KYRGYZ REPUBLIC: DISTRIBUTIONAL IMPACT OF ENERGY TARIFF REFORM

[Document subtitle]

Report No.

KYRGYZ REPUBLIC: DISTRIBUTIONAL IMPACT OF ENERGY TARIFF REFORM

January, 2019

Poverty and Equity Global Practice
Europe and Central Asia Region

Document of the World Bank

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The financial and technical support by the Energy Sector Management Assistance Program (ESMAP) and by DFID is gratefully acknowledged. ESMAP—a global knowledge and technical assistance program administered by the World Bank—assists low- and middle-income countries to increase their know-how and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. ESMAP is funded by Australia, Austria, Denmark, the European Commission, Finland, France, Germany, Iceland, Italy, Japan, Lithuania, Luxembourg, the Netherlands, Norway, the Rockefeller Foundation, Sweden, Switzerland, the United Kingdom, and the World Bank.

CURRENCY AND EQUIVALENT UNITS
(Exchange Rate Effective as of May 15, 2018)

Currency Unit	=	Kyrgyz som (KGS)
US$	=	68.4

WEIGHTS AND MEASURES
Metric system

ABBREVIATIONS

Gcal	Giga calorie
GDP	Gross Domestic Product
GoKG	Government of the Kyrgyz Republic
IMF	International Monitory Fund
KGS	Kyrgyz Som
KIHS	Kyrgyz Integrated Household Survey
kWh	Kilowatt hour
LFS	Kyrgyz Labor Force Survey
MBPF	Monthly benefit for poor families
MLSD	Ministry of Labor and Social Development
MoF	Ministry of Finance
MSB	Monthly social benefits
NBKR	National Bank of the Kyrgyz Republic
NSC	National Statistics Committee of the Kyrgyz Republic
SNA	State National Accounts

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Task Leaders	:	Katharina Gassner (GEE03), Saida Ismailakhunova (GPV03)

ACKNOWLEDGEMENTS

This report was prepared by a multi-sectoral team from the Poverty and Equity Global Practice (GP), and the Energy and Extractives GP. This report is part of the Kyrgyz Republic technical assistance for the energy tariff reform including poverty and social impact assessment and communication and outreach strategy led by Katharina Gassner and Saida Ismailakhunova (Task Team Leaders).

The report is prepared by Franziska Gassmann (consultant), Aline Meysonnat (consultant), Saida Ismailakhunova (Economist). The team benefited from advice and contributions of Moritz Meyer, William Seitz (GPV03), Oleksiy Sluchynskyy (GSP03), ____ (Peer Reviewers). The distributional analyze of the energy reform has been conducted in close coordination with government counterparts, development partners with earlier PowerPoint presentations and workshops used to support a dialogue on energy reforms facing the Kyrgyz Republic. The report was prepared under the guidance of Bolormaa Amgaabazar (Country Manager of the Kyrgyz Republic, ECCKG), Luis Felipe Lopez-Calva (ECA Practice Manager, Poverty and Equity GP); and Sameer Shukla (ECA Practice Manager, Energy and Extractives GP).

The team is grateful to the National Statistics Committee for the access to the Kyrgyz Integrated Household Survey, and the Kyrgyzstan Labor Force Survey that were drawn upon for the analysis within. The team is also grateful for consultations with government officials of the Kyrgyz Republic, primarily with the representatives of the Ministry of the Economy, Ministry of Finance, Ministry of Labor and Social Development, National Bank, the National Statistics Committee, National Institute for Strategic Studies of the Kyrgyz Republic. Any errors and omissions remain the responsibility of the authors.

Abstract

Energy tariff reforms have been at the center of the structural policy agenda in the Kyrgyz Republic since 1995. While in 2015 tariffs were increased for the residential electricity sector and thermal energy sector, energy tariffs are still below cost-recovery levels and further progress to increase energy tariffs has been stagnant. However, given the long-term unsustainability of below-cost recovery energy tariffs the government of the Kyrgyz Republic (GoKG) has put forward plans to increase energy tariffs in the residential sector as of the year 2018. Using data from the 2016 Kyrgyz Integrated Household Budget Survey (KIHS), this report analyzes the poverty and social impact of energy tariff increases on Kyrgyz households. In this report current energy consumption patterns are analyzed, poor and vulnerable households are identified and the level and distribution of implicit energy subsidies is estimated. In addition, the report simulates the distributional and poverty impact of the tariff reform put forward by the GoKG until 2023.

The distributional and poverty impact of electricity and thermal energy tariff increases until 2023 is moderate with an expected cumulative real income loss of 3.5% on average, of which 3% is due to the increase in electricity tariffs and 0.5% due tariff increases for thermal energy. However, for thermal energy users, the proposed thermal energy tariff increase would result in an average cumulative welfare loss of 3% in 2023, and combined with electricity, the expected loss would be 4.1%. The increase in thermal energy tariffs will result in a considerably larger loss for those households that are already energy poor in the current situation, which means that they spend more than 10% of their household budget on energy. The estimates predict that they would incur real welfare losses of up to 5%, and 7.2% if combined with the effect of increases in electricity tariffs. In order to cushion the impact for the most vulnerable groups, mitigation measures should be considered.

Table of Contents

List of Figures

List of Tables

Executive summary

Although energy tariffs for the residential sector have been raised several times over the last decade, they are still below cost-recovery levels to this day. The Kyrgyz Republic mainly relies on a combination of hydroelectric and thermal systems for the generation of electricity. The hydroelectric system includes large multi-year storage facilities that ensure the provision of electricity also in dry winters. Since 1995 tariff reform in the energy sector has been part of the structural policy agenda in the Kyrgyz Republic. In December 2014, tariffs for thermal energy were increased by 24% for district heating and 48% for hot water, respectively. A second increase in thermal energy tariff came into effect in April 2015. In January 2015, the Government of Kyrgyzstan introduced a two-tiered residential electricity tariff and increased the tariff for consumption above the threshold of 700 kWh per month. In August 2015, electricity tariffs were also raised for consumption below the threshold, and the tariff for above-threshold consumption was further increased.

In order to achieve cost-recovery for residential energy consumption in the long run, the GoKG considers further increases in both electricity and thermal energy prices. Despite the recent increases, energy tariffs are not at cost-recovery levels in the residential sector. World Bank analysis shows that in 2016, residential tariffs for consumption below 700 kWh, were only 35 percent of cost-recovery level. This below cost-recovery tariff covers 53 percent of overall consumption and is applied to 81 percent of residential consumption. Only for the second tier, the electricity tariff is close to cost-recovery levels. For hot water and district heating, tariffs as of April 2015 still remain at around one third of cost-recovery levels for households.

The objective of this report is to analyze the poverty and distributional impact of moving energy tariffs to full cost-recovery levels in the Kyrgyz Republic, using data from the 2016 Kyrgyz Integrated Household Survey (KIHS) collected by the National Statistical Committee (NSC) of the Kyrgyz Republic. The analysis only considers residential consumers and is limited to first-order effects based on the assumption that an increase in energy prices has an immediate effect on household welfare, particularly in the short run.

In 2016, still a quarter of the Kyrgyz population is living in absolute poverty. The risk of living in poverty is particularly high for individuals living in Jalal-Abad, Batken and Naryn oblasts. Topographic conditions also matter given that 31% of the population living in high mountain areas is poor. Children have a considerably higher risk of living in a poor household, while the poverty rate of elderly citizens is slightly below the country average.

The level of residential energy consumption mainly depends on the availability of energy sources and the type of heating used. While close to 100% of the population is connected to the electricity grid, only 10% of the population has access to the district heating system. Overall, 83% of the population use a stove for heating, burning solid fuels such as coal or wood, and more than half of the population also use electricity for heating. Central district heating is the main heating source for almost half of the population in Bishkek. Yet, still 38% of the population in the capital use a stove, often in combination with electric heating. In rural areas, most people use a stove for heating, but more than half combine it with electric heating.

In 2016, an average Kyrgyz household consumed 4,795 kWh of electricity and 1.05 Gcal of thermal energy (district heating and hot water combined). On average, 85% of households remained below the 700 kWh per month. Except for the poorest households, electricity consumption is relatively equal across the income distribution. Annual electricity consumption is particularly high in households living in urban areas other than Bishkek due to the relatively higher prevalence of electric heating. The consumption of thermal energy increases steadily with increasing welfare. The richest 40% of households consume at least two times more thermal energy than the poorest 40% of households.

Annual energy expenditures, including all types of energy, account for 6.6% of total household expenditures on average. Outside Bishkek, solid fuels and electricity take the largest share, while thermal energy and piped gas require less than one percent of the total household budget. Households that spend more than 10% of their total budget on energy are generally considered ‘energy poor’. In 2016, this applied to 17% of Kyrgyz households. The share of energy poor households is particularly

high in Bishkek, with close to half of the households exceeding the 10% share. A combination of monetary poverty and energy poverty makes households particularly vulnerable. In 2016, 2.3% of the population was both energy poor and income poor. Of those, 15% lived in Bishkek. The risk to be at the same time income and energy poor is particularly high in high mountain areas and the oblasts Chui and Naryn.

Implicit energy subsidies jeopardize the fiscal sustainability of the government and limit future investments into the energy sector. More than 80% of electricity consumption is charged at the lower tariff, which is a third of the cost-recovery tariff. Similarly, district heating and hot water prices are also a third of their cost-recovery tariffs. Hence, energy consumption is heavily subsidized. Yet, these subsidies are implicit, taking the form of zero-interest loans from government to the energy companies to cover their losses. Overall, the implicit energy subsidies represent a value of 2% of GDP, of which three quarters stem from subsidized electricity tariffs.

Overall, implicit subsidies are regressive, benefiting richer households more than the poor. The implicit benefits from paying below cost-recovery tariffs for electricity benefit both poor and rich households equally. An entirely different picture emerges when considering thermal energy. Richer households, mainly living in Bishkek, benefit disproportionally from the reduced thermal energy tariffs.

Raising the residential energy tariffs to cost-recovery levels has become an integral part of the Kyrgyz Republic's energy sector reform. For electricity, the scenario proposed by the regulator until 2023 foresees in the gradual increase of tariffs for consumption below the threshold and a reduction of the socially oriented tariff threshold. The step-wise reduction of the threshold to 350 kWh per month would mean that only one third of the households remains below the reduced threshold in the winter, while in the summer around 70% of the households would stay below 350 kWh per month. For thermal energy, the regulator plans to equalize the tariffs for hot water and heating and increase the tariffs every second year with 10 to 20%. However, none of these scenarios would achieve full cost-recovery by 2023. Two alternative scenarios are simulated for electricity, one which constitutes a lower bound, where only below-threshold tariffs are increased and an upper bound where the threshold is reduce and both tariffs below and above the threshold are increased. The alternative scenario for thermal energy foresees in a gradual increase of tariffs up to cost-recovery in 2023.

Overall, the effect of the proposed tariff reforms is moderate, but certain groups will find it more difficult to cope. If the regulator's scenarios are to be implemented, households would spend 2.7% of their expected total expenditures on electricity and 0.9% on thermal energy on average in 2023 (5.4% if only thermal energy users are considered). The increase in both electricity and thermal energy tariffs will result in an average cumulative real income loss of 2.4% by 2023. The expected cumulative loss is highest for thermal energy users (4.1%) and for households that are already energy poor in 2016 (3.9%). Poor households are expected to experience a real welfare loss of 2%.

The impact on household welfare would be substantially larger using the tariff scenarios, which would achieve cost-recovery in 2023. The increase in electricity tariffs would result in a cumulative average loss of 3%. Households in urban areas outside Bishkek, households mainly relying on electricity for heating and poor households would suffer the largest welfare losses if both thresholds are reduced and tariffs increased. The scenario of raising thermal energy tariffs to cost-recovery levels by 2023 would decrease the real welfare of thermal energy users by 7.3%. If households respond to the increase in electricity tariffs by reducing their consumption, the real income loss will be lower. However, assuming that households still require the same amount of energy, electricity might be compensated with other energy sources, such as solid fuels in the case of heating. As a result, the demand for alternative energy sources increases, which may increase the price of the alternatives and hence result in a higher real income loss. Alternatively, the increase in electricity prices may induce households to save energy by better insulating their properties or replacing older electric appliances or light bulbs with more energy efficient goods.

In line with the estimated real welfare loss, implementing the regulator's energy tariff scenarios would result in a 1.5 percentage point higher poverty rate in 2023. Without energy tariff increases and under the assumption that total household consumption grows annually with the predicted GDP per

capita growth rate and that all households benefit equally from economic growth, poverty is estimated to decrease to 13.8% in 2023, which is a reduction of 11.6 percentage points compared to 2016.

Assuming nominal growth of household incomes over time, the increase of energy tariffs, in particular for electricity has very moderate effects, yet, some households will be more affected than others. The increase in energy tariffs will be most painful for those that are currently both monetary and energy poor. Among this group, a relatively large share lives in Bishkek and most of them might not have the option to switch heating source. Households in high mountain areas and households with three or more children are also more likely to be both monetary and energy poor. These groups might be in need of mitigation measures that enable them to consume a basic amount of electricity and stay warm during the winter months.

Existing social protection programs play an important role in the Kyrgyz Republic, but they may not be sufficient to protect poor households against the increase in energy tariffs. The Monthly Benefit for Poor Families with children (MBPF), the only poverty targeted program for households with children, reaches one fifth of the population belonging to the poorest quintile. Energy compensations introduced by the GoKG in 2010, such as the energy compensations for pensioners with a low pension and the higher threshold of 1,000 kWh for high mountain households during the winter months do not particularly benefit the poor. In addition, the city of Bishkek provides housing subsidies to poor and vulnerable families in support of the payment for housing and communal services. This program could be extended nation-wide to mitigate the impact of energy tariff increases. Similarly, Armenia and Moldova have introduced targeted programs to compensate for energy reforms, which could serve as example for the Kyrgyz Republic.

Basic assumptions underlying the simulations

- Total household expenditures grow annually with nominal GDP per capita growth rates to reflect changes in household expenditures until 2023.
- We assume electricity and thermal energy consumption to remain at the 2016 level.

Alternative model for electricity:

- We assume households adjust the electricity consumption in response to the tariff increase and estimate price elasticities from -0.15 to -1.0.

1 Introduction

1. Since 1995 tariff reform in the energy sector has been part of the structural policy agenda in the Kyrgyz Republic. Although energy tariffs for the residential sector have been raised several times over the last decade, they are still below cost-recovery levels to this day. While tariffs for the industry (non-residential consumers) are at cost-recovery levels, the Government of the Kyrgyz Republic (GoKG) has been reluctant to increase the tariffs for households (World Bank, 2017).

2. The Kyrgyz Republic mainly relies on a combination of hydroelectric and thermal systems for the provision of electricity. The hydroelectric system includes large multi-year storage facilities that ensure the provision of electricity also in dry winters. Two combined heat and power plants provide both electricity and heat/hot water (World Bank, 2017). Although Kyrgyzstan has its own, though limited, natural gas reserves[1], only 20% of the population is connected to and utilizes natural gas.[2]

3. While thermal energy tariffs for residential consumers have increased significantly since 2009, electricity tariffs have only changed in 2015. This was the first increase since 2008 (Gassmann, 2010).[3] In January 2015 the Government of Kyrgyzstan introduced a two-tiered residential tariff and increased the tariff for consumption above the threshold. For the first 700 kWh of electricity consumption per month, households continued to pay the low tariff of 0.7 KGS/kWh. The tariff for consumption above 700 kWh per month was set at 1.82 KGS/kWh. In August 2015, electricity tariffs were also raised for consumption below the threshold (to 0.77 KGS/kWh), and the tariff for above-threshold consumption was further increased to 2.16 KGS/kWh. In December 2014 tariffs for district heating were increased from 715 to 917.78 KGS/Gcal, and the tariff for hot water increased from 518 to 664.94 KGS/Gcal. These tariffs were further increased in August 2015 by around 24% for district heating (to 1134.76 KGS/Gcal) and 48% for hot water (to 981.76 KGS/Gcal), respectively. However, as of 2016 there have been no further tariff increases.

