for residential or non-residential)** External Walls: 0.32 (W/m^2K) Windows in external walls and doors in spaces which people reside <=1.5 Flat roof: 0.20 Ceiling with vertical thermal flow (depending on the thermal flow direction and temperature difference): 0.2.-1.70 (World Bank,2019) In 2013, the standards were revised towards increasing the energy efficiency classes of buildings from 5 to 7, which is in line with the European Union Directives on Energy Efficiency in Buildings: 2002/91/EC and 2010/31/EC. In accordance with the new building codes, the actual thermal requirements for multi-apartment buildings, depending on the number of storeys, range from 64 to 78 kWh / m2. Monitoring showed that in 2014, 92% of new building projects in Kyrgyzstan comply with new building codes. (Rodina et al, 2015)
Heating	Average space heat demand for newly- constructed multi buildings apartment buildings (built after 2004) : 100-110 kWh/m2 (World Bank,2015)

ENERGY PERFORMANCE OF EXISTING BUILDINGS		
	Residential	**Non-residential**
Design envelope	Modern construction is characterized by excessive consumption of energy resources, with the use of construction structures and materials that are ineffective in terms of energy consumption, as well as the use of projects of buildings and residential buildings with high heat losses, low quality of construction work. (Arkhangelskaya, 2014)	The specific energy consumption currently averages 162 kWh per square meter of floor area, while demand averages 250 kWh per square meter. Approximately 70 to 88% of energy use in public buildings can be attributed to space heating, and electricity is used for space heating in 60% of all public buildings. Based on a number of energy audits in schools and hospitals (as well as the previously developed buildings inventory), the overall theoretical energy savings potential for the implementation of selected energy efficiency measures amounts to 50–60% of total energy consumption, or 500 GWh/year. (World Bank,2019)
Heating	Average Space heat demand per year for residential buildings Constructed in 1940-60s : 100-143 kWh/m2 Constructed in 1960-80s: 130-143 kWh/m2 (World Bank,2015) Recommended methods for calculating the thermal properties of enclosing structures to comply with the adopted standards, reference materials and design recommendations were set forth in the set of rules SP KR 23-101: 2009 “Design of thermal protection of buildings”. The new regulations have reduced energy consumption for heat supply in buildings from 140 to 80–100 kWh. · M2 per year, which allowed an average of 20% savings on energy bills. The new norms have led to an actual improvement in the learning conditions for schoolchildren in pilot schools and began to contribute to the improvement of the living conditions of citizens in buildings (Rodina et al, 2015)	Specific heat demand in kWh/m3/year Educational buildings: 30-66 Health facilities: 36-40 Administrative buildings: 45-50 (World Bank,2015)