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Switching the Lights Off: The Impact of Energy Tariff Increases on Households in The Kyrgyz Republic

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Abstract

Raising energy prices to cost-recovery tariffs has several implications. The implicit (quasi-fiscal) subsidization of the energy sector will be reduced to a large extent. Energy companies will have higher revenues, and consumers will be faced with a major increase of their energy bills and potentially high welfare losses. Removing subsidies affects poor households more as they spend on average a larger share of household income on energy and because they have fewer options to adjust their energy consumption. This paper analyses the impact of higher energy tariffs on households in the Kyrgyz Republic using micro-data from the Kyrgyz Integrated Household Survey 2009. It aims at answering the question which households will be most affected by higher energy tariffs and to what extent mitigation measures, such as lifeline tariffs or direct cash transfers could soften the impact on poor and vulnerable households. The analysis focuses on first-order effects and uses benefit incidence analysis and static micro-simulation to estimate expected costs and benefits of higher energy prices and the corresponding mitigation measures. Results suggest that both the type of energy and the level of connectedness matter. Increasing tariffs for thermal power used for central heating and hot water mainly affects richer households in urban areas. Reducing implicit electricity subsidies affects the whole population due to nearly full country coverage with electricity connections. Lifeline tariffs for electricity could mitigate the effect of higher tariffs to a certain extent as long as households have actual control over their consumption. However, all households would benefit equally. Direct cash transfers targeted at poor households improve the targeting performance and lower the costs compared to universal subsidies.

Keywords: energy subsidy, poverty, social transfers, Kyrgyz Republic

JEL Codes: H23, I38, P22

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1. Introduction[2,3]

In the decades following the collapse of the Soviet Union the energy infrastructure deteriorated dramatically in the region, while countries were confronted with higher energy prices. In the mid-1990s, many countries in Eastern Europe and Central Asia (ECA) embarked on reforming the energy sector. Countries had to raise energy tariffs to cost-recovery levels in order make the sector financially viable and encourage efficient energy consumption. Between 1991 and 2000, electricity prices increased with an average of 177 per cent in real terms in the region (Lampietti et.al., 2007:13). However, in 2003, electricity tariffs were still below cost-recovery level in 14 out of 19 ECA countries (Lampietti et.al., 2007). Confronted with high market prices and low revenues from consumers, governments had to support the energy sector with indirect subsidies, cross-subsidies, barter trading and accumulations of arrears.

Raising energy prices to cost-recovery tariffs has several implications. The implicit (quasi-fiscal) subsidization of the energy sector will be reduced to a large extent. Energy companies will have higher revenues, and consumers will be faced with a major increase of their energy bills and potentially high welfare losses. Several studies have analysed the distribution of energy subsidies either at country, regional or global level (see, e.g. Del Granado & Adenauer, 2011; Zhan, 2011; Lin & Jiang, 2011; Saboohi, 2001; Wodon et.al. 2003; World Bank 2004; Komives et.al, 2005, 2006; Lampietti et. al. 2007). They all conclude that universal energy subsidies are regressive, benefiting richer households more than the poor. Increasing block tariffs or volume-differentiated tariffs only marginally improve the targeting performance in most countries, not the least due to the frequently lower level of connectedness among poor households. Removing subsidies affects poor households more as they spend on average a larger share of household income on energy and because they have fewer options to adjust their energy consumption (see e.g. World Bank, 2004; Lampietti et.al. 2007). Only few studies have analysed the effect of higher energy tariffs on poverty. The potential for alternative targeting methods for allocating energy subsidies, such as geographical targeting, demographic targeting or means-testing is equally under-explored (see, eg., Komives et.al. 2006; Wodon et.al. 2003).

The objective of this paper is to analyse the impact of higher energy tariffs on households using micro-data from the Kyrgyz Integrated Household Survey (KIHS) 2009. It aims at answering the questions to what extent the removal of energy subsidies will lead to an increase in poverty, which households will be most affected by the drop in real income, and to what extent mitigation measures, such as lifeline tariffs or direct cash transfers could soften the impact on poor and vulnerable households. The analysis in the current study focuses on first-order effects and uses benefit incidence analysis and static micro-simulation to estimate expected costs and benefits of higher energy prices and the corresponding mitigation measures.

The Kyrgyz Republic is a low-income country in Central Asia, with a total population of 5.6 million and GDP per capita of 2,400 USD PPP in 2011 (IMF WEO 10/12). Poverty rates in the Kyrgyz Republic have been decreasing significantly since the beginning of the decade. In 2009, 32 per cent of the population is living below the absolute poverty line and three per cent is considered to be extremely

[2] We are grateful to the National Statistics Committee of the Kyrgyz Republic for providing the integrated household survey data.

[3] The author would like to thank the discussants and participants of the Conference on Micro-Level Analysis of Well-Being in Central Asia, May 2012, Berlin, for their helpful comments.

poor. Poverty is highest in rural areas (37 per cent), and lowest in Bishkek (14 per cent). 68 per cent of the extremely poor are living in rural areas (World Bank 2011).

Energy tariffs in the Kyrgyz Republic are heavily subsidized. Since as early as 1995, the Government of Kyrgyzstan has attempted to reform energy tariffs. In April 2008, it adopted a mid-term strategy for electricity tariffs with the aim of achieving cost-recovery level in 2012. Besides the objectives related to the production and delivery of electricity, the strategy also determined that by 2012 all electricity subsidies must be targeted to low-income consumers and provided through the state social benefit system (USAID, 2008:52). Implicit energy subsidies are estimated to account for 116 mio USD per year for electricity and 75 mio USD for thermal power, representing together 4.4 per cent of the Kyrgyz GDP.[4] On average, a household spends 6.2 per cent of total household expenditures on energy. Energy expenditures are highest in the capital city with 7.1 per cent of total household expenditures. The poorest households spend about half the average amount on energy which takes up 5.7 per cent of their total annual expenditures (KIHS 2009).

Results suggest that both the type of energy and the level of connectedness matter. Increasing tariffs for thermal power used for central heating and hot water mainly affects richer households in urban areas. Reducing implicit electricity subsidies affects the whole population due to nearly full country coverage with electricity connections. Lifeline tariffs for electricity could mitigate the effect of higher tariffs to a certain extent as long as households have actual control over their consumption. However, all households would benefit equally. Direct cash transfers targeted at poor households improve the targeting performance and lower the costs compared to universal subsidies.