4. In order to get energy tariffs for residential consumers to cost-recovery levels in the long-run, the GoKG considers further increases in both electricity and thermal energy prices. In light of these reforms, it is important to analyze the distributional effects of tariff increases and to understand which households will be most affected. Analyzing future tariff reforms ex-ante gives important insights on possible distributional outcomes, the households that will be most affected and the potential scope of mitigation measures needed to protect the energy consumption of poor and vulnerable households. The objective of this report is to analyze the distributional impact of increasing energy tariffs for residential consumers to full cost-recovery levels in the Kyrgyz Republic. While energy tariffs for other sectors of the economy are already at cost-recovery, tariffs for residential consumers remain heavily subsidized. Therefore, the focus of this report, is on households and individuals. The report examines current energy consumption patterns, identifies poor and vulnerable households, estimates the level and distribution of implicit energy subsidies, and simulates the distributional impact of various tariff reform scenarios to full cost-recovery level. It should be noted that the analysis is limited to first-order effects based on the assumption that an increase in energy prices has an immediate effect on household welfare given that a larger share of the budget has to be allocated to energy to keep energy consumption at pre-reform levels. Alternatively, households may reduce electricity consumption and/or switch to other energy sources in response to the tariff increase. To account for these behavioral changes, different price elasticities are applied in the analysis. Yet, the options to control energy consumption and/or switch to alternative heating sources are limited for Kyrgyz households, particularly in the short run. Hence, the estimates presented in this report refer to short-term impacts.

5. The analysis uses data from the 2016 Kyrgyz Integrated Household Survey (KIHS) collected by the National Statistical Committee (NSC) of the Kyrgyz Republic. The survey is conducted quarterly on

[1] The natural gas reserves are estimated at 6 billion cubic meters (http://www.gazprom.com/projects/kyrgyzstan/)

2 This might change in the future given the recent developments in revamping the international gas pipeline from Uzbekistan to Kazakhstan (https://oilprice.com/Geopolitics/Asia/Kyrgyzstan-Unveils-Revamped-Transnational-Gas-Pipeline.html). Gazprom has acquired a majority stake in Kyrgyzgas which is expected to increase the availability and affordability of natural gas in the future (Balabanyan et al., 2015).

[3] Except for the failed attempt to increase electricity tariffs in 2010.

households in the Kyrgyz Republic and provides information on 5015 households on household composition, education and health, migration, employment, housing and utilities, land and livestock possession and household income and expenditures. The data is representative at the national and oblast level. Despite the comprehensiveness of the KIHS, there are some limitations for the current analysis. First, the dataset only contains indirect information on energy consumption of households. While it provides information on the availability of utilities such as heating, hot water, electricity and gas, it does not provide information on the actual consumption in kilowatt hours or calories. Hence, energy consumption in this report is estimated by dividing household energy expenditures by unit costs. Second, the focus of the analyses is on first-order effects and does not evaluate second-order effects. Energy tariff increases can affect the general price level for other goods and services, or households may switch energy source in response to tariff changes. The focus of this report is on the impact of the tariff reform in the residential sector, even though other sectors of the economy might be affected by the reforms as well.

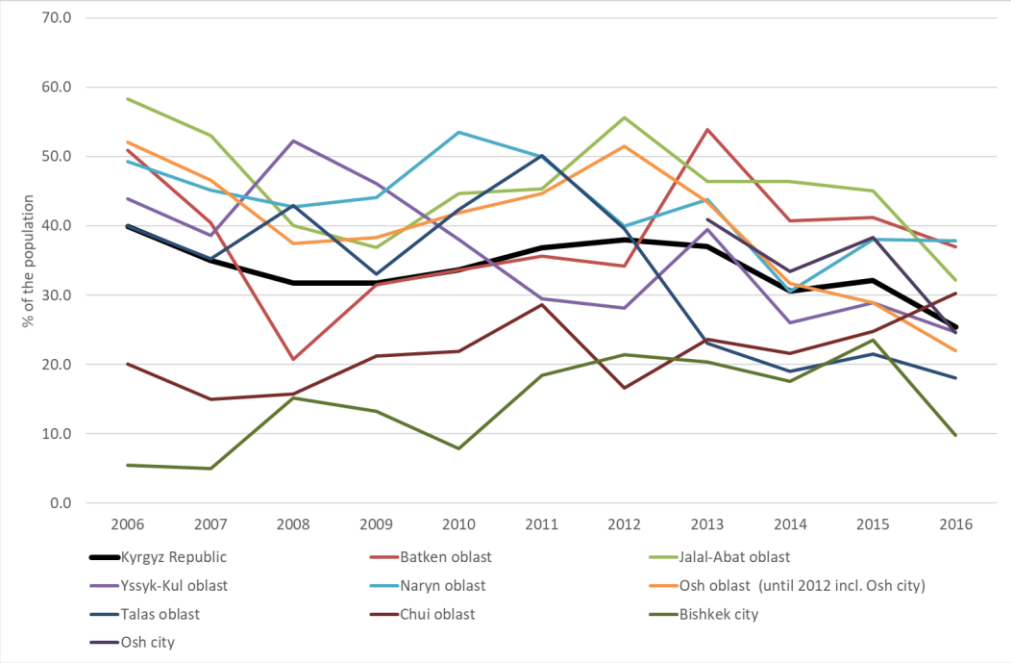
6. The report is structured as follows: First a general background on poverty and severe poverty of households is provided, followed by a brief description of tariff reforms and pricing structures of the energy sector. Next, current patterns of energy use, connectivity and energy mix are described, followed by an analysis of energy expenditures. Energy affordability and current policy measures to ensure energy affordability are discussed in section six and seven, respectively. In section eight the distributional impact of different tariff reforms is analyzed. The report concludes with a discussion on the results in section nine.

2 General background on poverty

7. While poverty rates have been decreasing steadily in the first decade of this millennium until 2007 (World Bank, 2017b; NSC 2017), the development in the second decade was much more volatile, with increasing poverty rates between 2008 and 2012 (NSC, 2017). Figure 2.1 also shows that there is no clear ranking in terms of poverty rates by oblast. While poverty rates used to be lowest in Bishkek and Chui oblast in most years, since 2014 the risk to be living in poverty has increased significantly for the population in Chui oblast. In 2016, 25.6% of the population lives below the national absolute poverty line[4] and 0.8% are considered extremely poor. In other words, an estimated 49,091 people are considered extremely poor.[5] Based on this, one could conclude that extreme poverty is almost eradicated. Yet, in Chui and Naryn, there are still three percent of the population living in extreme poverty. In rural and other urban areas, up to three out of ten people are compared to one in ten in Bishkek. Substantial differences in poverty rates can be observed across regions. The risk of living in poverty is particularly high for the population living in Jalal-Abad, Batken and Naryn oblasts. The topographic condition also matters given that 31% of the population living in high mountain areas is poor. Although the risk of being poor is considerably lower in the plains, these areas account for more than 70% of the poor. Poverty is positively correlated with the number of household members, and also with the number of children per household. Children as such have a considerably higher risk of living in a poor household. Pensioners, which have been partly compensated since the attempt to increase energy tariffs in 2010, are not above proportionally poor compared to the total population. The poverty rate of elderly citizens is slightly below the country average. The poverty rate for individuals living in households headed by an old-age pensioner is 27.6%. The poverty incidence of different population groups is shown in Table 2.1 and Table 2.2.

[4] In 2016, the national poverty line was 31,145 KGS/year.
[5] A 95% confidence interval reveals a lower bound of 0.32% of the population (19898 individuals) and an upper bound of 1.13% of the population (69230 individuals) to be considered extremely poor.

Figure 2.1. Development of poverty rates, by oblast, 2006-2016



Source: NSC (2018) stat.kg/en/opendata/category/120/

Table 2.1 Poverty incidence and share by location in 2016, % of the population

	Poverty rate (%)	Extreme poverty rate (%)	Poverty gap (%)	Share among the poor	Share in population
Average	25.6	0.8	4.2	100.0	100.0
By region:					
Bishkek	9.7	0.0	1.4	6.0	15.9
Other urban	26.0	0.6	3.9	19.8	19.5
Rural	29.4	1.1	4.9	74.2	64.6
By oblast:					
Issykul	25.2	0.0	4.5	7.7	7.8
Jalal-Abad	32.2	0.1	4.1	24.0	19.1
Naryn	38.1	2.6	6.7	6.8	4.6
Batken	37.3	0.3	6.9	12.0	8.2
Osh	22.5	0.8	3.5	18.5	21.0
Talas	18.0	0.0	2.4	2.9	4.2
Chui	30.6	3.1	6.5	17.7	14.8
Bishkek	9.7	0.0	1.4	6.0	15.9
Osh City	24.6	0.0	2.4	4.4	4.60
By topographic region:					
High-mountain	31.1	1.2	5.4	12.3	10.1
Semi-Mountain	24.5	0.0	3.2	12.6	13.2
Flat	25.0	0.9	4.2	75.1	76.7

Source: Own calculations based on KIHS 2016. Individual weights

Table 2.2 Poverty incidence and share by demographic characteristics, 2016, % of population

	Poverty rate (%)	Extreme poverty rate (%)	Poverty gap (%)	Share among the poor (%)	Share in population (%)
By Household size:					
1 member	0.5	0.0	0.0	0.0	1.8
2 members	2.2	0.2	0.3	0.7	8.0
3 members	5.7	0.4	0.8	2.9	13.1
4 members	12.1	0.3	1.5	9.2	19.3
5 members	23.9	0.2	3.5	19.7	21.1
6 members	37.0	0.8	5.2	27.4	18.9
7+ members	57.8	2.7	11.4	40.2	17.8
By age:					
below 6	42.9	2.0	8.5	19.0	14.2
6-15	40.6	1.6	7.5	25.7	20.3
16-20	29.6	0.8	5.3	7.4	8.1
21-40	32.2	1.3	5.9	26.3	26.2
41-60	22.1	0.8	3.8	15.7	22.8
61-70	20.3	0.3	3.6	3.0	4.7
70+	23.9	1.2	4.5	2.7	3.7
By sex*:					
Male	26.0	0.8	4.2	48.3	47.5
Female	25.2	0.8	4.2	51.7	52.5
By economic status of household head:					
employed	22.8	0.3	3.4	45.2	50.8
unemployed	43.4	4.8	9.8	12.8	7.6
pensioner old age	27.6	0.9	4.4	28.5	26.4
pensioner disability	26.2	0.0	3.8	3.7	3.6
other	21.4	0.5	3.4	9.7	11.6
By number of children below 16 in household:					
none	4.8	0.1	0.0	3.6	19.2
one child	13.9	0.2	0.0	11.9	21.8
two children	25.7	0.7	0.0	25.1	25.1
three or more children	44.7	1.6	0.1	59.3	33.9

Source: Own calculations based on KIHS 2016. Individual weights.*not significant at 10% level

3 Tariffs and pricing structure

8. As already mentioned in the introduction, the Kyrgyz Republic mainly relies on a combination of hydroelectric and thermal systems for the provision of electricity. The hydroelectric system includes large multi-year storage facilities that ensure the provision of electricity also in dry winters. Two combined heat and power plants provide both electricity and heat/hot water (World Bank, 2017). The centralized district heating system providers rely on coal and electricity for the production of heat and hot water (Balanyan et al., 2015). After the collapse of the Soviet Union, gas became scarce and expensive, and many households started using electricity for heating their premises. Households relying on district heating also use electricity for additional heating which puts an additional strain on the electricity grid, particularly during harsh winters (Balanyan et al., 2015).

9. In December 2014, tariffs for thermal energy were increased by 24% for district heating and 48% for hot water, respectively. A second increase in thermal energy tariff was implemented in April 2015 (see Table 3.1) Since January 2015, a two-tiered electricity tariff applies to residential consumers. For the first 700 kWh of electricity consumption per month, households paid the low tariff of 0.7 KGS/kWh. The tariff for consumption above 700 kWh per month was set at 1.82 KGS/kWh. In August 2015, electricity tariffs were increased to 0.77 KGS/kWh for the first tier (<700kWh/month) and 2.16 KGS/kWh for the second tier (>700kWh/month). As of 2016, energy prices were not increased but stayed at 0.77 KGS/kWh for the first tier and 2.16 KGS/kWh for the second tier.

Table 3.1 Recent Energy Tariff Reforms, Kyrgyz Republic, 2014-2016, KGS

		2014	2015 Jan-Mar	2015 Apr-Dec	2015 Jan-Jul	2015 Aug-Dec	2016	Cost-Recovery**
Electricity <700	kWh	0.7			0.7	0.77	0.77	2.17
Electricity >700	kWh	0.7			1.82	2.16	2.16	2.17
District heating	Gcal	715	917.78*	1134.76			1134.76	3443.48
Hot water	Gcal	518.29	664.96*	981.76			981.76	2924.96

Source: World Bank (2017) Analysis of the Kyrgyz Republic's Energy Sector; publication supported by PPIAF (www.ppiaf.org).
*Effective December 2014; ** as per November 2017

10. Even though energy tariffs have increased considerably in 2015, they are not at cost-recovery levels in the residential sector. For cost recovery, district heating would need to be priced at 3,443.48 KGS/Gcal, hot water at 2,924.96 KGS/Gcal and electricity at 2.17 KGS/kWh per month. Even after the energy tariff increases in August 2015, households pay the low tariff of 0.77 KGS for the first 700 kWh of electricity consumption per month, and 2.16 KGS for consumption higher than 700 kWh. World Bank analysis shows that in 2016, residential tariffs for consumption below 700 kWh, were only 35 percent of cost-recovery level. This below cost-recovery tariff covers 53 percent of overall consumption and is applied to 81 percent of residential consumption. Only for the second tier, the electricity tariff is close to cost-recovery levels. For hot water and district heating, tariffs as of April 2015 still remain at around one third of cost-recovery levels for households.

4 Patterns of energy use

11. The level of energy consumption depends on several factors, amongst others, the availability of energy sources, the type of heating used and the frequency of power interruptions. While close to 100% of the population is connected to the electricity grid, only 10% of the population has access to the central heating system. 20% of the population is connected to a gas line.

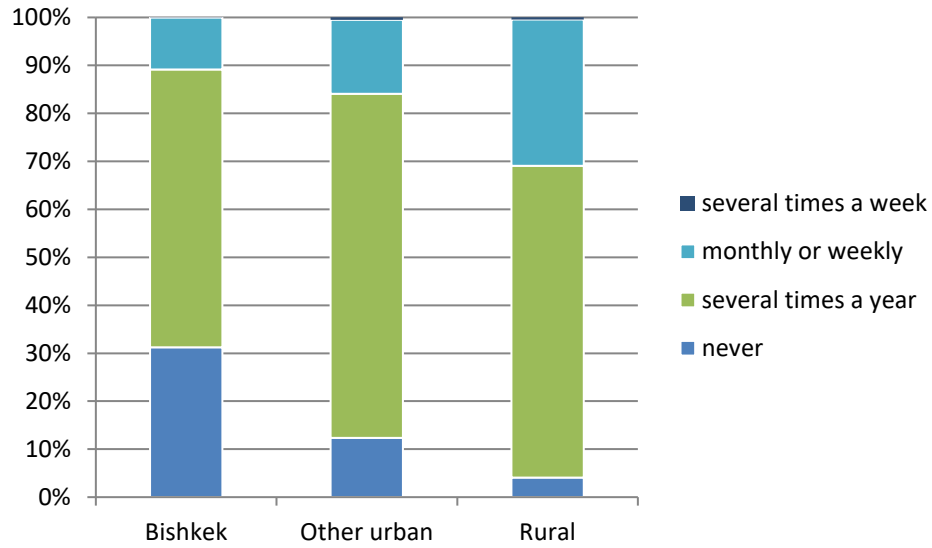
Table 4.1 Availability of various energy sources, 2016, % of population

	Average	Bishkek	Other urban	Rural	High-mountain	Semi-Mountain	Flat	not poor	poor
Electricity	99.6	98.0	100.0	99.9	99.7	99.9	99.6	99.6	99.7
District heating	10.2	45.8	13.8	0.4	1.2	1.7	12.8	12.7	2.8
Hot water	9.9	45.6	5.3	2.6	0.4	0.8	12.7	12.1	3.3
Central gas	20.0	63.2	33.7	5.4	0.0	0.0	26.2	23.6	9.6

Source: Own calculations based on KHIS 2016. Individual level weights.

12. Connectivity to energy sources is only one determinant of energy consumption patterns. Supply reliability and service quality remain a major challenge in the Kyrgyz Republic, as energy supply reliability has been deteriorating and power shortages and network failures remain a major challenge for the country. Figure 4.1 shows that the amount of electricity supply interruptions is dependent on the geographical location of a household. The frequency of power interruptions is lower in Bishkek compared to other urban and rural areas. In rural areas, 30% of the population experienced power interruptions on a monthly or weekly basis in 2016. The risk of power interruptions increases during the winter months and are particularly severe during harsh winters. According to a World Bank report (2017), the gap between electricity generation capacity and demand in the winter is expected to increase as long as the sector is not reformed and the necessary investments made. In 2009 more than 50% of the households outside Bishkek were affected by power interruptions on an almost daily basis, which was related to the extremely harsh winter 2008-2009 (Gassmann, 2011). During the winters 2010 to 2012, the largest distribution company reported 20 outages per day on average (World Bank, 2017).

Figure 4.1 Frequency of electricity supply interruptions, 2016, by location



Source: Own calculations based on KHIS 2016; individual weights

13. The availability of various energy sources and their reliability is reflected in the type of heating people use. Overall, 83% of the population use a stove for heating, burning solid fuels such as coal or wood. In contrast, central heating is only used by 10% of the population as a heating source, and more than half of the population also use electricity for heating (Table 4.2). More than half of the population use a combination of different heating sources (Table 4.3). Almost half combine the stove with electric heating. Large differences can be noticed across population groups, which are directly related to the availability of a particular source. Central heating is only available in Bishkek and some other cities. As a result, central heating is the main source for almost half of the population in Bishkek. Yet, still 38% of the population in the capital use a stove for heating, often in combination with electric heating. In rural areas, most people use a stove for heating, but more than half combine it with electric heating. With respect to heating with electricity, this type is most prevalent in other urban areas. This can most probably be explained by the fact that people living in apartments in smaller towns have no access to central heating. Using a stove might also not be feasible in multi-story buildings, leaving electricity as the only option. Still, even in other urban areas, 43% combine a stove with electric heating. The combination of stove and electric heating is most prevalent in rural and high/semi-mountainous areas.

Table 4.2 Prevalence of different heating sources, 2016

	Total	Bishkek	Other urban	Rural
Central heating	10.1	46.4	13.2	0.3
Stove	83.0	37.9	67.4	98.6
Electric heating	54.2	31.5	67.4	55.7

Source: Own calculations based on KHIS 2016; individual weights

Table 4.3 Type of heating used, percent of the population, 2016

	Total	Bishkek	Other urban	Rural	High-mountain	Semi-Mountain	Flat	not poor	poor
central heating only	8.3	44.2	5.7	0.3	0.4	0.7	10.6	10.4	2.0
electric heating only	4.9	6.4	16.6	1.0	1.2	3.6	5.6	5.1	4.1
stove only	34.9	15.6	24.2	42.8	33.4	44.0	33.5	31.5	44.8
central & electric heating	1.8	2.2	7.5	0.0	0.9	1.0	2.1	2.2	0.7
stove & electric heating	46.8	19.1	43.0	54.7	64.2	50.7	43.8	46.6	47.3
other combinations	3.3	12.6	3.1	1.1	0.0	0.0	4.3	4.0	1.2
total	100	100	100	100	100	100	100	100	100

Source: Own calculations based on KHIS 2016. Individual level weights.

14. The need to heat the dwelling throughout the year varies by location. In rural areas 16 percent of households heat their dwelling more than six months per year compared to less than 5 percent of households in Bishkek. The main type of heating used plays an important role in the duration of the heating period. Households connected to central heating are dependent on the official dates central heating is switched on and off.

15. Household consumption of different energy sources is calculated by dividing the energy expenditures by the applicable tariff in 2016. On average a Kyrgyz household consumed 4,795 kWh of electricity and 1.05 Gcal of thermal energy (central heating and hot water combined).[6] Except for households belonging to the first quintile, electricity consumption is relatively equal across the income distribution with 5,000 kWh per year. Households in the first quintile consume on average 4,502 kWh annually. Annual electricity consumption is particularly high in households living in urban areas other than Bishkek. This is related to the relatively higher prevalence of electricity as main type of heating in these areas, as discussed above. Even though electricity is generally considered a public good in a household, a more nuanced picture emerges when considering electricity consumption per household member. An individual belonging to the richest 20% of the population consumes almost three times more electricity than an individual belonging to the poorest 20%. Yet, the analysis by household size shows that economies of scale apply for electricity consumption and that, indeed, electricity almost behave as a public good.

16. The consumption of thermal energy increases steadily with increasing welfare. The richest 40% of households consume at least two times more thermal energy than the poorest 40% of households. These proportions are even more pronounced when considering per capita consumption. This is closely related to the fact that thermal energy is mainly available in Bishkek where the average living standard is

[6] According to administrative records, total residential electricity consumption was 6 billion kWh in 2016 (State Agency for Fuel and Energy Sector Regulation under the Government of the Kyrgyz Republic, 2017), indicating an average of about 4,000 kWh per household.

considerable higher compared to the rest of the country as also evidenced by the poverty rates reported in Table 2.1. Hence, per capita consumption of thermal energy in Bishkek is five times the national average. If only considering actual thermal energy users, the average annual consumption was 6.37 (2.13) Gcal per household (per capita).

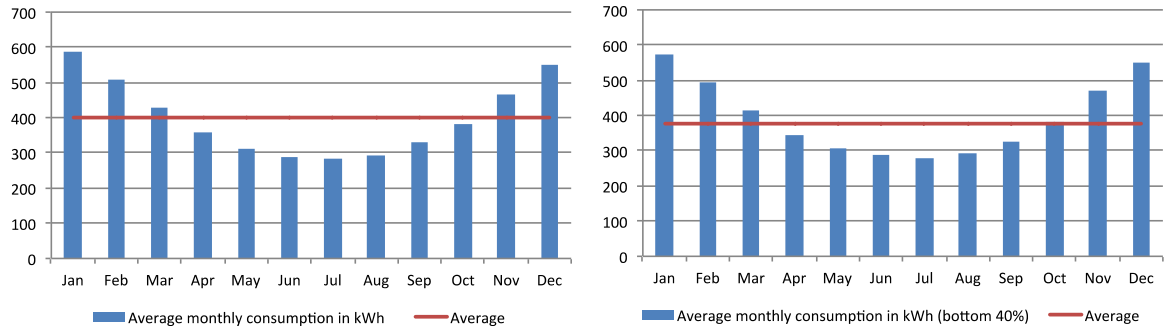
Table 4.4 Annual household and per capita energy consumption, 2016

	Household				Per capita			
	Electricity kWh	Central heating Gcal	Hot water Gcal	Thermal energy Gcal	Electricity kWh	Central heating Gcal	Hot water Gcal	Thermal energy Gcal
Average	4,795.2	0.62	0.43	1.05	1185.7	0.15	0.11	0.26
Quintiles*								
Q1	4,502.3	0.17	0.13	0.30	804.6	0.03	0.02	0.05
Q2	4,938.9	0.44	0.31	0.75	1035.2	0.09	0.07	0.16
Q3	4,743.7	0.69	0.54	1.23	1152.5	0.17	0.13	0.30
Q4	4,756.4	0.93	0.71	1.64	1401.5	0.28	0.21	0.48
Q5	5,035.5	0.86	0.47	1.33	2150.7	0.37	0.20	0.57
Region								
Bishkek	4,396.8	2.01	1.84	3.85	1430.8	0.65	0.60	1.25
Other urban	5,160.4	0.83	0.06	0.90	1318.0	0.21	0.02	0.23
Rural	4,812.7	0.05	0.06	0.11	1085.2	0.01	0.01	0.02
Top. Region								
High-mountain	4,447.9	0.13	0.00	0.13	985.4	0.03	0.00	0.03
Semi-Mountain	4,908.2	0.14	0.00	0.14	1177.0	0.03	0.00	0.03
Flat	4,817.1	0.75	0.55	1.31	1213.7	0.19	0.14	0.33
Poverty Status								
not poor	4,844.1	0.73	0.51	1.23	1321.5	0.20	0.14	0.34
poor	4,570.9	0.12	0.10	0.22	790.9	0.02	0.02	0.04
Household size								
1 member	3,200.6	1.49	0.81	2.29	3200.6	1.49	0.81	2.29
2 members	4,213.0	0.99	0.65	1.64	2106.5	0.49	0.33	0.82
3 members	4,771.2	0.71	0.53	1.24	1590.4	0.24	0.18	0.41
4 members	4,817.7	0.57	0.51	1.07	1204.4	0.14	0.13	0.27
5 members	5,100.6	0.43	0.22	0.66	1020.1	0.09	0.04	0.13
6 members	5,473.7	0.24	0.21	0.44	912.3	0.04	0.03	0.07
7 + members	5,663.7	0.04	0.06	0.10	737.3	0.01	0.01	0.01
HH with beneficiary**								
MBPF	4,121.4	0.04	0.04	0.08	762.8	0.01	0.01	0.02
Pension	4,822.8	0.52	0.31	0.83	1189.5	0.13	0.08	0.20
Thermal energy users								
	2924.4	3.74	2.62	6.37	978.3	1.25	0.88	2.13

Source: Own calculations based on KIHS 2016. Household level weights (Per capita values: Individual level weights.). *Quintiles are based on household expenditures per capita.
**Household with at least one MBPF or pension recipient.

17. Energy consumption in the Kyrgyz Republic is highly seasonal. In Kyrgyzstan winters are very cold. Hence, average demand for electricity and thermal energy decreases in the summer months and increases in the winter.[7] Given that many households use electricity as main or additional heating source, it is not surprising to find significantly higher electricity consumption during the winter (Figure 4.2).

Figure 4.2. Average monthly electricity consumption (kWh per month), all quintiles and bottom 40%, 2016

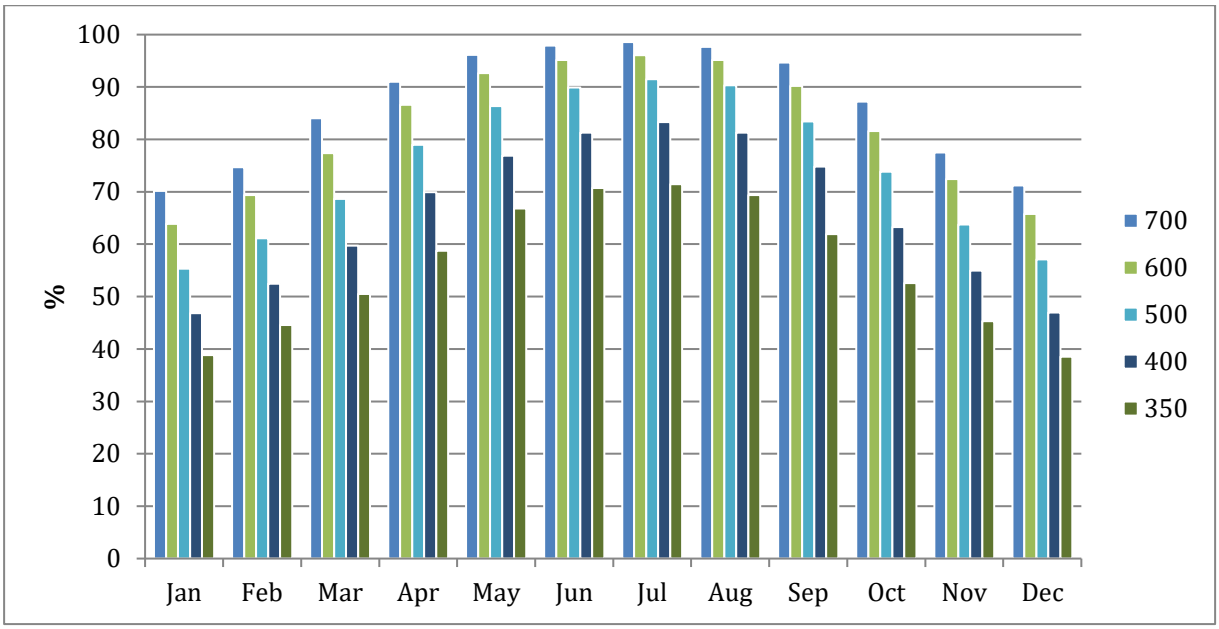


Source: Own calculations based on KIHS 2016. Household level weights.

18. However, even during the winter months, average electricity consumption remains below the threshold of 700 kWh. In an average month, 85% of connections do not exceed this threshold in 2016 compared to 86% in 2014.[8] In the summer months, close to 100% of the households remain below the threshold of 700 kWh, which currently separates the first from the second tier of the tariff. During the winter months still close to three quarters of the households do not reach the threshold. In January, for example, 34 percent of households consumed above the threshold. A threshold reduction as foreseen in the policy scenarios reduces the number of households that consume below the threshold (Figure 4.3). For example, a reduction of the threshold to 350 kWh per month, would mean that only one third of the households remains below the reduced threshold in the winter, while in the summer around 70% of the households would stay below 350 kWh per month.

[7] Note that central heating is only available during the winter months.
[8] Source for 2014: World Bank (2016)

Figure 4.3. Share of Households consuming below 700 kWh, 600 kWh, 500 kWh, 400 kWh and below 350 kWh per month, 2016

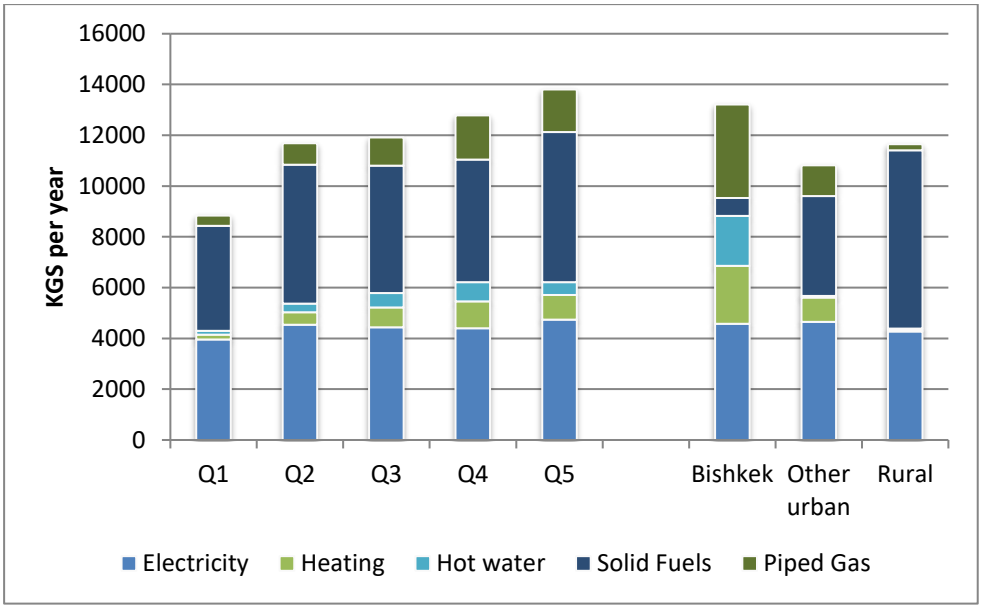


Source: Own calculations based on KIHS 2016. Household level weights.

5 Energy expenditures

19. On average a Kyrgyz Households spends 12,126 KGS on energy, which is 6.6% of total household expenditures (see Table 5.1 and Table 10.1 in the Appendix). Total energy expenditures increase with higher living standards. Households belonging to the lowest quintile spend the least, and households of the richest quintile the most. Outside Bishkek, solid fuels and electricity account for the largest expenditures. This is particularly true for rural households. In Bishkek a considerable amount is spent on gas and other energy sources.