The remainder of this paper is structured as follows: the following section summarizes the theory behind energy subsidies and the potential impact of their removal. Section three explains the data and methodology used. Current energy consumption and its determinants are analysed in section four. In section five we simulate the consequences of removing the energy subsidies and in section six we analyse the potential of lifeline tariffs and direct cash transfers to mitigate the welfare loss. Section seven concludes.

2. Energy subsidies

Energy subsidies have several objectives and they come in different forms. In this paper we consider energy as being subsidized if the price charged to consumers is below the full economic costs of production.[5] Generally, the objective of energy subsidies is to make energy affordable, support the poor and redistribute income. Subsidies for goods and services covering basic needs are commonly seen as social policy instruments (Komives et.al. 2006; Foster, 2000). The main arguments against energy subsidies refer to allocative and productive inefficiencies, financial unsustainability and equity issues (Komives, et.al. 2005, 2006).

A typology of energy subsidies differentiates between consumption and connection subsidies, and between targeted and universal subsidies (Komives, et.al. 2006). In this paper the focus is on consumption subsidies. A universal subsidy provides energy at below cost-recovery prices to all consumers. Targeting can either be implicit or explicit. Implicit targeting refers to the application of

[4] Calculation based on KIHS 2009 using the difference between actual tariffs and full cost recovery prices as estimated by USAID/TetraTech (2011) and UNDP (2011). GDP data for 2009 from IMF (2011).

[5] This includes operating, maintenance and capital costs.

flat fees, but also includes theft, fraud and inaction by the provider if the energy bill is not paid (Komives, et.al. 2006). Explicit targeting is either quantity based (increasing block tariffs or volume-differentiated tariffs) or administrative (means testing, categorical targeting).

Removing energy subsidies affects household welfare directly and indirectly (Kilian, 2008; Zhang, 2011). As a result of higher energy prices, households have less discretionary income. After the energy bill is paid, they have less to spend on other goods and services. Secondly, household may increase precautionary savings in order to allow for future consumption smoothing. Finally, households may delay or forgo the purchase of energy-using consumer durables. Indirect effects arise due to the reallocation of capital and labour as a result of higher energy prices (Zhang, 2011) and higher retail prices for goods using energy during production (del Granado & Adenauer, 2011). The distributional impact of higher energy prices on households has been analysed in various studies. Expenditures for energy are estimated to increase between 2 - 16 per cent for the poorest twenty per cent households and between 2 -8 per cent for the richest quintile. The decrease in real income ranges between 3 and 9 per cent for the poorest, and between 2 and 8 per cent for the richest twenty per cent (IEA et.al. 2010; del Granado & Adenauer, 2011). Studies analysing the impact of energy subsidy removals on the macro economy using general equilibrium models generally found a negative impact on output and growth.[6]

The extent to which households can adjust their energy consumption behaviour depends on their welfare status and the location. Poor households are constrained in their options to adjust consumption. First, their energy consumption is already minimal, covering basic needs only, and secondly, they often have fewer options to switch to alternative energy sources (Zhang, 2011). In order to measure the effect of energy price increases in households, the ability to adjust consumption by different households needs to be taken into account. Recent research confirms that the price elasticity for energy is not homogeneous (Zhang, 2011). Richer households are more flexible in adjusting their energy consumption following a price increase. Furthermore, long-run price elasticity is larger than in the short-run as households need time to adjust their utilization behaviour (Zhang, 2011).

Data and Methodology

The paper uses data from the 2009 Kyrgyz Integrated Household Survey (KIHS) collected by the National Statistics Committee (NSC) of the Kyrgyz Republic. The KIHS is implemented quarterly covering a sample of 5,000 households. The survey consists of several questionnaires and diaries collecting information on the household composition, education and health, migration, employment, housing, land and livestock possession and household income and expenditures. Households are visited four times per year. The data are representative at the national and regional level.

The dataset only contains indirect information on energy use. It provides information on the availability of utilities, such as electricity, central heating, water, etc. The survey does not collect information on the consumption of energy in terms of kilowatt hours (kWh) for electricity or giga calories (Gcal) for central heating and hot water. Energy consumption is estimated based on reported household expenditures divided by unit costs. Household survey data on energy consumption may be affected by selection bias if connected households do not report respective expenditures. Less

[6] For a good overview of empirical studies see World Bank (2010) and IEA et.al. (2010).

than one per cent of connected households did not report electricity expenditures in 2009. With central heating and hot water, this applies to 19 and 29 per cent respectively.

For the distributional analysis of energy consumption we use total and per capita household expenditures as calculated by the NSC. The choice of expenditures over consumption or household income is guided by the premise that total expenditures better reflect the incomes of households.[7] Households are ranked and divided into ten groups of equal size (deciles) based on total household expenditures per capita, unless indicated otherwise. The poverty status of a household (individual) is based on the consumption aggregate and the official poverty lines as provided by the NSC.

The second part of the analysis simulates the effect of an energy tariff reform and its impact on poor and vulnerable households using the price-gap approach. The study focuses on first-order effects. Households will have to spend more money for energy given that they keep consumption at the pre-reform level. As a result, the share of total household income devoted to energy will increase. Taking into account that households may adjust their consumption behaviour by reducing their energy use or switching to other fuels, we correct post-reform electricity consumption assuming a given price elasticity.

Static micro-simulation is applied in the third part to assess the potential impact of different mitigation measures. The subsequent distributional analysis provides an indication of the expected effects in terms of coverage, distribution and adequacy of the support measures compared to current implicit subsidies. All results are calculated at the household level, unless indicated otherwise. Sampling weights are used in order to render the results nationally representative.

The focus of the analysis is on first-order effects and does not capture second-order effects. The impact of the tariff reform is assessed for residential consumers only, although the reform will also affect the industry.[8]

Current energy consumption

The level of household energy consumption depends on several factors. The availability of different energy sources determines the use of electricity and thermal power in a household. A household heating with electricity, for example, may have a higher electricity bill than other households. Households connected to district heating (central heating) consume higher volumes of thermal power. Table 1 summarizes the availability of different energy sources for different groups of the population. Coverage with electricity is almost 100 per cent, unlike countries of similar income level in other parts of the world (Komives et.al. 2005), but typical for countries in the region.