Figure 5.1 Composition of annual energy expenditures per quintiles and region, 2016



Source: own calculations using KIHS2016

Table 5.1 Share of energy expenditures in total household expenditure, %, 2016

	Electricity	Thermal energy	*Thermal energy (only users)*	Solid Fuels	Piped Gas	Total energy	*Total energy (only thermal energy users)*
Average	2.46	0.87	*5.29*	2.52	0.71	6.56	*8.46*
Quintiles							
Q1	2.64	0.37	*4.65*	2.52	0.30	5.83	*8.32*
Q2	2.61	0.68	*5.49*	2.73	0.55	6.57	*8.74*
Q3	2.31	0.98	*5.28*	2.42	0.65	6.35	*8.43*
Q4	2.35	1.28	*5.36*	2.25	1.03	6.92	*8.34*
Q5	2.42	1.05	*5.33*	2.67	1.02	7.15	*8.51*
Region							
Bishkek	2.86	3.37	*6.46*	0.35	2.39	8.97	*9.28*
Other urban	2.71	0.60	*2.87*	1.99	0.70	5.99	*6.09*
Rural	2.24	--	--	3.47	0.11	5.90	--
Top. Region							
High-mountain	1.99	--	--	4.14	0.00	6.20	--
Semi-Mountain	2.36	0.10	*2.04*	2.76	0.00	5.22	*5.84*
Flat	2.54	1.09	*5.42*	2.29	0.91	6.82	*8.57*
Poverty Status							
not poor	2.44	1.02	*5.44*	2.50	0.82	6.77	*8.57*
poor	2.60	0.22	*3.29*	2.61	0.21	5.64	*7.10*
Number of children in Household							
none	2.75	1.65	*6.77*	2.39	1.22	8.01	*10.42*
one child	2.48	0.61	*4.15*	2.54	0.58	6.22	*6.79*
two children	2.29	0.54	*3.87*	2.55	0.50	5.88	*6.71*
3 or more children	2.19	0.24	*2.92*	2.68	0.27	5.37	*5.60*
Household Size							
1	3.18	3.51	*8.42*	1.56	1.86	10.10	*12.57*
2	2.79	1.53	*6.01*	2.61	1.19	8.12	*9.30*
3	2.56	0.87	*4.84*	2.20	0.76	6.39	*7.55*
4	2.37	0.63	*3.91*	2.64	0.63	6.27	*6.76*
5	2.26	0.28	*3.10*	2.74	0.37	5.66	*5.90*
6	2.21	0.20	*2.64*	2.71	0.28	5.40	*5.49*
7 +	2.10	0.03	*0.87*	2.84	0.22	5.19	*3.99*
HH with beneficiary*							
MBPF	1.81	0.07	*1.55*	3.06	0.06	5.00	*3.98*
pension	2.54	0.89	*6.48*	0.00	0.00	0.00	*10.21*

Source: Own calculations based on KIHS 2016. Household level weights. Quintiles based on household expenditures per capita.*Household with at least one MBPF or a pension recipient

20. Not surprisingly then, solid fuels account for the largest share in total household expenditures, followed by electricity. Thermal energy and piped gas account for less than one percent of the total household budget. Expenditures on thermal energy and piped gas as a percent of overall expenditure increase for the richer households. Interestingly, the share of total energy expenditures increases for richer households.[9] The differences in the shares spent on energy consumption are not so much along household living standards, but by location. The share spent on energy is higher for households in Bishkek than in rural areas. This is clearly due to access to thermal energy and piped gas, but also the share spent on electricity is higher, which might be related to higher living standards in Bishkek and a potentially higher prevalence of electric appliances.

6 Energy affordability

21. Households are classified as 'energy poor' if the share of the household budget spent on energy is higher than 10%. In 2016, 17% of households had energy expenditures, including all types of energy, exceeding 10% of total household expenditures (Table 6.1). The share of energy poor households is particularly high in Bishkek, where almost half of the households have energy expenditures above 10% of total expenditures. However, this is not surprising given that households in Bishkek spend 50% more of their household expenditures on energy compared to rural households. Among poor households 10.3% have energy expenditures exceeding 10% of total household expenditures, which is a significantly smaller share than for the non-poor households. If only spending on electricity and thermal power (excluding gas and other fuels) is considered, 4% of the households spend more than 10% of their budget on these two energy sources.

Table 6.1 Energy poverty incidence (% of households), 2016

	Energy Poor (all energy sources)	Energy Poor (only thermal power and electricity)
Average	17.1	4.05
Quintiles		
Q1	12.4	2.94
Q2	15.4	4.55
Q3	13.9	3.98
Q4	20.1	4.86
Q5	23.6	3.93
Region		
Bishek	43.2	14.64
Other urban	12.9	1.38
Rural	12.1	1.18
Top. Region		
High-mountain	12.9	0.46
Semi-Mountain	9.2	0.82
Flat	18.8	4.99
Poverty Status		
not poor	18.5	4.62

[9] Differences are statistically significant at 5% level.

poor	10.3	1.44
Type of heating		
central heating	35.6	19.42
electric heating	9.5	8.59
stove only	12.9	1.80
central and electric heating	22.9	5.82
stove& electric heating	12.0	0.59
other combinations	17.4	2.03
By household size:		
1	44.5	21.27
2	29.6	7.52
3	15.5	2.35
4	13.0	2.30
5	9.2	0.76
6	10.5	1.01
7+	7.4	1.19
By number of children:		
none	23.5	8.48
one child	12.7	2.47
two children	11.7	1.69
three or more children	8.1	1.17

Source: Own calculations based on KIHS 2016. Energy poverty: Household level weights. Quintiles are based on household expenditures per capita.

22. Having energy expenditures above 10% is not by itself a fact to worry about. What matters is the total household budget and how much is left for spending on other goods and services. Households are most vulnerable if they have little income and spend an above proportionate share on energy. In 2016, 2.3% of the population was both energy poor and income poor[10]. Analyzing this group even further shows that of these 2.3%, 15% lived in Bishkek. Individuals living in high mountain areas have a considerably higher risk to be income and energy poor. They account for one fifth of the total group of income and energy poor. The same applies to Chui and Naryn where the population has an above proportionate risk to be both energy and income poor. Individuals living in households with three or more children are also highly at risk of being both monetary and energy poor.

Table 6.2 Distribution of individuals that are income and energy poor (% of population), 2016

Total	100
Region	
Bishkek	15.2
Other urban	14.0
Rural	71.0
Top. Region	
High-mountain	17.6
Semi-Mountain	7.5
Flat	74.9
By oblast:	

[10] Income poverty refers here to households with consumption below the absolute poverty line.

Issykul	3.5
Jalal-Abad	10.7
Naryn	13.2
Batken	0.6
Osh	21.0
Talas	1.9
Chui	31.2
Bishkek	15.2
Osh City	2.7
By number of children:	
none	4.1
one child	9.3
two children	42.1
three or more children	44.5
Type of heating	
central heating	11.3
electric heating	2.3
stove only	51.0
central and electric heating	5.7
Stove & electric heating	28.3
other combinations	1.0

Source: Own calculations based on KIHS 2016. Individual level weights. Quintiles are based on household expenditures per capita.

7 Performance of current policy measures to ensure energy affordability

7.1 Implicit subsidies

23. Energy tariffs in the Kyrgyz Republic are below cost-recovery levels. For cost recovery in the residential sector, district heating would need to be priced at 3,443.48 KGS/Gcal, hot water at 2,924.96 KGS/Gcal and electricity at 2.17 KGS/kWh (<700kWh). However, even after the energy tariff increases in August 2015 households consuming electricity below the threshold of 700 kWh per month pay only 0.77 KGS/kWh. Given that only a small percentage of households reach the threshold also in 2016, evidently more in the winter than in the summer (see Figure 4.3), most electricity consumption (80%+) is charged at 0.77 KGS/kWh, which is a third of the cost-recovery tariff. Similarly, district heating and hot water prices are also a third of their cost-recovery tariffs. This implies that energy consumption is heavily subsidized, although these subsidies are implicit, taking the form of zero-interest loans from government to the energy companies to cover their losses.[11] This not only jeopardizes the fiscal sustainability of the government, but risks future investments into the energy sector.

24. Table 7.1 and Table 7.2 show the distribution of the implicit subsidies by energy source and as a percentage of total household expenditures, respectively. The implicit benefits from paying below cost-recovery tariffs for electricity consumption are allocated neutrally across the income distribution. Both poor and rich households benefit equally. An entirely different picture emerges when considering thermal energy. Given that thermal energy is predominately available in Bishkek (and some other cities), where the average welfare level is higher than in rural areas, richer households benefit disproportionally from the reduced thermal energy tariffs (Table 7.1). This is also evident when considering the distribution of

[11] Another way in which below cost recovery tariffs are compensated for is by inadequate maintenance and replacement of equipment and insufficient investment in future capacity.

implicit subsidies by location. Three quarter of the implicit thermal energy subsidies are enjoyed by households living in Bishkek. Overall, implicit subsidies are slightly regressive, benefiting richer households more than the poor.

Table 7.1 Distribution of implicit subsidies by energy source and household characteristics, %, 2016

	Electricity	Thermal energy	Total (electricity and thermal energy)	Share of the population (%)
Total subsidy	100	100	100	100
Quintiles*				
Q1	19.4	5.8	15.7	20.0
Q2	20.6	14.2	18.9	20.0
Q3	19.5	23.3	20.6	20.0
Q4	19.8	31.1	22.8	20.0
Q5	20.7	25.6	22.0	20.0
Region				
Bishkek	17.4	75.8	33.2	15.9
Other urban	22.0	18.4	21.0	19.5
Rural	60.7	5.8	45.8	64.6
Top. Region				
High-mountain	8.8	1.2	6.7	10.1
Semi-Mountain	13.3	1.9	10.2	13.2
Flat	77.9	96.9	83.0	76.7
Poverty Status				
not poor	82.4	96.3	86.1	74.4
poor	17.6	3.7	13.9	25.6
Number of children in Household				
none	30.5	50.5	35.9	19.2
one child	23.7	20.8	22.9	21.8
two children	21.8	17.8	20.7	25.1
3 or more children	24.0	11.0	20.5	33.9
Energy vulnerable households				
Energy poor**	17.7	33.4	22.0	13.0
Energy poor and monetary poor	1.9	1.3	1.8	2.3
Thermal energy users	10.9	100	35.1	12.1

Source: Own calculations based on KIHS 2016. Household weights. *Quintiles based on household expenditures per capita. **Total energy expenditures >10%

25. On average, the absolute value of the implicit subsidy is 5,991 KGS per household per year for electricity and 2,232 KGS per household per year for thermal energy (Table 7.2). At the aggregate level, the implicit subsidies represent a value of 2.7% of GDP, of which three quarters stem from subsidized electricity tariffs.

26. On average the implicit subsidies represents a value of 5% of total household expenditure. The subsidy on electricity reflects 3.5% of total household expenditures and the subsidy on thermal energy a little less than 2%. Table 7.2 shows that the implicit value of total energy subsidies as a share of total household expenditure is highest in Bishkek and lowest in the rural areas. The value of energy subsidies as a share of total household expenditure differs by one percentage point for poor and non-poor

households. However, below cost-recovery tariffs for electricity are slightly more important for poor households given that the share in total expenditure is half a percentage point higher than for richer households. The shares reflected in Table 7.2 can also be interpreted as the loss in real income if subsidies would have been abolished in 2016 at once.

Table 7.2 Value of implicit subsidy by energy source (KGS/year) and as a share of total household expenditure (%), 2016

	Electricity (KGS/year)	Thermal energy (KGS/year)	Total* (KGS/year)	Electricity (%)	Thermal energy (%)	Total* (%)
Average	5991.7	2232.6	8224.3	3.5	1.7	5.1
Total as % of GDP**	2.0%	0.7%	2.7%			
Quintiles						
Q1	5808.6	644.1	6452.8	3.9	0.7	4.6
Q2	6180.6	1591.1	7771.7	3.6	1.3	4.9
Q3	5858.9	2598.8	8457.7	3.2	1.9	5.1
Q4	5919.3	3471.0	9390.4	3.2	2.5	5.7
Q5	6191.7	2860.0	9051.6	3.3	2.0	5.4
Region						
Bishkek	4960.2	8053.9	13014.1	3.3	6.4	9.7
Other urban	6540.5	2046.6	8587.1	3.9	1.2	5.1
Rural	6172.4	218.6	6391.0	3.3	0.1	3.5
Top. Region						
High-mountain	5798.3	307.4	6105.7	3.1	0.2	3.2
Semi-Mountain	6269.0	325.2	6594.2	3.4	0.2	3.6
Flat	5968.9	2767.3	8736.2	3.5	2.1	5.6
Poverty Status						
not poor	6010.5	2618.3	8628.9	3.4	1.9	5.3
poor	5905.4	464.1	6369.5	3.9	0.4	4.3
Number of children in Household						
none	5463.1	3334.1	8797.2	4.0	3.2	7.1
one child	6064.5	1965.3	8029.8	3.4	1.2	4.5
two children	6215.4	1864.5	8079.9	3.2	1.0	4.2
3 or more children	6544.8	1102.0	7646.8	3.0	0.5	3.5
Energy vulnerable households						
Energy poor***	6226.1	4372.2	10598.3	4.2	4.8	9.0
Energy poor and monetary poor	6269.3	1541.6	7810.9	4.7	1.5	6.2
Thermal energy users	3956.3	13521.9	17478.2	2.7	10.1	12.9

Source: Own calculations based on KIHS 2016. Household weights. Quintiles are based on household expenditures per capita.
* Electricity and thermal energy combined
** Nominal GDP in current prices 2016 retrieved from IMF World Development Indicators October 2017
*** Total energy expenditures >10%

7.2 Direct social protection transfers and energy compensations

27. The Kyrgyz Republic has a comprehensive social protection system providing social insurance, social assistance and social services. After the fall of the Soviet Union, the Kyrgyz Republic was one of the first countries to reform its social assistance system to reach the poorest and most vulnerable households in the country. Social assistance, which provides non-contributory transfers to poor and vulnerable households and individuals, consists of a lump-sum birth grant[12], a monthly benefit for poor families with children (MBPF), monthly social benefits (MSB), cash compensations for privileged groups, supplementary monthly social benefits and energy subsidies and compensations for vulnerable groups.[13] These national programs can be supplemented by local programs, such as the Bishkek Housing Subsidy Allowance. The MBPF is a cash transfer directed at children in poor households. Households with children under 16 and average household income below the guaranteed minimum income are eligible for the transfer. The MSB is a categorical transfer targeted at vulnerable population groups in Kyrgyzstan, including children under the age of 18 with disabilities, people with disabilities and senior citizens who are not eligible for a social insurance pension, and mothers with seven or more children and orphans. The benefit is paid unconditionally on a monthly basis. The GoKG also provides assistance to protect the energy consumption of vulnerable households by providing compensations and subsidies for energy consumption (in addition to below-cost recovery tariffs). Following the increase in energy tariffs, these programs were introduced in 2010 to mitigate the financial burden imposed on poor households. Two types of compensations are provided: an energy compensation of 200 KGS/month for pensioners with a monthly pension below 4,000 KGS[14], and a higher electricity consumption threshold for households in high-mountain areas. From October to March the lower tariff applies up to a 1,000 kWh/month.[15]

28. In 2015, total social protection expenditures accounted for 10.6% of GDP. Social insurance and military pension account for the lion's share with 7.9% of GDP. The remaining 2.7% of GDP (which is the same as the total value of implicit energy subsidies in 2016) is allocated to the MBPF (0.6% of GDP), MSB (0.6% of GDP), cash compensations for privileged groups (0.4% of GDP) and the energy compensations for pensioners (0.4% of GDP) (MLSD, 2017).

Table 7.3 Coverage (% of individuals living in a beneficiary household), 2016

	Q1	Q2	Q3	Q4	Q5	Total
Any social Transfer	78.3	58.5	52.7	44.1	34.5	53.6
Pension	68.5	48.0	47.8	36.7	31.4	46.5
MSB	2.8	1.2	1.3	1.1	1.2	1.5
MBPF	19.2	7.2	9.1	6.1	1.2	8.6
Other Social Benefits	3.4	3.5	2.3	1.4	1.0	2.3
Monetary compensations & local subsidies	3.4	3.3	5.9	3.9	2.2	3.7
Energy compensations (estimated)						
- pension < 4000 KGS	21.8	14.2	15.7	11.3	13.6	15.3
- high mountain area households	2.1	2.9	4.4	4.6	4.8	3.7

[12] Introduced in 2018

[13] See for previous reviews and additional information: Gassmann (2011b; 2013; 2015); Mamadaliev (2014); World Bank (2009).

[14] The monthly pension is increased with 200 KGS.

[15] Note that this also concerns an implicit subsidy. The costs related to the higher electricity threshold are not part of the social protection budget, nor do they feature explicitly in any other government budget.

Source: Own calculations based on KIHS 2016. Individual weights. Quintiles are based on annual per capita consumption before a given transfer assuming a marginal propensity of 33 percent. Energy compensations: assumption that all households with a small pensioner receive the compensation.

29. Table 7.3 to Table 7.5 provide information on the targeting performance and adequacy of social protection transfers and energy compensations in 2016. In 2016, 53% of the Kyrgyz population lives in a household where at least one member benefits from any social transfer scheme (Table 7.3). Pensions have the highest coverage reaching 46% of the total population. Moreover, pension coverage is the highest for poor households. In the lowest consumption quintile, 68% of individuals live in a pension-recipient household. The MBPF, the only poverty-targeted social assistance program in the Kyrgyz Republic, reaches 8.6% of the population. Even though coverage is highest in the poorest quintile, the numbers indicate that exclusion errors are substantial. About 15% of the population benefits from energy compensations targeted at pensioners with a small pension. Although coverage rates are slightly higher in the poorest quintile, still 13% of individuals belonging to the richest 20% benefit directly and indirectly from this compensation. The subsidized electricity tariff for high mountain households benefits mainly the wealthiest individuals. In 2016, an estimated 3.7% of the population benefited from this compensation.

30. The distribution of benefits indicates that, overall, social transfers are slightly progressive, even though certain transfers benefit particularly the rich. The MBPF, which is targeted to the poor, is the most progressive given that 45% of the benefits are going to the poorest 20% of the population. Energy compensations for pensioners with a small pension, which are 200 KGS/month, present a different picture with almost 28% of the compensation benefiting the richest 20% of the population. With respect to the energy compensation for high mountain areas, 37% of the implicit subsidy benefits the richest 20% of the population compared to 6.3% that is enjoyed by the poorest 20% of the population. While the subsidized consumption below 700 kWh can be classified as a neutral distribution, the additional subsidy for high mountain areas is highly regressive.

Table 7.4 Distribution of benefits (% of total benefits received), 2016

	Q1	Q2	Q3	Q4	Q5	Total
Any social Transfer	27.2	18.8	17.6	17.8	18.5	100
Pension	27.2	18.2	17.8	17.7	19.1	100
MSB	30.8	11.8	14.8	15.2	27.5	100
MBPF	45.2	16.8	24.9	11.4	1.6	100
Other Social Benefits	38.9	30.0	14.2	11.6	5.3	100
Monetary compensations & local subsidies	13.0	4.9	18.0	35.4	28.6	100
Energy compensations (estimated)						
- pension < 4000 KGS	21.1	16.0	19.5	15.9	27.5	100
- high mountain area households	6.3	12.1	22.3	22.3	37.0	100

Source: Own calculations based on KIHS 2016. Individual weights. Quintiles are based on annual per capita consumption before a given transfer assuming a marginal propensity of 33 percent. Energy compensations: assumption that all households with a small pensioner receive the compensation.

Table 7.5 Benefit adequacy (% of benefits in total household consumption, only recipient households), 2016

	Q1	Q2	Q3	Q4	Q5
Any social Transfer	39.0	34.5	35.7	36.9	41.6
Pension	43.0	38.1	38.6	40.8	43.1
MSB	10.6	10.1	6.8	6.6	7.1
MBPF	11.4	10.9	9.2	5.5	3.8
Other Social Benefits	0.3	0.3	0.1	0.1	0.0
Monetary compensations & local subsidies	3.5	1.2	1.6	4.8	4.3

Energy compensations (estimated)					
- pension < 4000 KGS	1.9	1.6	1.5	1.4	1.4
- high mountain area households	0.1	0.1	0.1	0.1	0.1

Source: Own calculations based on KIHS 2016. Individual weights. Quintiles are based on annual per capita consumption after all transfers. Energy compensations: assumption that all households with a small pensioner receive the compensation.

31. Social protection transfers are important contributions to the household budget. On average social transfers in the poorest recipient households account for 39% of total household consumption (Table 7.5). For the poorest households, pensions constitute the lion's share of benefits in the household share followed by the MBPF. Direct energy compensations for pensioners are very small. Even in recipient households they only account for 2% in the poorest quintile. This is less than half the share of the value of implicit subsidies, but it covers about 20% of annual energy expenditures. In high mountain area households, the additional implicit subsidy accounts for only 0.1%.

32. In addition to these national programs, the city of Bishkek has its own locally funded social assistance programs, which actively support poor and vulnerable households.[16] Among them, housing subsidies are provided to poor and vulnerable families in support of the payment for housing and communal services. The subsidies are available to families and individuals living in owner-occupied houses or apartments in the city of Bishkek if the costs for housing and communal services within social norms exceed 10% of total family income. The subsidies are provided in kind (direct transfer to service providers) and can only be used for payment of housing and communal services. The housing subsidy is calculated according to the social norm of the housing area at 14 m2 per person, but no more than 70 m2 per family. For a small family of one or two people the social norm is based on 35 m2 of the total area. A family is eligible for a housing subsidy if the costs for housing and communal services exceed the share of family's own expenses for housing and communal of 10% of its aggregate household income. Only actually provided services are taken into account. For apartments subsidies include services for central heating and gas supply, hot and cold water supply, solid waste disposal and the maintenance for elevators. The size of the housing subsidy is defined as the difference between the social norm for housing and communal services and the maximum allowable share of the family's own expenses. Families in detached houses have the option to receive 1.5 tons of coal per winter if they use solid fuels for heating purposed. Starting in August 2018, the provision of coal will be replaced with a cash equivalent for 1 ton of coal.

Energy compensation strategies in other ECA countries

The social assistance program in Moldova provides two targeted cash transfers for the poorest households, AjutorSocial: a benefit provided to fill the gap between a household's income and a guaranteed minimum income set by the law and an additional heating allowance, which compensates the poor for increased cost of living during the five cold winter months and is set at 250 MDL flat for all recipients of AjutorSocial. However, it was estimated that the effective coverage of these programs remained modest (Bertholet, 2015). To alleviate the impact of rising energy tariffs, Armenia introduced an energy cash benefit of 1,000 AMD a month to recipients of the biggest social assistance program (FBP – family benefit program) in 2016. A World Bank analysis shows that this cash-transfer compensates the welfare losses of poor households and is adequate to satisfy minimum levels of energy needs but suffers from exclusion errors. In Ukraine, two mitigation measures are in place, the Housing and Utility Subsidies program, a non-targeted program reducing utility bills for households with high energy shares and the Housing and Utility Privileges program which reduces energy bills at different percentages for underprivileged groups. In 2014, the programs were reformed. Households' increased utility expenditures were compensated when households' income is below the subsistence minimum. In turn, the threshold share of energy expenditures that defined benefits became a function of income. These reforms improved the coverage of the most vulnerable households (ESMAP, 2017).

[16] The KIHS does not allow an analysis of the Bishkek program given the limited number of observations.

8 Simulation and distributional impact of tariff increases

8.1 Simulating increases of residential tariffs to cost-recovery levels

33. Raising the residential energy tariffs to cost-recovery levels has become an integral part of the Kyrgyz Republic's energy sector reform. In the electricity sector, cost-recovery could be achieved either by increasing tariffs gradually until 2023, or by lowering the socially oriented tariff threshold and increase the tariffs. Table 8.1 shows a possible scenario (scenario 1) developed by the regulator for a gradual increase to a cost recovery scenario where both electricity tariffs increase and the threshold is lowered. However, as Table 8.1 shows, the scenario proposed by the regulator that does not foresee that the below-threshold tariff reaches cost recovery already in 2023. In addition, two more scenarios are simulated, one which constitutes a lower bound, where the threshold is not decreased and below threshold tariffs are increased and one (the upper bound) where tariffs below and above the threshold are increased and the threshold is lowered as of 2020 onwards. We simulate the scenarios from 2017 onwards.

Table 8.1 Scenarios for gradual electricity tariff increases for 2017-2023

	Year	threshold kwh	tariff below the threshold KGS/kwh	tariff above the threshold KGS/kwh
Scenario 1	2017	700	0.77	2.16
	2018	700	0.90	2.16
	2019	700	0.90	2.16
	2020	500	1.10	2.16
	2021	500	1.10	2.16
	2022	350	1.30	2.16
	2023	350	1.30	2.16
Scenario 2	2017	700	0.77	2.16
	2018	700	0.90	2.16
	2019	700	0.90	2.16
	2020	700	1.10	2.16
	2021	700	1.10	2.16
	2022	700	1.30	2.16
	2023	700	1.30	2.16
Scenario 3	2017	700	0.77	2.16
	2018	700	0.90	2.38
	2019	700	0.90	2.38
	2020	500	1.10	2.62
	2021	500	1.10	2.62
	2022	350	1.30	2.88
	2023	350	1.30	2.88

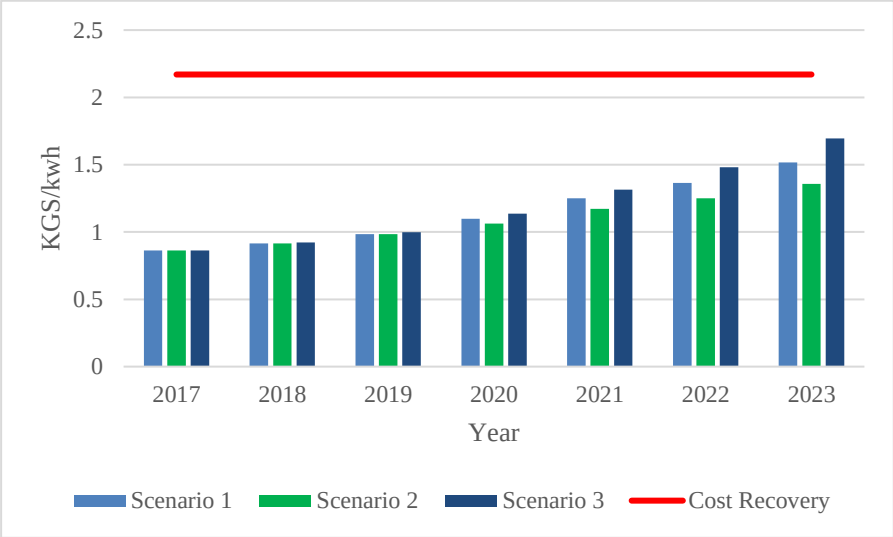
Source: Energy Team World Bank

In scenario 1 and 3 the electricity tariff below the socially oriented tariff threshold is gradually increased every year and as of 2020 the socially oriented tariff threshold is lowered gradually to 350 kWh in 2023. In 2016, even during winter months, 75% of households remain below the socially oriented tariff threshold of 700kWh (see Figure 4.3); during a summer month close to 100% of households do not reach the threshold. A threshold reduction to 350 kWh per month implies that only a third of households consume below the socially oriented tariff threshold in winter, while in summer still close to three quarter of the households would stay below 350 kWh per month. Average monthly electricity consumption lies at 400 kWh (see Figure 4.2). Calculation of the average electricity tariff paid in 2023[17] shows that no scenario reaches cost-recovery fully (shown as the red line in Figure 8.1). Scenario 1 reaches 70% of the

[17] We calculate the actual electricity price paid in KGS/kWh as the expenditures on electricity divided by electricity consumption in kWh.

cost-recovery tariff, the lower bound scenario 2 reaches 60% of the cost-recovery tariff while the higher bound scenario 3 reaches 80% of the cost-recovery level.

Figure 8.1 Average KGS/kwh, electricity scenario 1 – 3, years 2016 -2023



34. For thermal energy, we simulate two possible scenarios, one in which the tariff for thermal energy increases to cost-recovery level (scenario 2). Table 8.2 shows the tariff structure until 2023. There are two planned changes by the GoKG. First, central heating and hot water tariffs are equalized such that consumers pay the same price for hot water and for central heating. Next, instead of switching in April, it is planned to change thermal energy tariffs on August 1st in line with electricity tariffs. However, for simplicity we assume that energy tariffs increase on April 1st throughout the whole planning period. As shown in Figure 8.2, cost recovery will only be achieved under scenario 2.[18]

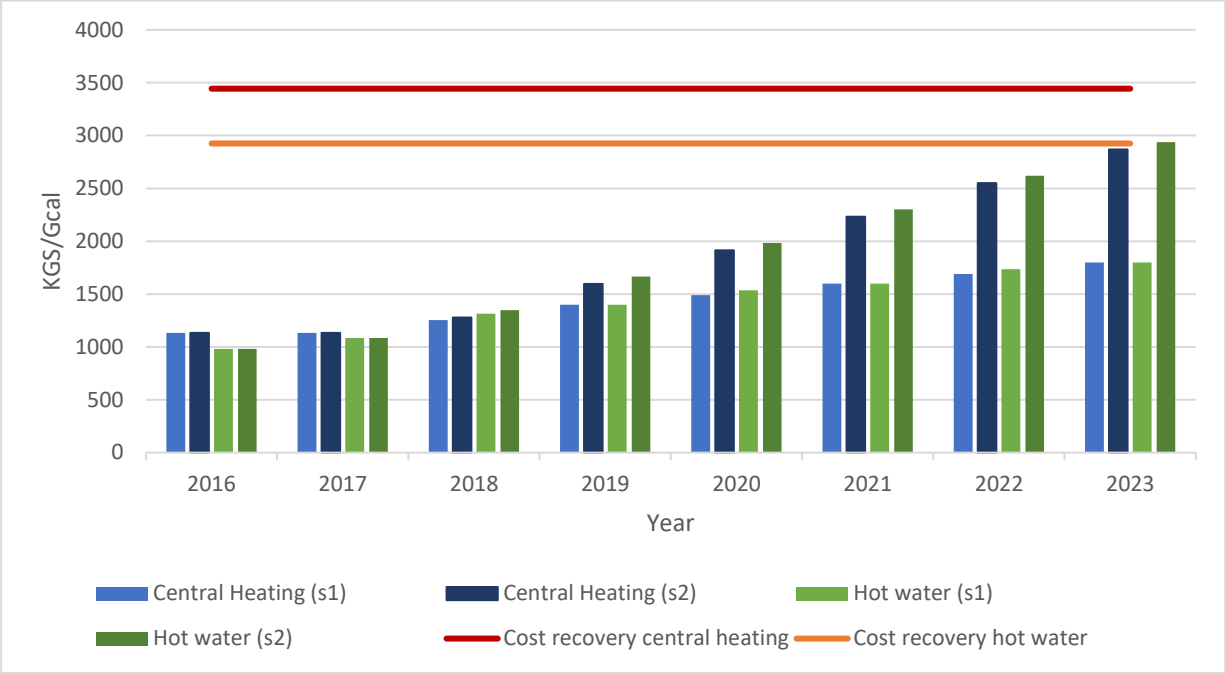
Table 8.2 Scenarios for gradual thermal energy tariff increases for 2017-2023

	Year	Heat KGS/Gcal	Hot Water KGS/Gcal
Scenario 1	2017	1134	1134
	2018	1400	1400
	2019	1400	1400
	2020	1600	1600
	2021	1600	1600
	2022	1800	1800
	2023	1800	1800
Scenario 2	2017	1134	1134
	2018	1452	1452
	2019	1770	1770
	2020	2088	2088
	2021	2406	2406
	2022	2724	2724
	2023	3042	3042

Source: World Bank Energy Team

[18] The remaining difference occurs because tariffs only change in April and hence households start paying full cost recover tariffs only after April 2023.