Coverage with other energy sources, such as central heating, hot water and central gas supply is much less widespread. Moreover, it is mainly the non-poor population in the capital city that has access to these amenities. Overall, 12 per cent of the population live in a house or apartment connected to the central heating system, and 17 per cent use electric heating (Table 1 and 2). The majority, though, uses other types of heating based on solid fuels such as coal, wood, or dung. Coverage with central heating is highest in urban areas. More than half of Bishkek's residents are connected to the central heating system. Electric heating is most prevalent in other urban areas. The

[7] Spearman rank correlation coefficients: per capita expenditures versus per capita consumption = 0.98; per capita expenditures versus per capita income = 0.60 (KIHS 2009).
[8] 37 per cent of total electricity produced in the Kyrgyz Republic is used by households (UNDP, 2011:19).

use of solid fuels is most common in rural areas, where 83 per cent of the population depends on this type of heating. The welfare level of the household is only slightly indicative for the type of heating used. Central heating is predominantly used by non-poor households, while the poor depend on other heating sources. This finding is closely correlated with the distribution of poverty in the Kyrgyz Republic. Relatively more poor live in rural areas where central heating is not available.

Table 1. Availability of main energy sources, per cent of population, 2009

	Total	Not poor	poor	Bishkek	other urban	Rural
Electricity	99.9	99.9	99.9	100.0	99.9	99.9
Central gas supply	21.0	26.3	9.5	66.8	35.5	6.0
Hot water	11.3	14.7	3.8	55.4	9.1	1.8
Central heating	12.4	15.9	4.8	54.9	14.9	1.9

Source: Own calculation based on KIHS 2009. Individual level weights. Except for electricity, differences across groups are statistically significant (p<0.001).

Table 2. Type of heating, % of population, 2009

	Total	Not poor	Poor	Bishkek	other urban	Rural
central heating	12.4	15.9	4.8	54.9	14.9	1.9
electric heating	17.5	16.8	19.0	8.5	32.7	14.8
other heating	70.1	67.3	76.2	36.6	52.4	83.3

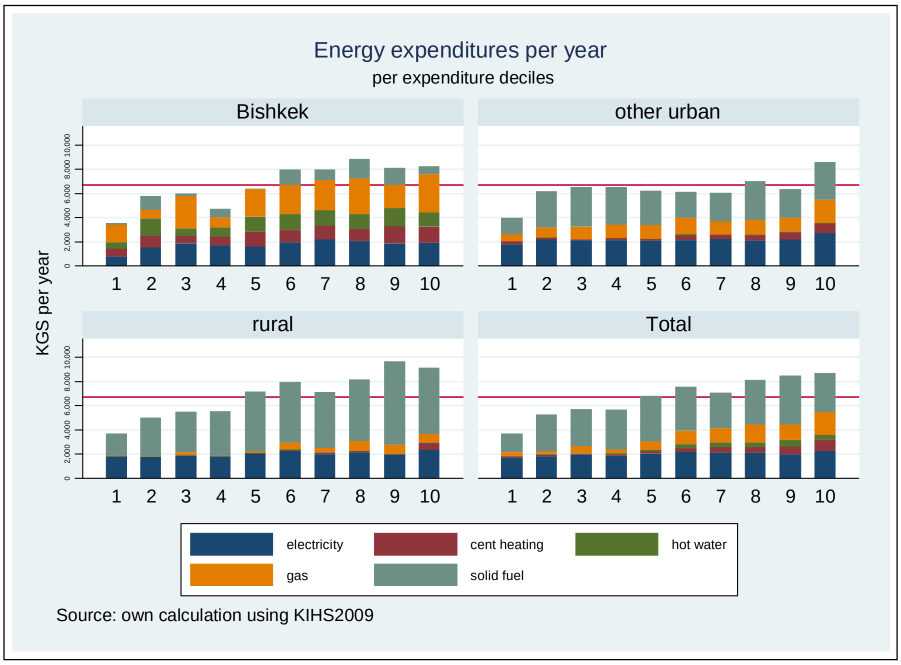
Source: Own calculation based on KIHS 2009. Individual level weights. p<0.001 (chi-square).

The possession of electric appliances is also influencing electricity consumption. Households with many electric appliances are expected to consume more electricity (Zhang, 2011). Colour TVs, refrigerators, washing machines, sewing machines and mobile phones are the most widely possessed durable goods running on electricity, both in poor and non-poor households. However, coverage is higher in non-poor households.[9]

Household energy consumption is estimated by dividing total household expenditure (actually paid amount) per energy type by the applicable tariffs for 2009. This method does not correct for outstanding amounts or payments made to cover arrears. Nor does it include unreported consumption. In 2009, a Kyrgyz household consumed on average 2,843 kWh of electricity, and 1.69 Gcal of thermal power (central heating and hot water). Richer households have higher energy expenditures than poorer households (fig. 1). The richest households spend over two times more than the poorest households (KGS 8,700 vs. KGS 3,700). However, in terms of share of energy in total household expenditures, poorest and richest households allocate approximately the same (5.7 – 5.8 per cent). Only higher middle-income households (5th to 9th decile) allocate a slightly higher share to energy. In total, an average Kyrgyz household spends KGS 6,705 (146 USD) for different types of energy in 2009 accounting for 6.2 per cent of total household expenditures. Solid fuels and electricity represent the lion's share (Table 3).

[9] See table A1 in the Annex.

Figure 1. Annual energy expenditures 2009



Annual consumption of electricity varies between 2,392 kWh for the poorest and 3,252 kWh for the richest ten per cent of the population, accounting for 2.7 per cent of total household expenditures in the poorest households versus 1.6 per cent in the richest households, which is low by international standards (Komives, et.al. 2005). While electricity can be considered as a normal good, this does not apply to thermal power, where the richest households consume eight times more than the poorest households (0.43 Gcal versus 3.57 Gcal per year), taking an increasing share of total household expenditures. In Bishkek, households consume by far the most thermal power with more than 7 Gcal per year.