Figure 8.2 Average KGS/gcal, electricity scenario 1 – 2, years 2016 -2023



Source: Own calculations

8.2 Electricity expenditures as a result of tariff increases 2017 – 2023

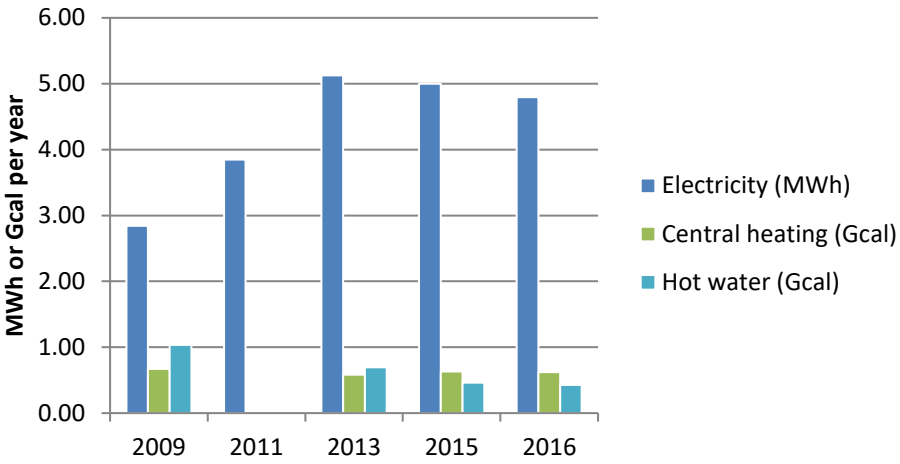
35. In this section the potential impact of energy tariff reforms on energy expenditures in Kyrgyz households from 2017 to 2023 is simulated. For the analysis of electricity tariff increases, we use the scenarios described in Table 8.1. For simplicity we describe the results of scenario 1 in detail, noting that the results for the remaining two scenarios can be found in the appendix.

36. The change in energy tariffs can induce households to change their consumption. A household's response to an increase in energy prices depends on two factors: the energy price and the household's price elasticity. Households may adjust their energy consumption behavior depending on their income elasticity by either reducing their energy consumption, or substituting with other energy sources (Gassmann, 2014; Gassmann & Tsukada, 2014). To what extent households reduce their energy consumption is dependent on the price elasticity of a household and whether it has the opportunity to switch energy sources. If the price elasticity of a household is low, an increase in energy prices has a limited effect on consumption. Conversely, high price elasticity would result in significant reductions in energy consumption. Previous work on estimating the price elasticity for electricity has estimated a price elasticity of -0.20 (World Bank, 2004). Price elasticity may also vary in the short versus the long run. In the long run, households might have more time to adjust their consumption behavior, by switching to other energy sources, which might not be feasible in the short run. Assuming that higher electricity prices will lead to a more reliable provision of the service in the long run, the price elasticity might even be positive as households are no longer restrained by power cuts in the amount of electricity they use. However, it is not possible to say by how much previous power interruptions affected households' electricity consumption. Based on Lampietti et al. (2007), Gassmann (2011) uses a price elasticity of -0.15 to analyze the distributional impact of electricity tariff increases in the Kyrgyz Republic based on the KIHS 2009 data. Given that there has been no estimation of the price elasticity in the Kyrgyz Republic, and an ad-hoc choice might be ultimately arbitrary, we assume in the following estimations that the price elasticity of electricity consumption is zero, and discuss the robustness of results under different price elasticities in section 8.4.

37. Assuming zero price elasticity may also be justified considering the trends in electricity consumption. While residential electricity consumption increased considerably between 2009 and 2013, it seems to have tapered off more recently (Figure 8.3.). Between 2013 and 2016 annual average

household electricity consumption remained more or less constant.[19] However, the decrease in overall electricity consumption could reflect households' response to the increase of tariffs in 2015. Yet, the tariff increase for below-threshold consumption was marginal and consumption above threshold remained limited as shown above.

Figure 8.3 Trends in average annual household energy consumption



Source: Own calculations based on KIHS 2009, 2011, 2013, 2015, 2016

38. The base model for the simulation of electricity tariff reforms makes the following assumptions:

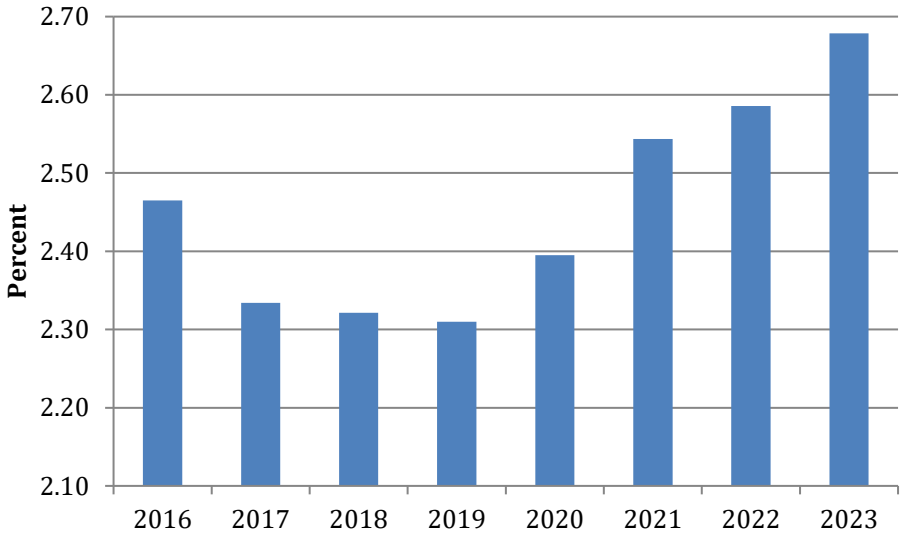
- Total household expenditures grow annually with nominal GDP per capita growth rates to reflect changes in household expenditures until 2023. We assume that household expenditures grow in nominal amounts and that households will have higher total expenditure levels when the higher tariff applies.[20]
- Nominal GDP per capita growth rates were derived from the IMF database (WEO April 2017). A table with the growth rates is provided in the appendix.
- We assume electricity consumption to remain at the 2016 level.

39. Figure 8.4 shows the expected electricity expenditures as the share of total household expenditures for the scenario 1 and for different population groups in the years 2017 to 2023. For 2016 and 2017, the tariffs implemented in August 2015 apply for the whole year. The share of electricity expenditures increase over the years, reaching a peak of 2.7% in 2023. For further details see the Appendix.

[19] According to administrative data, total annual electricity consumption of residential consumers decreased from 6.8 billion kWh in 2014 to 6.1 billion kWh in 2015 and 6 billion kWh in 2016. For 2017, the regulator predicts an increase to 6.6 billion kWh (State Agency for Fuel and Energy Sector Regulation under the Government of the Kyrgyz Republic, 2017).

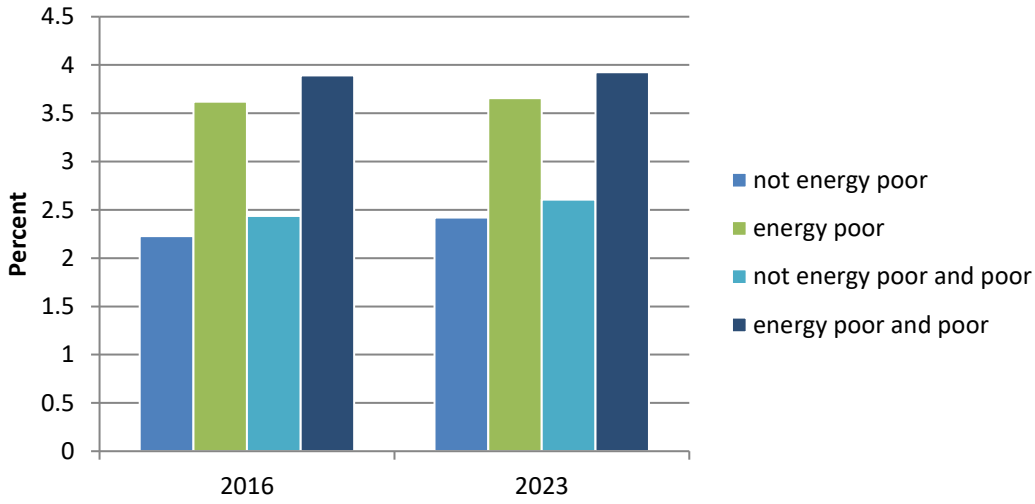
[20] An analysis of growth incidence between 2011 and 2016 indicates that real per capita consumption growth was slightly higher for the bottom 60%, ranging between 6.6% for the second and third quintile and 8.7% for the poorest quintile. The richest 10% experienced zero or negative consumption growth. Hence, the simulation results may be overestimated if growth continues to be pro-poor until 2023.

Figure 8.4 Average electricity expenditure shares in % of total household expenditures, scenario 1, 2016-2023



Source: Own calculations. Household weights. No price elasticity, i.e. electricity consumption constant at 2016 levels

Figure 8.5 Average electricity expenditure shares in % of total household expenditures for the most vulnerable households, scenario 1, 2016 and 2023



Source: Own calculations. Household weights. No price elasticity, i.e. electricity consumption constant at 2016 levels. Energy poor defined as household energy expenditures as a % of total expenditures larger than 10%.

8.3 Thermal energy expenditures as a result of tariff increases 2017 – 2023

40. For the analysis of increases in tariffs for thermal energy we use the scenarios described in Table 8.2. Again, scenario 1 will be discussed in detail, while the results for scenario 2 can be found in the appendix. For thermal energy a price elasticity of zero is assumed as households cannot change their thermal energy consumption but are dependent on the official heating season set by the government.

In addition, the following assumptions for the simulation have been made:

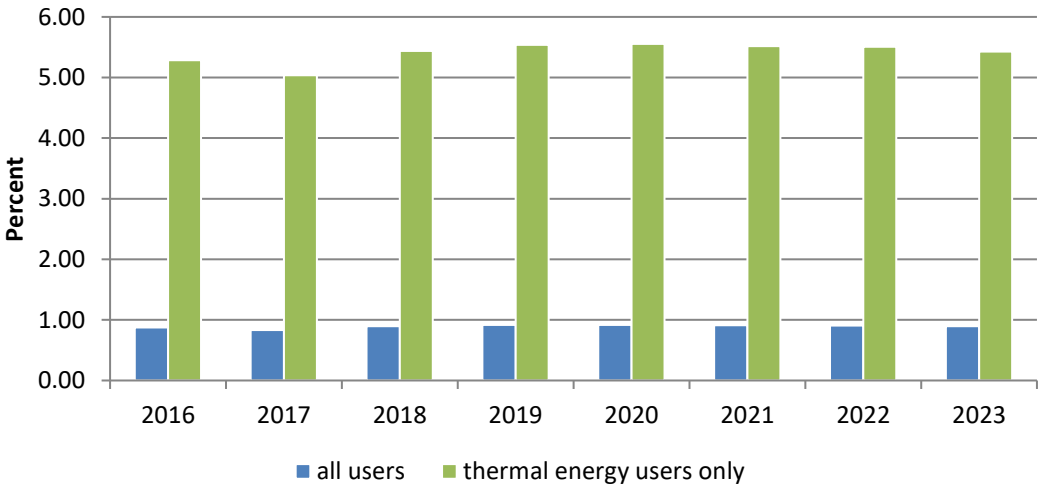
- Total household expenditures grow annually with nominal GDP per capita growth rates to reflect changes in household expenditures until 2023. We assume that household expenditures grow in

nominal amounts and that households will have higher total expenditure levels when the higher tariff applies.

- Nominal GDP per capita growth rates were derived from the IMF database (WEO April 2017). A table with the growth rates is provided in the appendix.
- Consumption (in Gcal) of central heating and hot water is assumed to remain at the 2016 level. This is justified by the fact that most households cannot control the amount of thermal energy consumed and bills are often based on normative standards

41. Under the proposed thermal energy scenario 1, the expenditure shares for thermal energy will remain nearly constant over the years (Figure 8.6). This is because thermal energy consumption is kept constant, tariffs do not increase annually, and, hence, the average annual tariff increase is almost equal to the expected GDP per capita growth rate.

Figure 8.6 Average expenditure shares for thermal energy, scenario 1, 2016-2023

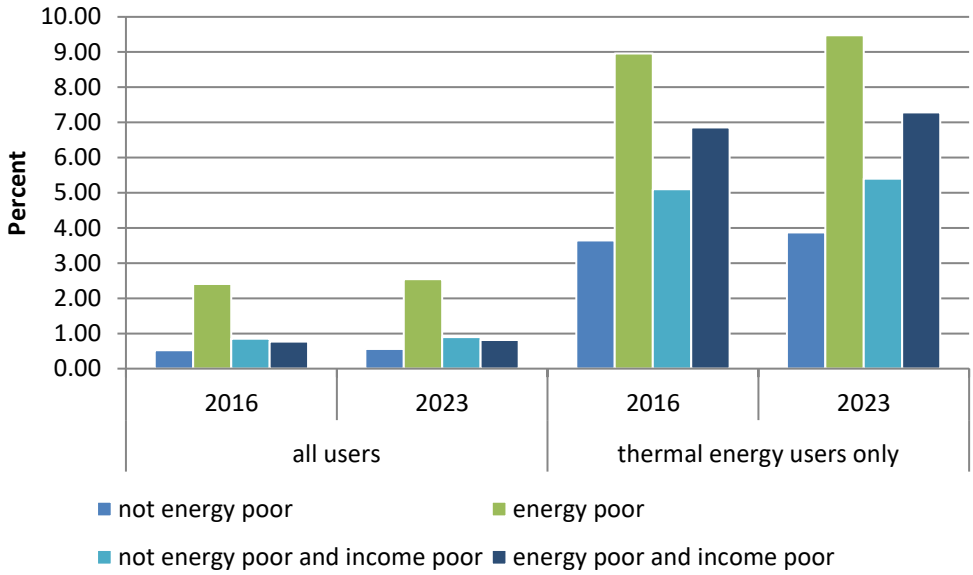


Source: Own calculations. Household weights. No price elasticity, i.e. thermal energy consumption constant at 2016 levels

42. Even though the tariff development up to 2023 remains moderate, the burden for energy vulnerable households that use thermal energy will increase further. In 2016, energy poor households spent 9% of total expenditures on thermal energy. This is expected to increase to 9.5% in 2023. For energy and income poor households, the increase is expected from 6.7% to 7.3%.

43. The increase in energy tariffs will also affect the share of households that are considered energy poor. Under scenarios 1 for both electricity and thermal energy, the share of households spending more than 10% of the total household budget on electricity and thermal energy will only slightly increase from 4.1% to 4.2% (. This share can increase to 9.5% if scenario 3 is implemented for electricity and scenario 2 for thermal energy. Note that these shares do not include spending on other energy sources, such as gas, coal, wood and other solid fuels.

Figure 8.7 Average thermal energy expenditure shares for energy vulnerable households, scenario 1, 2016 and 2023



Source: Own calculations. Household weights. No price elasticity, i.e. thermal energy consumption constant at 2016 levels

Table 8.3 Energy Poverty (only electricity and thermal energy) in 2023 under different scenarios

		Electricity		
Thermal Energy		Scenario 1	Scenario 2	Scenario 3
	Scenario 1	4.17	3.67	5.41
	Scenario 2	8.21	7.75	9.45

Source: Own calculations. Household weights. No price elasticity.

8.4 Impact on real household welfare 2017 – 2023

44. The change in welfare is calculated as the change in price of a good multiplied by the share of the good in total household expenditures before the price increase. For example, an increase of 10% and share of 5% leads to a loss of 0.5% in real income. For the sake of brevity, we will focus on the results of the cumulative income loss and present the yearly income losses in the Appendix. The increase in electricity tariffs will result in an average cumulative loss of 2% over six years. However, for some groups of the population the cumulative loss will be considerably higher. Households that spend more than 10% of their budget on energy already in 2016 will experience a welfare loss that is 1.5 times the average. The welfare loss is also expected to be higher for households in Bishkek. Households that depend on electricity for heating will be most heavily affected with an expected cumulative welfare loss of 3%. A comparison between different electricity scenarios (see Appendix 11) shows that the welfare loss varies between 1 percent at the lower bound and 3 percent at the upper bound scenario of the scenarios proposed in Table 8.1.