Table 3. Annual energy consumption and expenditures per decile, 2009

		Households by expenditure deciles (based on per capita expenditure)										
Current energy consumption		All	1	2	3	4	5	6	7	8	9	10
Electricity	kWh	2,843	2,392	2,583	2,765	2,640	2,870	3,125	3,016	2,983	2,805	3,252
Central heating	Gcal	0.67	0.21	0.21	0.14	0.24	0.4	0.63	0.93	0.95	1.29	1.74
Hot water	Gcal	1.03	0.22	0.47	0.22	0.41	0.62	1.28	1.51	1.55	2.26	1.83
Current energy expenditures as share of total household expenditures												
Electricity	%	1.98	2.70	2.10	2.09	1.98	1.97	1.97	1.95	1.84	1.62	1.58
Central heating	%	0.37	0.25	0.20	0.13	0.18	0.25	0.32	0.58	0.48	0.57	0.73
Hot water	%	0.26	0.13	0.21	0.08	0.14	0.18	0.29	0.42	0.35	0.46	0.38
Solid fuels	%	2.81	2.15	3.10	2.88	3.05	3.58	3.13	2.46	2.69	3.14	1.96
Piped gas	%	0.81	0.51	0.30	0.67	0.37	0.68	0.91	1.08	1.23	1.19	1.16
Total	%	6.24	5.73	5.91	5.86	5.73	6.66	6.63	6.49	6.58	6.98	5.81
PM: Total household expenditures	*Thds KGS*	*113*	*68*	*90*	*100*	*100*	*109*	*117*	*119*	*130*	*140*	*160*

Source: Own calculation based on KIHS 2009. Energy consumption is calculated by dividing total household expenditures per source (actually paid amount) by the applicable tariff. Households are distributed across deciles based on per capita expenditures.

In order to identify the determinants of electricity consumption, we estimate a OLS regression model with electricity expenditures as the dependent variable (table 4). The dependent variable is the natural logarithm of household electricity expenditures. The estimated model can be written as follows:

$$Ln(exp_i) = \alpha + \boldsymbol{\beta X}_i + \varepsilon_i \qquad [1]$$

where exp_i is expenditures for electricity per household i, α a constant, **β** a vector of coefficients, $\mathbf{X}_i$ a vector of household indicators, and ε_i the error term. We estimate the models for all households and separately for urban and rural areas accounting for the different living conditions. We include household and housing characteristics, location, and various variables for utilities and durable goods that may explain electricity consumption.

Table 4. Determinants of electricity consumption, 2009

	Model 1: total			Model 2: urban			Model 3: rural		
	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t
Poverty status (not poor)									
Poor	-0.156	0.031	0.000	-0.236	0.038	0.000	-0.058	0.038	0.122
extreme poor	-0.290	0.090	0.001	-0.493	0.159	0.002	-0.145	0.100	0.145
household size	0.087	0.009	0.000	0.122	0.010	0.000	0.066	0.012	0.000
with children <6	-0.005	0.028	0.849	-0.037	0.033	0.267	0.006	0.040	0.885
with elderly >65	-0.045	0.043	0.296	-0.175	0.043	0.000	0.024	0.062	0.693
female hh head	-0.023	0.025	0.367	-0.050	0.028	0.071	0.024	0.037	0.512
age hh head	0.000	0.001	0.758	0.000	0.001	0.992	0.001	0.002	0.708
Wall material (bricks)									
concrete slab	-0.090	0.049	0.065	-0.101	0.043	0.020	-0.016	0.125	0.900
crude airbricks	-0.095	0.028	0.001	-0.025	0.034	0.461	-0.112	0.043	0.009
earth, clay	-0.206	0.035	0.000	-0.161	0.048	0.001	-0.161	0.047	0.001
Other	0.041	0.057	0.470	-0.033	0.057	0.566	0.133	0.073	0.069
Roof material (slates)									
Concrete	0.033	0.046	0.473	0.045	0.042	0.284	-0.076	0.116	0.511
Other	0.094	0.052	0.069	0.133	0.057	0.020	0.059	0.066	0.373
Heating (central)									
electric heating	0.484	0.046	0.000	0.441	0.047	0.000	0.440	0.126	0.000
other heating	0.406	0.042	0.000	0.316	0.044	0.000	0.453	0.121	0.000
Household has central gas supply	-0.123	0.037	0.001	-0.241	0.034	0.000	0.052	0.088	0.552
Power interruption (never)									
several times a year	0.036	0.044	0.413	0.051	0.050	0.301	-0.012	0.096	0.904
monthly or weekly	-0.032	0.049	0.510	0.016	0.059	0.786	-0.042	0.094	0.654
several times a week	-0.035	0.052	0.502	0.055	0.056	0.326	-0.232	0.109	0.033
every day	0.117	0.045	0.010	0.090	0.049	0.065	0.016	0.092	0.858
has refrigerator	0.110	0.030	0.000	0.083	0.034	0.014	0.079	0.041	0.054
has washing machine	-0.050	0.028	0.079	-0.007	0.031	0.823	-0.047	0.039	0.228
has electric stove	0.132	0.031	0.000	0.077	0.037	0.038	0.104	0.047	0.026
has electric heater	0.107	0.030	0.000	0.089	0.038	0.017	0.106	0.044	0.015
has electric leisure appliances (none)									
One	0.099	0.099	0.314	0.031	0.111	0.781	0.326	0.153	0.033
Two	0.192	0.097	0.049	0.146	0.111	0.190	0.368	0.150	0.014

Three	0.147	0.098	0.133	0.110	0.110	0.319	0.346	0.151	0.022
Four	0.213	0.101	0.035	0.142	0.112	0.205	0.431	0.154	0.005
five or more	0.236	0.107	0.027	0.109	0.122	0.372	0.484	0.161	0.003
oblast (Bishkek; Chui in rural)									
Issykul	-0.277	0.051	0.000	-0.027	0.063	0.664	-0.292	0.056	0.000
Jalal-Abad	-0.358	0.048	0.000	-0.255	0.044	0.000	-0.306	0.065	0.000
Naryn	-0.036	0.090	0.690	0.671	0.122	0.000	-0.206	0.114	0.070
Batken	-0.413	0.068	0.000	-0.538	0.060	0.000	-0.329	0.087	0.000
Osh	-0.215	0.045	0.000	-0.093	0.047	0.050	-0.256	0.060	0.000
Talas	0.014	0.055	0.792	0.077	0.082	0.345	0.091	0.062	0.142
Chui	-0.116	0.047	0.014	-0.207	0.047	0.000	(omitted)		
Altitude (high mountain)									
Semi mountain	0.121	0.072	0.092	0.687	0.128	0.000	-0.168	0.090	0.064
Plains	0.248	0.067	0.000	0.699	0.111	0.000	0.035	0.083	0.670
Constant	6.644	0.143	0.000	6.246	0.178	0.000	6.584	0.209	0.000
Number of observations		4862			2929			1933	
R^2		0.293			0.431			0.279	

Source: Own calculation based on KIHS 2009. Weighted OLS regression; Dependent variable: Ln(electricity expenditures); categorical variables: base case indicated between brackets.