Table 8.4 Cumulative (2017-2023) real income loss for the electricity tariff scenario 1, % of total household expenditures

Average	1.92

Q1	2.08
Q2	2.03
Q3	1.75
Q4	1.82
Q5	1.89
Region	
Bishkek	1.84
Other urban	2.33
Rural	1.80
Top. Region	
High-mountain	1.59
Semi-Mountain	1.98
Flat	1.94
Poverty Status	
not poor	1.88
poor	2.07
Energy vulnerable households	
energy poor	2.53
Income & energy poor	2.70
Type of heating	
central heating only	0.92
electric heating only	3.06
stove only	1.75
central heating and electric	1.46
stove and electric heating	2.13
other combinations	2.65

Source: Own calculations based on KIHS 2016. Household weights. No price elasticity, i.e. electricity consumption constant at 2016 levels. Cumulative loss compared to the baseline in 2016.

Table 8.5 Cumulative (2017-2023) income loss for thermal energy scenario 1, %

	All users			Only thermal energy users		
	central heating	hot water	thermal energy	central heating	hot water	thermal energy
Average	0.26	0.23	0.49	1.55	1.38	2.96
Quintiles						
Q1	0.11	0.10	0.21	1.32	1.28	2.62
Q2	0.19	0.19	0.38	1.56	1.50	3.09
Q3	0.28	0.27	0.55	1.51	1.44	2.98
Q4	0.37	0.34	0.72	1.56	1.42	3.01
Q5	0.33	0.24	0.58	1.68	1.24	2.94
Region						
Bishkek	0.91	0.99	1.92	1.74	1.89	3.67
Other urban	0.27	0.02	0.30	1.31	0.11	1.42

Rural	0.02	0.03	0.05	--	--	--
Top. Region						
High-mountain	0.04	0.00	0.04	--	--	--
Semi-Mountain	0.05	0.00	0.05	0.97	0.03	1.00
Flat	0.32	0.29	0.61	1.57	1.44	3.04
Poverty Status						
not poor	0.30	0.26	0.57	1.60	1.41	3.04
poor	0.06	0.06	0.12	0.91	0.95	1.88
Energy vulnerable						
energy poor	0.75	0.63	1.40	2.78	2.35	5.20
Income & energy poor	0.23	0.22	0.45	2.02	1.95	4.00

Source: Own calculations based on KIHS 2016. Household weights. No price elasticity, i.e. thermal energy consumption constant at 2016 levels.

45. Table 8.5 shows the cumulative real welfare loss for the thermal energy scenario. Even though on average the cumulative income loss is only half a percent, the analysis of only those households that use thermal energy yields a slightly different picture. For expected cumulative loss for thermal energy users is close to 3%. Households in Bishkek will be affected above proportionately, given the high share of thermal energy connections. The burden will be highest for energy poor households. It is expected that they will experience a welfare loss of more than 5%. The more severe scenario 2 described in Table 8.2 results in a welfare loss of 1.2 percent for all Kyrgyz households and 7.3 percent for only thermal energy users.

46. Combining the real welfare losses incurred by the electricity and the thermal energy tariff scenarios 1, Table 8.6 shows that the expected total loss is on average 2.4%. Driven mainly by the consumption of thermal energy, the expected cumulative loss is highest for households in Bishkek, and for households that are already energy poor in 2016. The loss for energy and income poor households will be between three and four percent of total household expenditure.

Table 8.6 Cumulative welfare loss (2017-2023) due to energy tariff increases, %

Average	2.41
Quintiles	
Q1	2.29
Q2	2.42
Q3	2.31
Q4	2.54
Q5	2.47
Region	
Bishkek	3.76
Other urban	2.63
Rural	1.85
Top. Region	
High-mountain	1.62
Semi-Mountain	2.03
Flat	2.56
Poverty Status	

not poor	2.45
poor	2.19
Energy vulnerable	
energy poor	3.94
Income & energy poor	3.15
Thermal energy users	
	4.08

Source: Own calculations based on KIHS 2016. Household weights.
No price elasticity, i.e. thermal energy and electricity consumption is constant at 2016 levels.

Box 1: Calculating the real welfare loss

The change in welfare is calculated as the price change of a good multiplied by the share of the good in total household expenditures before the price increase.

$$\Delta y_i = \left(\frac{p_e^a - p_e^b}{p_e^b}\right) \times \left(\frac{x_{i,e}^b}{X_i^b}\right)$$

Where Δy_i is the real welfare loss for household *i*, p_e^a is the price for energy source *e* after the increase, p_e^b is the price for energy source *e* before the increase, $x_{i,e}^b$ is the expenditure of household *i* for energy source *e* before the tariff increase, and X_i^b is total household expenditures before the increase. For example, if the price increases with 10 percent and the households has spent 5 percent of total household expenditures on energy, the real welfare loss would be 0.5 percent (0.1/0.05 = 0.005).

If there are two energy blocks (above and below the threshold):

$$welfare\ loss_i = \left[\left(\frac{p_t^{block\,1} - p_{t-1}^{block\,1}}{p_{t-1}^{block\,1}}\right) \times \left(\frac{x_{i,t-1}^{block\,1}}{X_{t-1}}\right)\right] + \left[\left(\frac{p_t^{block\,2} - p_{t-1}^{block\,2}}{p_{t-1}^{block\,2}}\right) \times \left(\frac{x_{i,t-1}^{block\,2}}{X_{t-1}}\right)\right]$$

If in addition to a change in tariffs, the threshold changes as well, a third block has to be added which is the welfare loss resulting from having a lower threshold and therefore part of the consumption that was previously paid at the lower electricity tariff is now paid at the higher electricity tariff:

$$welfare\ loss_i = \left[\left(\frac{p_t^{block\,1} - p_{t-1}^{block\,1}}{p_{t-1}^{block\,1}}\right) \times \left(\frac{x_{i,t-1}^{block\,1}}{X_{t-1}}\right)\right] + \left[\left(\frac{p_t^{block\,3} - p_t^{block\,1}}{p_{t-1}^{block\,1}}\right) \times \left(\frac{x_{i,t-1}^{block\,2}}{X_{t-1}}\right)\right] + \left[\left(\frac{p_t^{block\,3} - p_{t-1}^{block\,3}}{p_{t-1}^{block\,3}}\right) \times \left(\frac{x_{i,t-1}^{block\,3}}{X_{t-1}}\right)\right]$$

After having calculated the annual welfare loss for every year, one can calculate the cumulative welfare loss by multiplying each year's individual welfare loss according to the following equation:

$$cumulative\ loss_{t+n} = \prod (1 + loss_{t+n}) - 1 = [(1 + loss_{t1}) \times (1 + loss_{t2}) \times \ldots \times (1 + loss_{t+n})] - 1$$

47. Table 8.7 shows the estimated poverty rates for 2023 after energy tariff increases. The estimated poverty rate in 2023 is 13.8% with a corresponding poverty gap of 1.2%.[21] From 2016 to 2023 this would mean a reduction of poverty by 11.6 percentage points over seven years, assuming that total household consumption grows annually with the predicted GDP per capita growth rate and that all households benefit equally from economic growth. With energy tariff increases, poverty rates will be higher compared to the baseline poverty rate in 2023. In line with the estimated real welfare loss, implementing the energy tariff scenarios would result in a 1.5 percentage point higher poverty rate.

[21] The poverty rate for 2023 was estimated by augmenting poverty lines by the inflation rate and per capita deflated daily consumption by nominal per capita GDP rates (see appendix 11 for more detail).

Table 8.7 Estimated Poverty rates (poverty gap) after energy tariff increases

	electricity	thermal energy	combined
Poverty rate 2023	13.8	13.8	13.8
Poverty gap 2023	1.2	1.2	1.2
Poverty rate after energy tariff increase	15.3	13.9	15.3
Poverty gap after energy tariff increase	2.3	2.1	2.3

Source: Own calculations based on KIHS 2016. Individual level weights.

8.5 Robustness of results using different price elasticities for electricity

48. Assuming that the demand for electricity is price elastic, this section analyzes to what extent the findings are robust to different assumption about price elasticities. Applying different price elasticities between 0 (no change in consumption) and -1 (a 10% price increase leads to a 10% reduction of electricity consumption), the new monthly electricity consumption (and for each block) is calculated according to equation 3:

$$kWh_{new} = kWh_{old} - (\Delta P * e * kWh_{old}) \quad (3)$$

Table 8.8 shows the results for the cumulative income loss of different scenarios using a price elasticity of 0, -0.15, -0.25, -0.5 and -1, respectively. The base model in Table 8.4 can be considered the upper bound for the impact of electricity tariff increases. When households reduce electricity consumption in response to a change in price, the real income loss will be slightly lower. However, this is only the first order effect. Assuming that households still require the same amount of energy, the decrease in electricity consumption has to be compensated with other energy sources, such as solid fuels in the case of heating. As a result, the demand for alternative energy sources increases, which may lead to price increases making the alternatives more expensive as well, and, hence result in a higher real income loss. Alternatively, the increase in electricity prices may induce households to save energy by better insulating their properties or replacing older electric appliances or light bulbs with more energy efficient goods. Table 8.8 and Table 8.9 show that our findings are robust across different price elasticities, except for the extreme case of a price elasticity of 1. The difference between poverty rates between a price elasticity of 0 and an elasticity of 1 is approximately 0.7 percentage points.

Table 8.8 Cumulative income loss for different electricity tariff scenarios and different elasticities

	e=0	e=-0.15	e=-0.25	e=-0.5	e=-1
Cumulative loss	1.92	1.75	1.63	1.35	0.95

Source: Own calculations based on KIHS 2016. Household weights.

Table 8.9 Poverty rates (poverty gap) after electricity tariff increases for different elasticities

	(e=0)	(e= -0.15)	(e=-0.25)	(e=-0.5)	(e=-1)
estimated poverty rate 2023	13.82	---	---	---	---
estimated poverty gap 2023	1.19	---	---	---	---
poverty rate after energy tariff	15.27	15.16	15.11	14.85	14.45
poverty gap after energy tariff	2.32	2.30	2.30	2.24	2.20

Source: Own calculations based on KIHS 2016.Individual weights.

9 Conclusion

49. Structural reforms of the energy sector are an integral part of current policy discussions in the Kyrgyz Republic. Even though tariffs have been increased in 2015, further increases have stalled since then and the sector operates still below cost-recovery levels. Assuming nominal growth of household incomes over time, the increase of energy tariffs, in particular for electricity has very moderate effects. Simulating different tariff scenarios including a reduction in the socially oriented tariff threshold has shown that real income losses due to tariff increases are relatively small on average. These results hinge on the assumptions regarding the development of nominal household incomes over time. Given that projected GDP growth rates exceed the simulated growth in tariff, it is not surprising that the impacts remain relatively small. Moreover, the analysis of past consumption patterns indicated that growth incidence was slightly pro-poor, meaning that poorer households have experienced higher real consumption growth than the richest households between 2011 and 2016. However, the analysis presented in this report focused on average effects for different population groups. This does not preclude that certain households might experience much stronger effects, for example because their incomes do not develop in line with projected growth rates or in the event their energy consumption increases substantially.

50. A different picture emerges when looking at increases in thermal energy tariffs. Here, poor households have no control over their consumption and are bound to the official heating seasons set by the government. As a result, poor households whose main heating source is district heating will be heavily affected by increases in thermal energy tariffs. Choosing the right tariff increase combination between electricity and thermal power is essential to understand how high the burden could be. In such a case additional mitigation measures are necessary to protect vulnerable households and alleviate the burden of energy price increases.

51. The increase in energy tariffs will be most painful for those that are currently both monetary and energy poor. Among this group, a relatively large share lives in Bishkek and most of them might not have the option to switch heating source. Households in high mountain areas and households with three or more children are also disproportionately represented among the group that is both monetary and energy poor. These groups might be in need of mitigation measures that enable them to consume a basic amount of electricity and stay warm during the winter months.

52. Social protection programs already play an important role in the Kyrgyz Republic. The MBPF, the only poverty targeted program for households with children, reached one fifth of the population belonging to the poorest quintile. It managed to allocate half of the total program funds to this group. In 2010, the GoKG introduced energy compensations for pensioners receiving less than 4,000 KGS per month as a compensation for the planned energy tariff increase. Households in high mountain areas benefit from a higher threshold of 1,000 kWh during the winter months which should protect their energy consumption. However, as the analysis in section seven has shown, these compensations are highly regressive and benefit mostly wealthy households living in high mountain areas. Less than four percent of the population lives in a household that benefits from this compensation. In addition to these national programs, the city of Bishkek has its own locally funded social assistance programs, which actively support poor and vulnerable households.[22] Among them, housing subsidies are provided to poor and vulnerable families in support of the payment for housing and communal services.

53. Targeted programs to compensate for energy reforms have been implemented in other countries such as Armenia and Moldova. The city of Bishkek's own housing and utility program targeted at subsidizing utilities for poor households could be extended nation-wide to mitigate the impact of energy tariff increases in the Kyrgyz Republic. In 2010, the GoKG suggested that the city of Osh introduces housing subsidies based on the Bishkek model in order to mitigate the tariff increase. Due to limited local resources, Osh was financially not able to implement the program. Another drawback of the Bishkek model is that is requires extensive information on a household's income and composition, their actual utility bills and, ideally, the installation of meters.[23]

[22] The KIHS does not allow an analysis of the Bishkek program given the limited number of observations.

[23] Under the current model, meters are not strictly necessary as the compensation is based on normative amounts.

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10 Appendix

Table 10.1 Composition of energy expenditures by source (by poverty status, quintile, for selected groups) in KGS

	Electricity	Heating	Hot water	Solid Fuels	Piped Gas	Total energy expenditures	Annual Total expenditures	Annual expenditures Per capita
Average	4413.9	701.6	461.3	5073.7	1156.2	11806.8	193539.0	54692.4
Quintiles								
Q1	3961.4	193.1	139.6	4140.3	407.6	8842.1	159174.1	28663.3
Q2	4536.9	497.1	340.0	5467.3	851.6	11693.0	188656.1	39677.0
Q3	4435.0	787.2	569.5	5016.8	1109.2	11917.6	199563.5	48598.3
Q4	4402.0	1059.4	755.7	4822.9	1743.0	12783.0	204753.0	60543.8
Q5	4735.3	972.0	502.2	5923.8	1670.5	13803.8	215612.5	96023.4
Region								
Bishkek	4580.8	2280.2	1965.1	700.4	3686.5	13213.1	165434.1	59196.5
Other urban	4657.6	947.1	63.2	3944.0	1205.4	10817.3	187420.0	55999.8
Rural	4271.1	54.4	60.7	7020.3	236.4	11642.8	205659.3	52638.4
Top. Region								
High-mountain	3853.6	151.1	0.0	8471.8	6.3	12482.8	209682.0	51573.8
Semi-Mountain	4381.7	156.3	5.0	5414.9	8.6	9966.5	200649.2	55251.8
Flat	4484.2	854.5	589.4	4623.6	1476.9	12028.6	190505.4	54963.1
Poverty Status								
not poor	4501.2	824.4	540.0	5223.2	1339.6	12428.5	199591.2	60315.1
poor	4013.6	138.7	100.7	4388.2	315.2	8956.3	165791.2	28913.6
Number of children in household								
none	3916.6	1085.6	649.6	4039.6	1605.1	11296.5	154006.6	72018.1
one child	4595.9	618.8	408.1	5117.6	1104.3	11844.7	198370.0	54629.2
two children	4582.6	539.5	429.7	5446.4	1026.7	12024.9	210978.5	44688.0
3 or more children	4849.1	336.7	237.4	6295.4	652.6	12371.2	232851.8	38059.0
Household Size								
1	2776.3	1685.3	869.4	1716.0	1598.4	8645.4	91524.6	91524.6
2	3777.3	1119.8	698.6	4127.3	1574.2	11297.2	145841.4	72920.7
3	4433.9	803.5	560.9	4104.9	1324.2	11227.3	180613.8	60204.6
4	4375.6	642.1	541.1	5201.8	1327.6	12088.2	196446.3	49111.6
5	4684.7	493.0	235.5	6095.5	855.6	12364.3	220614.7	44122.9
6	5196.1	268.1	215.2	6259.0	672.6	12611.0	239238.7	39873.1
7 +	5374.8	45.4	64.0	7578.2	617.8	13680.2	265861.4	34892.0

HH with beneficiary*								
MBTF	3420.3	51.0	40.7	6074.3	77.7	9664.0	201313.2	39358.8
pension	4434.8	584.5	334.2	5663.1	1222.7	12239.3	190730.9	54317.1
Thermal energy users								
	2389.7	4249.4	2794.2	545.1	1807.0	11785.5	160713.7	59703.0

Source: Own calculations. Household weights. No price elasticity, i.e. electricity consumption constant at 2016 levels
* Quintiles based on household per capita expenditures

Table 10.2 Nominal GDP growth rates and inflation rates 2016 -2023

Year	Inflation	Nominal GDP Growth rate
2016	0.39%	4.87%
2017	3.78%	5.60%
2018	5.06%	6.04%
2019	4.95%	7.68%
2020	5.01%	7.35%
2021	5.04%	6.88%
2022	4.99%	6.98%
2023*	4.99%	6.98%

Source: IMF WEO April 2017 (GDP), IMF WEO October 2017 (Inflation)
* 2023 not provided by IMF, we assume it is the same as 2023

Table 10.3 Electricity expenditure shares in %, 2016 – 2023, scenario 1

	2016	2017	2018	2019	2020	2021	2022	2023
Average	2.46	2.33	2.32	2.31	2.40	2.54	2.59	2.68
Quintiles*								
Q1	2.64	2.50	2.49	2.49	2.59	2.75	2.81	2.92
Q2	2.61	2.47	2.46	2.44	2.53	2.69	2.73	2.83
Q3	2.31	2.19	2.17	2.16	2.23	2.37	2.40	2.49
Q4	2.35	2.22	2.21	2.20	2.28	2.42	2.45	2.54
Q5	2.42	2.29	2.28	2.26	2.35	2.49	2.53	2.62
Region								
Bishek	2.86	2.70	2.65	2.62	2.66	2.81	2.79	2.87
Other urban	2.71	2.56	2.56	2.55	2.68	2.85	2.92	3.03
Rural	2.24	2.12	2.12	2.12	2.20	2.34	2.40	2.49
Top. Region								
High-mountain	1.99	1.88	1.88	1.89	1.95	2.09	2.14	2.24
Semi-Mountain	2.36	2.23	2.23	2.22	2.32	2.48	2.54	2.63
Flat	2.54	2.40	2.39	2.37	2.46	2.61	2.65	2.74
Poverty Status								
not poor	2.44	2.31	2.29	2.28	2.36	2.51	2.55	2.64
poor	2.60	2.46	2.46	2.45	2.55	2.71	2.77	2.87
Number of children in Household								
none	2.8	2.6	2.6	2.6	2.7	2.8	2.9	3.0
one child	2.5	2.4	2.3	2.3	2.4	2.5	2.6	2.7

two children	2.3	2.2	2.2	2.1	2.2	2.4	2.4	2.5
3 or more children	2.2	2.1	2.1	2.0	2.1	2.3	2.3	2.4
Household with beneficiary								
MBTF	1.8	1.7	1.7	1.7	1.8	1.9	1.9	2.0
pension	2.5	2.4	2.4	2.4	2.5	2.6	2.7	2.8
Household size								
1	3.2	3.0	3.0	3.0	3.1	3.3	3.3	3.4
2	2.8	2.6	2.6	2.6	2.7	2.9	2.9	3.0
3	2.6	2.4	2.4	2.4	2.5	2.6	2.7	2.8
4	2.4	2.2	2.2	2.2	2.3	2.4	2.5	2.6
5	2.3	2.1	2.1	2.1	2.2	2.3	2.4	2.5
6	2.2	2.1	2.1	2.1	2.1	2.3	2.3	2.4
7 +	2.1	2.0	2.0	2.0	2.0	2.2	2.2	2.3
Energy vulnerable households								
energy poor	3.6	3.4	3.4	3.3	3.4	3.6	3.6	3.7
energy poor and poor	3.9	3.7	3.6	3.6	3.7	3.9	3.9	4.0

Source: Own calculations. Household weights. No price elasticity, i.e. electricity consumption constant at 2016 levels
* Quintiles based on household per capita expenditures

Table 10.4 Real annual income loss in % as a result of a price change in electricity 2017-2023, scenario 1

	2017	2018	2019	2020	2021	2022	2023
Average	0	0.13	0.18	0.17	0.44	0.48	0.50
Quintiles							
Q1	0	0.14	0.20	0.19	0.47	0.49	0.55
Q2	0	0.13	0.19	0.18	0.47	0.51	0.53
Q3	0	0.12	0.17	0.16	0.40	0.44	0.46
Q4	0	0.12	0.17	0.16	0.42	0.46	0.47
Q5	0	0.12	0.17	0.16	0.43	0.48	0.50
Region							
Bishek	0	0.12	0.17	0.16	0.42	0.48	0.46
Other urban	0	0.14	0.20	0.19	0.55	0.60	0.61
Rural	0	0.12	0.17	0.16	0.41	0.44	0.48
Top. Region							
High-mountain	0	0.11	0.16	0.15	0.34	0.38	0.43
Semi-Mountain	0	0.13	0.18	0.17	0.44	0.50	0.54
Flat	0	0.13	0.18	0.17	0.45	0.48	0.50
Poverty Status							
not poor	0	0.12	0.17	0.17	0.43	0.47	0.49

poor	0	0.14	0.20	0.19	0.48	0.49	0.54
Number of children in the household							
none	0	0.15	0.21	0.20	0.49	0.51	0.54
one child	0	0.12	0.17	0.17	0.43	0.48	0.50
two children	0	0.12	0.17	0.16	0.42	0.46	0.48
3 or more children	0	0.11	0.16	0.15	0.39	0.44	0.47
Household with beneficiary*							
MBTF	0	0.11	0.15	0.14	0.30	0.32	0.37
pension	0	0.13	0.19	0.18	0.45	0.49	0.52
Household size							
1	0	0.18	0.25	0.24	0.54	0.52	0.57
2	0	0.15	0.21	0.20	0.49	0.51	0.55
3	0	0.13	0.18	0.17	0.45	0.50	0.52
4	0	0.12	0.17	0.16	0.42	0.46	0.49
5	0	0.11	0.16	0.15	0.41	0.46	0.49
6	0	0.11	0.15	0.15	0.39	0.46	0.47
7 +	0	0.10	0.15	0.14	0.39	0.43	0.44
Energy vulnerable households							
energy poor	0	0.16	0.22	0.21	0.59	0.67	0.66
energy poor and poor	0	0.17	0.24	0.23	0.63	0.68	0.70
Type of heating							
central heating only	0	0.09	0.13	0.13	0.20	0.16	0.21
electric heating only	0	0.17	0.24	0.23	0.74	0.84	0.78
stove only	0	0.12	0.17	0.16	0.40	0.42	0.46
central heating and electric	0	0.11	0.16	0.15	0.32	0.32	0.37
stove and electric heating	0	0.13	0.19	0.18	0.49	0.54	0.57
other combinations	0	0.14	0.20	0.19	0.63	0.76	0.70

Source: Own calculations. Household weights. No price elasticity, i.e. electricity consumption constant at 2016 levels
* Quintiles based on household per capita expenditures

Table 10.5 Energy expenditure shares for thermal energy scenario 1 for 2017 -2023 *

	2017	2018	2019	2020	2021	2022	2023
Average	0.83	0.90	0.91	0.92	0.91	0.91	0.90
Quintiles							
Q1	0.35	0.38	0.39	0.39	0.39	0.39	0.38
Q2	0.64	0.70	0.71	0.71	0.71	0.70	0.69

Q3	0.94	1.02	1.03	1.04	1.03	1.03	1.01
Q4	1.22	1.32	1.34	1.35	1.34	1.34	1.32
Q5	1.00	1.08	1.10	1.10	1.10	1.09	1.08
Region							
Bishek	3.21	3.48	3.54	3.55	3.53	3.52	3.47
Other urban	0.57	0.60	0.61	0.61	0.61	0.61	0.60
Rural	0.07	0.08	0.08	0.08	0.08	0.08	0.08
Top. Region							
High-mountain	0.07	0.08	0.08	0.08	0.08	0.08	0.08
Semi-Mountain	0.09	0.10	0.10	0.10	0.10	0.10	0.10
Flat	1.04	1.12	1.14	1.15	1.14	1.14	1.12
Poverty Status							
not poor	0.97	1.04	1.06	1.07	1.06	1.06	1.04
poor	0.21	0.23	0.23	0.23	0.23	0.23	0.23
Number of children in household							
none	1.56	1.69	1.72	1.72	1.71	1.71	1.68
one child	0.58	0.63	0.64	0.64	0.64	0.64	0.63
two children	0.52	0.56	0.57	0.57	0.57	0.57	0.56
3 or more children	0.23	0.25	0.25	0.25	0.25	0.25	0.24
Household with beneficiary*							
MBTF	0.07	0.07	0.07	0.07	0.07	0.07	0.07
pension	0.85	0.92	0.94	0.94	0.93	0.93	0.92
Household size							
1	3.33	3.58	3.65	3.66	3.64	3.63	3.58
2	1.45	1.57	1.60	1.60	1.60	1.59	1.57
3	0.83	0.90	0.92	0.92	0.91	0.91	0.90
4	0.60	0.65	0.66	0.66	0.66	0.66	0.65
5	0.27	0.29	0.30	0.30	0.30	0.30	0.29
6	0.19	0.21	0.21	0.21	0.21	0.21	0.21
7 +	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Energy vulnerable households							
energy poor	2.36	2.56	2.60	2.61	2.59	2.58	2.55
energy poor and poor	0.76	0.82	0.83	0.83	0.83	0.83	0.81
Thermal energy users	5.04	5.44	5.54	5.56	5.52	5.50	5.43

Source: Own calculations. Household weights. No price elasticity, i.e. thermal energy constant at 2016 levels

* Quintiles based on household per capita expenditures

Table 10.6 Real annual income loss in % as a result of a price change in thermal energy, scenario 1

	2017	2018	2019	2020	2021	2022	2023
Average	0.02	0.12	0.09	0.07	0.06	0.06	0.05
Quintiles							
Q1	0.01	0.05	0.04	0.03	0.03	0.02	0.02
Q2	0.02	0.10	0.07	0.05	0.05	0.04	0.04
Q3	0.03	0.14	0.11	0.07	0.07	0.06	0.06
Q4	0.04	0.18	0.14	0.10	0.09	0.08	0.08
Q5	0.03	0.15	0.11	0.08	0.07	0.07	0.06
Region							

Bishek	0.11	0.49	0.37	0.25	0.24	0.22	0.21
Other urban	0.00	0.07	0.06	0.04	0.04	0.04	0.04
Rural	0.00	0.01	0.01	0.01	0.01	0.01	0.00
Top. Region							
High-mountain	0.00	0.01	0.01	0.01	0.01	0.00	0.00
Semi-Mountain	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Flat	0.03	0.16	0.12	0.08	0.08	0.07	0.07
Poverty Status							
not poor	0.03	0.14	0.11	0.08	0.07	0.07	0.06
poor	0.01	0.03	0.02	0.02	0.02	0.01	0.01
Number of children in the household							
none	0.04	0.23	0.18	0.12	0.11	0.11	0.10
one child	0.02	0.09	0.07	0.05	0.04	0.04	0.04
two children	0.02	0.08	0.06	0.04	0.04	0.04	0.03
3 or more children	0.01	0.03	0.03	0.02	0.02	0.02	0.01
Household with beneficiary*							
MBTF	0.00	0.01	0.01	0.01	0.00	0.00	0.00
pension	0.02	0.13	0.10	0.07	0.06	0.06	0.05
Household size							
1	0.09	0.49	0.38	0.26	0.24	0.23	0.21
2	0.04	0.22	0.16	0.11	0.11	0.10	0.09
3	0.03	0.13	0.09	0.07	0.06	0.06	0.05
4	0.02	0.09	0.07	0.05	0.04	0.04	0.04
5	0.01	0.04	0.03	0.02	0.02	0.02	0.02
6	0.01	0.03	0.02	0.02	0.01	0.01	0.01
7 +	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy vulnerable							
energy poor	0.07	0.35	0.27	0.19	0.17	0.16	0.15
energy poor and poor	0.02	0.11	0.09	0.06	0.06	0.05	0.05
Thermal energy users							
	0.15	0.75	0.57	0.40	0.37	0.35	0.32
Type of heating							
central heating only	0.18	0.89	0.67	0.46	0.44	0.40	0.38
electric heating only	0.00	0.03	0.03	0.02	0.02	0.02	0.02
stove only	0.00	0.00	0.00	0.00	0.00	0.00	0.00
central heating and electric	0.05	0.43	0.35	0.25	0.23	0.21	0.20
stove and electric heating	0.00	0.00	0.00	0.00	0.00	0.00	0.00
other combinations	0.00	0.01	0.00	0.00	0.00	0.00	0.00

Source: Own calculations. Household weights. No price elasticity, i.e. thermal energy constant at 2016 levels

* Quintiles based on household per capita expenditures

Table 10.7 Cumulative losses in % for electricity scenarios 1 – 3, 2016-2023

	Scenario 1	Scenario 2	Scenario 3
Average	1.92	1.08	2.95
Quintiles			
Q1	2.08	1.23	3.12
Q2	2.03	1.12	3.17
Q3	1.75	1.00	2.69
Q4	1.82	1.01	2.82
Q5	1.89	1.04	2.94
Region			
Bishkek	1.84	1.04	2.95
Other urban	2.33	1.23	3.63
Rural	1.80	1.05	2.72
Top. Region			
High-mountain	1.59	0.97	2.33
Semi-Mountain	1.98	1.08	3.07
Flat	1.94	1.10	3.00
Poverty Status			
not poor	1.88	1.05	2.92
poor	2.07	1.21	3.10
Energy vulnerable households			
energy poor	2.53	1.33	4.15
Income & energy poor	2.70	1.48	4.35
Type of heating			
central heating only	0.92	0.80	1.06
electric heating only	3.06	1.46	5.21
stove only	1.75	1.04	2.65
central heating and electric	1.46	0.96	2.01
stove and electric heating	2.13	1.14	3.32
other combinations	2.65	1.21	4.52

Table 10.8 Cumulative (2017-2023) income loss for thermal energy scenario 2, %

	all users			only thermal energy users		
	central heating	hot water	thermal energy	central heating	hot water	thermal energy
Average	0.66	0.52	1.21	4.00	3.16	7.33
Quintiles						
Q1	0.27	0.23	0.51	3.38	2.91	6.43
Q2	0.50	0.43	0.95	4.02	3.45	7.67
Q3	0.72	0.61	1.37	3.89	3.31	7.37
Q4	0.96	0.78	1.78	4.02	3.25	7.44
Q5	0.85	0.56	1.44	4.32	2.83	7.30

Region						
Bishkek	2.34	2.26	4.72	4.49	4.33	9.04
Other urban	0.70	0.05	0.76	3.37	0.26	3.64
Rural	0.05	0.06	0.11	2.03	2.61	4.82
Top. Region						
High-mountain	0.10	0.00	0.10	6.24	0.00	6.24
Semi-Mountain	0.12	0.00	0.13	2.51	0.07	2.58
Flat	0.81	0.67	1.52	4.04	3.31	7.52
Poverty Statu						
not poor	0.77	0.60	1.41	4.13	3.24	7.54
poor	0.16	0.14	0.31	2.35	2.17	4.59
Energy vulnerable						
energy poor	1.93	1.45	3.50	7.20	5.42	13.03
Income & energy poor	0.58	0.50	1.10	5.20	4.47	9.89
Thermal energy User						
	4.00	3.16	7.33	-	-	-
Type of heating						
central heating only	4.51	3.92	8.64	4.61	4.01	8.84
electric heating only	0.34	0.03	0.36	2.24	0.19	2.43
stove only	0.00	0.01	0.01	0.22	0.68	0.90
central heating and electric	3.18	1.14	4.36	3.51	1.26	4.81
stove and electric heating	0.01	0.01	0.02	0.53	0.54	1.07
other combinations	0.04	0.02	0.06	0.81	0.45	1.26