As expected, the lower the welfare level of a household, the lower the electricity consumption. Extremely poor households consume 29 per cent less than rich households, all else being equal. However, if the model is estimated separately for urban and rural households, the poverty status of households is no longer significant in rural areas. The composition of the household has only a minor influence on electricity consumption. Only household size has a positive and significant impact. With each additional household member, electricity consumption increases between seven and 12 per cent. The presence of children and/or elderly has only a limited impact. In the urban model, the presence of an elderly person decreases consumption by four per cent, all else being equal. This might be due to the fact that elderly in urban areas more often live alone and are poorer than other households.

We would expect that the quality of the roof and walls of the dwelling has an effect on electricity consumption, especially if households use electricity for heating purposes. A better insulated dwelling should decrease the energy use for heating purposes. Based on our model, only wall material has a predictive power on electricity consumption. The signs of the coefficient are however not as expected. Electricity consumption is lower in dwellings without brick walls, while we would expect the opposite. It seems that the wall material is rather a reflection of the living standard, confirming the negative coefficients for poor and extremely poor households. As expected the type of heating used has a very strong impact on electricity consumption. Households using electric heating consume almost 50 per cent more electricity than households with central heating. Interestingly, this also applies to households with other heating sources, although to a slightly lesser extent. The availability of gas has a negative effect on electricity consumption. It reduces the need for electricity for cooking. We would expect that the frequency of power interruptions also has an impact on electricity consumption. With more frequent interruptions, households are limited in their electricity use. Our data do not confirm this expectation. The coefficients are not significantly different from zero, except for daily interruptions. However, the sign is positive, which actually means higher electricity consumption than in households without power interruptions, all else being equal.

The presence of durable goods and household appliances has only a limited influence on electricity consumption. The presence of a refrigerator, electric stove and electric heater have a positive effect. Households possessing one of these items consume more electricity. Having a washing machine, on the other hand, has a negative effect on electricity consumption. The presence of electric leisure appliances, such as TVs, mobile phones, computers, etc. has a measurable impact for households possessing four or more items.

Finally, the location of a household matters. Households in Bishkek consume significantly more electricity than similar households in other regions. The difference is between 10 and 40 per cent. Households in high mountain areas consume significantly less than households in other areas. In the plains, electricity consumption is 25 per cent higher than in high mountain areas, all else being equal.

Impact of higher energy tariffs

Raising energy tariffs to cost recovery levels will have an immediate impact on all households. Higher tariffs translate into higher energy bills. Households have only few choices to react to the price increase. They can maintain their current energy consumption, resulting in significantly higher energy expenditures, they can reduce their energy consumption down to an extent where energy expenditures remain unchanged, or they can switch to other energy sources.[10] Evidence from Armenia showed that 80 per cent of the households partly substituted their electricity consumption with other energy sources following an electricity price increase. The primary substitute for 60 per cent of households was wood, which replaced electricity use for cooking and heating (Lampietti et.al. 2007:51-53). Evidence from Georgia shows that average household consumption of electricity remains fairly constant after a price increase if consumption is already at a minimum level. Georgian households consume about 125 kWh per month. This is sufficient to power a refrigerator and some light-bulbs (Lampietti et.al. 2007:27). Following the tariff increase in 1998, Armenian households reduced their consumption with 17 per cent within the first year. Median annual household electricity consumption is as low as 1,275 kWh (Lampietti et.al. 2007:55).

The extent to which households reduce or substitute electricity consumption depends on the price elasticity of the consumed good, the level of consumption prior to the reform, the extent of the price increase and the relative price of fuel substitutes. Low price elasticity means that a tariff increase has a limited effect on consumption, while high price elasticity would result in significant changes in consumption levels. Price elasticity may differ in the short and long run. The elasticity is higher in the long run as households have more time to adjust their behaviour and, for example, switch to other energy sources or use energy more efficiently. At an already low level of consumption, the price elasticity is lower since households have little room to save on energy consumption.

We measure the impact of a price increase by comparing consumption before and after the reform. For electricity, we calculate after reform consumption allowing for price elastic demand:

$$x^{a}{}_{i,e} = x^{b_{i,e}} - [(\frac{p^{a}{}_{e} - p^{b}{}_{e}}{p^{a}{}_{e}}) * \varepsilon_{e} * x^{b}{}_{i,e}] \qquad [2]$$

[10] Theft or the incurrence of payment arrears are also possible reactions to a price increase.

Where $x^a_{i,e}$ is consumption of energy *e* after reform for household *i*, $x^b_{i,e}$ is current consumption of energy *e* for household *i*, p^a_e the price of energy *e* after the reform, p^b_e the price of energy *e* before the reform, and ε_e the price elasticity of energy *e.*

Ideally, the price elasticity is derived from country data and estimated for different population groups. Due to lack of relevant data for the Kyrgyz Republic, we select the coefficient based on international evidence and one earlier study, assuming that the current population would behave similarly. A USAID report published in 2008 analysed the potential impact of tariff increases on the poorest groups of the Kyrgyz population. The study concluded that higher electricity tariffs result in reduced consumption by the poorest households by 15-25 per cent (USAID 2008). Estimates for other countries range between -0.15 and -0.74 (World Bank, 2004:23). Since our study looks at short-run effects, we assume a price elasticity of -0.15, in line with the impact assessment for Azerbaijan (World Bank, 2004). A ten per cent increase in electricity tariffs reduces electricity consumption with 1.5 per cent. This assumption is plausible as households are less flexible in the short run.

The demand for thermal power after the reform does not account for substitution effects. Households are constrained in adjusting their thermal power consumption. It is common for countries in the region that central heating and hot water are from district providers leaving connected households with few alternative choices. Furthermore, households rarely have control over their consumption as they lack individual thermostats and thermal power meters. As a result, the estimated impact may be overestimated.

We estimate the impact of the increase of energy prices from the currently subsidized to full cost recovery prices. There is no hard evidence on what the true costs of different energy types are for the Kyrgyz Republic. A report from USAID/Tetra Tech (2011) estimates the full cost recovery price for electricity at KGS 2.03 per kWh (4.4 USD cents per kWh) implying a subsidy of KGS 1.33 per kWh at given electricity tariffs. No similar information is available for thermal power. According to UNDP, current prices for thermal power only cover 45 per cent of total costs. Based on a different calculation, 75 per cent of revenues of thermal power providers are from the state budget (UNDP 2011). The full cost recovery price for thermal power may be anywhere between KGS 1,111 and KGS 2,500 per Gcal (24 – 54 USD/Gcal). For the current paper we use the arithmetic average between the two extremes.

Table 5. Overview of energy tariffs used for simulation

	Electricity (kWh)	Central heating (Gcal)	Hot water (Gcal)
Actual price in 2009	KGS 0.70 (USD 0.01)	KGS 500 (USD 10.84)	KGS 250 (USD 5.42)
Full cost recovery price	KGS 2.03 (USD 0.04)	KGS 1,800 (USD 39.01)	KGS 1,800 (USD 39.01)
Increase (%)	190%	260%	620%

Source: USAID/TetraTech (2011) for electricity; own calculations for thermal power based on UNDP (2011). Exchange rate: 46.14 KGS/USD.

Assuming a price elasticity of -0.15, households would reduce their annual consumption from 2,843 to 2,033 kWh on average per year (Table 6). Keeping current expenditure levels constant, households would have to reduce their annual electricity consumption down to less than 1,000 kWh per year on average. Even the richest households could only consume 200 kWh per month, while the poorest would have to do with just over 70 kWh per month.[11]

Table 6. Estimated price effect on annual electricity consumption, kWh

		Households by expenditure deciles									
	All	1	2	3	4	5	6	7	8	9	10
current electricity consumption	2,843	2,392	2,583	2,765	2,640	2,870	3,125	3,016	2,983	2,805	3,252
under constant expenditures	980	865	959	1,006	958	1,068	1,196	1,144	1,129	1,085	1,254
with price effect*	2,033	1,710	1,847	1,977	1,887	2,052	2,235	2,156	2,133	2,006	2,325

Source: Own calculation based on KIHS 2009. *\assuming a price elasticity of -0.15.

Table 7. Impact of energy price increase on energy expenditures, percentage

			Households by expenditure deciles									
		All	1	2	3	4	5	6	7	8	9	10
Difference with energy expenditures prior to reform												
Increase in expenditures	%	68.8	65.1	55.9	45.4	51.9	53.4	68.3	82.0	72.3	85.9	86.8
After reform energy expenditures as a percentage of total household expenditures												
Electricity*	%	4.1	5.6	4.4	4.3	4.1	4.1	4.1	4.0	3.8	3.4	3.3
Central heating	%	1.3	0.9	0.7	0.5	0.7	0.9	1.2	2.1	1.7	2.1	2.6
Hot water	%	1.9	0.9	1.5	0.6	1.0	1.3	2.1	3.0	2.5	3.3	2.7
Total (incl. gas, solid)	%	11.0	10.1	10.0	9.0	9.2	10.6	11.4	12.7	12.0	13.1	11.7

Source: Own calculation based on KIHS 2009. *\assuming a price elasticity of -0.15.

As a result of energy price increases, the share of total household expenditures allocated to energy would increase from six per cent to 11 per cent on average (Table 7). Rich households would be confronted with a larger increase mainly due to thermal power consumption. Under the new tariff regime poor households would spend up to 5.6 per cent of total household expenditures on electricity. The question to be asked is whether poor households can afford such an increase and what the implications are for other categories of expenditures. The possibility to reallocate expenditures within households is limited as most of the consumption is used to cover basic needs. Food accounts for 70 per cent of total consumption in the poorest households. Even the richest households spend more than half of their budgets on food. Investments in human capital such as expenditures for education and health range between 1.4 in poor and 5.6 per cent in rich households. A higher energy bill means that the consumption of other goods and services has to be reduced.

The increase of energy tariff has a direct effect on the real income of households. Following del Granado and Adenauer (2011:4), we estimate the change in real income by multiplying the change in price with the share in total household expenditures per energy source:

$$\Delta y_i = \sum_e \left(\frac{p^a{}_e - p^a{}_e}{p^a{}_e}\right) * \left(\frac{x^b{}_{i,e}}{X_i}\right) \quad [3]$$

[11] 60 kWh per month provide enough energy to power a refrigerator for 5.5 hours and 3 light bulbs of 75 Watt during 4 hours per day (Lampietti et.al. 2007:93-94).

where y_i is the real income of household *i*, p^a_e the price of energy *e* after the reform, p^b_e the price of energy *e* before the reform, $x^b_{i,e}$ expenditures on energy *e* before the reform in household *i*, and X_i total household expenditures of household *i*. In reality, the change in real incomes is even larger as indirect effects are not taken into account. Indirect effects arise for example due to higher retail prices of goods and services using energy for their production. The change in real income can also be interpreted as the value of the implicit subsidies in total household expenditures prior to the price reform.

Raising electricity tariffs to cost recovery levels decreases the real income of households with 3.8 per cent. The decline is largest in poor households and is decreasing with increasing welfare levels (table 8). On the other hand, rich households are confronted with the largest decline in real income when accounting for thermal power price effects. Similarly, households living in Bishkek would experience a 14 per cent reduction of real income if all energy sources are taken into account. Households living in urban areas outside Bishkek would face the highest reduction in real income following an electricity tariff reform.

All households face welfare losses in the event of higher energy tariffs. Figure 10 uses Pen's Parade to illustrate the expected welfare losses following an electricity tariff reform. An average household would lose 3,781 KGS (82 USD) worth in subsidies on an annual basis. The poorest ten per cent would forego only slightly less with 3,181 KGS per year. As a result, some households will be pushed into poverty. Using the information on the change in real income, we estimate the expected change in absolute poverty rates.[12] On average, absolute poverty is expected to increase with three percentage points. Households in Bishkek would be the least affected. However, if the price increase for thermal power is taken into account as well, absolute poverty rates would increase most in Bishkek (see table A2 in Annex). Large households and households with children and elderly would be most affected by the increase in poverty rates. This confirms earlier findings from USAID (2008). The absolute poverty rate for individuals living in households with children and pensioners is expected to increase by more than five percentage points as a result of a move to full cost recovery electricity tariffs.

Table 8. Decrease in real income due to energy tariff increase per energy source, per cent

			Households by expenditure deciles									
		All hhs	1	2	3	4	5	6	7	8	9	10
Electricity	%	3.8	5.1	4.0	4.0	3.8	3.7	3.8	3.7	3.5	3.1	3.0
Central heating	%	1.0	0.7	0.5	0.3	0.5	0.7	0.8	1.5	1.2	1.5	1.9
Hot water	%	1.6	0.8	1.3	0.5	0.9	1.1	1.8	2.6	2.2	2.9	2.3
Total	%	6.4	6.6	5.8	4.8	5.1	5.5	6.4	7.8	6.9	7.4	7.2

Source: Own calculation based on KIHS 2009.

[12] Poverty rates are calculated using the FGT class of poverty measures (Foster, Greer, Thorbecke, 1984).

Figure 3. Pen's parade: Welfare loss following an electricity tariff increase (Source: KIHS 2009)

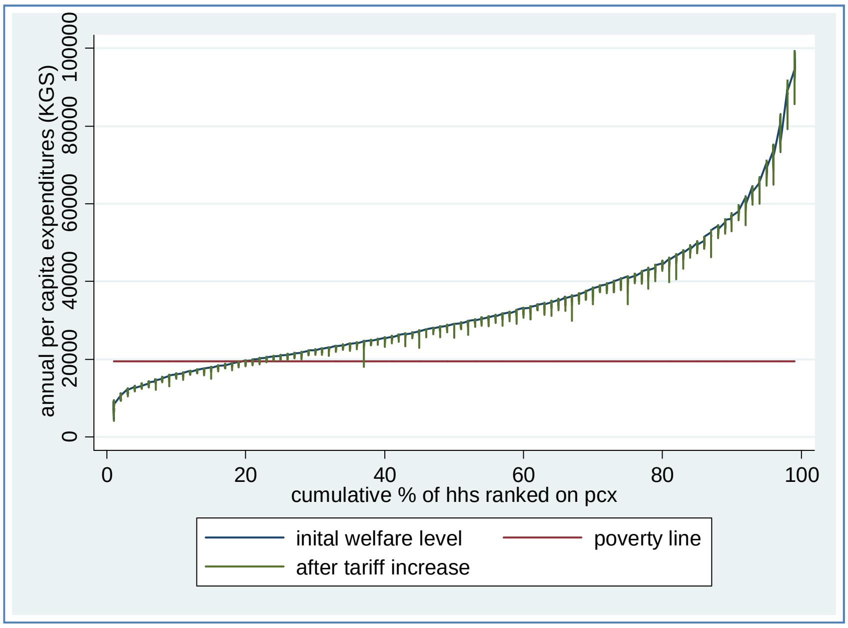
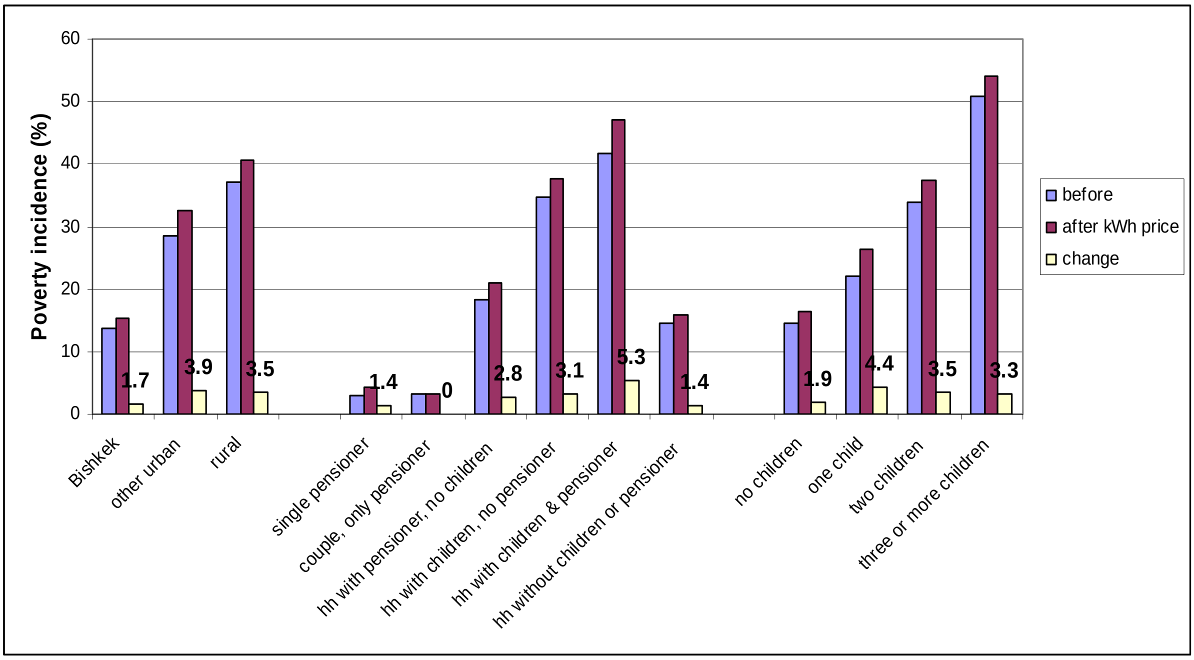


Figure 4. Estimated impact on poverty incidence (Source: KIHS 2009)



Mitigation measures for electricity price increase

In this section we simulate different mitigation measures against the increase in electricity tariffs only. Current electricity subsidies are rather uniformly distributed. However, the loss of these subsidies leads to a larger decrease of real income in poor households. Basically, there are two main types of mitigation measures: direct income transfers or tariff-based subsidies, such as lifeline tariffs or volume-differentiated tariffs. The provision of cash transfers aims at protecting the welfare level of poor and vulnerable households. It prevents households from depleting their limited assets or reducing consumption to such an extent that their livelihoods are threatened. Studies from Armenia and Georgia have shown that cash transfers are also to the benefit of energy companies. Households use the transfers to pay their energy bills (Lampietti, 2007: 58&75). In Armenia, the cash transfer softened the impact of the tariff increase for those households receiving transfers. They still reduced consumption by about 20 per cent, but they showed higher average monthly payments for utilities compared to non-recipient poor households (Lampietti et.al., 2007:58). The cash transfer may have prevented an even larger reduction of consumption and accumulation of payment arrears.

Ideally, energy price compensations are progressive and support poor and vulnerable households. There are different options to target poor households. Targeting methods are either based on an assessment of means of potential beneficiaries, categorical indicators, or use community approaches or self-selection as a way to identify eligible households or individuals.[13] In this paper, we define eligibility criteria along demographic characteristic. Targeting transfers based on categorical criteria is less sensitive to errors and fraud. The additional costs of leakage to the non-poor inherent to categorical targeting are more likely to be accepted by the population and politicians in the specific case of energy compensations following the withdrawal of universal subsidies. Furthermore, assessments of the existing social protection system of the Kyrgyz Republic indicate that the targeting performance of the existing means-tested cash transfer is subject to substantial exclusion errors (World Bank, 2009; Gassmann, 2011).

It is difficult to identify eligible groups a priori which would result in a progressive allocation of future transfers. As electricity subsidies are distributed rather uniformly, everybody would lose more or less the same in absolute terms. Relatively, though, the welfare loss of the poor is higher as shown above. Based on the poverty profile (World Bank, 2011) and the poverty analysis above, we can identify the groups with the highest poverty risk. Large households and households with children have a higher than average risk of living in poverty. Geographical location is less suited as targeting indicators, although the variables indicating location in the model above (table 4) are significant. The KIHS does not allow for a detailed enough breakdown to identify the districts most vulnerable to poverty. Allocating compensations only to households in rural areas, which have a significantly higher poverty rates, would neglect the high welfare loss to be expected in urban areas.

First, we identify households with children below the age of 16 as the main target group since these households have an above average poverty risk. Secondly, we extend the group again and include also households with elderly. 64 per cent of all households have at least one child below the age of 16 (Table 9). By including the elderly as well, coverage rates increase to 76 per cent of all households. Targeting based on demographic indicators is intrinsically pro-poor as more poor households have children and/or elderly. Almost all extremely poor households have either a child and/or an elderly person. The exclusion error of such a categorical approach would therefore be low. Thirdly, we identify three distinct types of households for the simulation of a differentiated cash transfer (see below). Eligible households consist either of a single elderly person, one or two children, or three and more children. 67 per cent of all households satisfy one of these three criteria.

[13] For a good overview of targeting methods and their pros and cons, see Grosh et.al. (2008), or Coady et.al. (2004)

Table 9. Prevalence of different households, per cent

		Households by expenditure deciles									
	Total	1	2	3	4	5	6	7	8	9	10
With children	**63.8**	**93.2**	**85.7**	**82.6**	**77.5**	**63.6**	**70.8**	**55.8**	**51.0**	**39.0**	**20.1**
With children & elderly	**76.3**	**94.4**	**89.9**	**89.6**	**86.3**	**81.3**	**82.9**	**74.2**	**67.3**	**61.3**	**36.5**
Three types	**66.7**	**93.3**	**85.8**	**82.9**	**77.8**	**64.4**	**72.4**	**60.2**	**56.5**	**47.5**	**27.3**
- Single elderly	2.9	0.1	0.0	0.3	0.4	0.9	1.6	4.4	5.5	8.5	7.2
- 1-2 children	45.1	44.7	48.1	50.9	57.5	46.8	53.1	47.5	47.8	35.0	18.5
- 3 and more children	18.7	48.6	37.6	31.8	20.0	16.8	17.7	8.3	3.3	4.1	1.6

Source: Own calculation based on KIHS 2009

We simulate three different types of compensations. Compensations are allocated to each household meeting the targeting criteria. Scenario one applies lifeline tariffs, whereby eligible households are compensated up to a maximum amount of electricity consumption. Such a lifeline approach guarantees the consumption up to a certain level at reduced rates. The second scenario simulates the payment of direct cash transfers to households with children. Flat benefits have several advantages. From an administrative perspective they are less demanding since there is no need to calculate individual benefit levels. From an equity perspective, the poor benefit relatively more as they consume less electricity than richer households. Finally, scenario three foresees in different cash transfers for different types of households accounting for economies of scale. For scenario one and two we estimate two different compensation levels, a minimum level and a more generous variation (see table 10).

The minimum lifeline of 125 kWh per household per month is sufficient to power a refrigerator and a few light bulbs (Lampietti et.al. 2007). 200 kWh per household per month represent the current median consumption in the Kyrgyz Republic (and also the average consumption of the poorest 20 per cent). The cash transfers are based on the additional costs of consuming either 125 or 200 kWh per month.

Table 10. Overview of simulated compensations, monthly volume/amounts per eligible household

Type of households	Lifeline tariffs (0.7 KGS/ kWh)		Flat cash transfers		Differentiated cash transfer
	kWh	kWh	KGS	KGS	KGS
All households with children<16	125	200	160	260	
All households with children or elderly	125	200			
By household type					
- Single elderly					130
- Households with 1-2 children					160
- Households with 3+ children					200

Replacing current implicit subsidies with lifeline tariffs or direct cash transfers leads to lower benefits for all households. Average monthly compensations are lower in nominal terms resulting in a lower share of total household expenditures (Table 11). However, poor households' shares decline to a lesser extent than the average.

Comparing the results of the simulation and putting them into perspective with the current implicit electricity subsidy suggests that limiting eligibility for lifeline tariffs to specific groups of households would on the one hand improve the targeting performance and reduce costs for the government.

Targeting households with children yields the most progressive distribution of electricity compensations. Whether we use targeted lifeline tariffs or direct cash transfers has no significant impact on the distributional outcomes. However, lifeline tariffs are only meaningful with appropriate billing and metering systems in place. Households need to be able to control their consumption. A possible drawback of lifeline or volume-differentiated tariffs is also the risk of corruption and incentives for tampering.

Table 11. Current subsidy versus simulated compensations as share of total household expenditures, per cent

		Household expenditure quintiles				
	All	1	2	3	4	5
Current subsidy	3.8	4.6	3.9	3.8	3.6	3.1
Lifeline - households with children<16						
125 kWh	1.2	2.2	1.6	1.1	0.7	0.3
200 kWh	1.7	3.1	2.2	1.6	1.1	0.5
Lifeline - households with children or elderly						
125 kWh	1.5	2.3	1.8	1.5	1.2	0.7
200 kWh	2.1	3.2	2.5	2.2	1.7	1.0
Flat benefit - households with children<16						
160 KGS	1.2	2.3	1.6	1.1	0.7	0.3
260 KGS	1.9	3.7	2.5	1.8	1.2	0.5
Benefit varies per household type						
130 KGS - 160 KGS - 200 KGS	1.4	2.5	1.7	1.2	0.9	0.6

Source: Own calculation based on KIHS 2009

Table 12. Distribution of lifeline subsidies and cash transfers under different scenarios

	Household expenditure quintiles				
	1	2	3	4	5
Current electricity subsidy	17.5	19.0	21.1	21.3	21.1
Lifeline - households with children<16	26.7	25.4	21.4	17.2	9.4
Lifeline - households with children or elderly	23.2	23.3	21.8	18.9	12.8
Flat benefit - households with children<16	27.0	25.3	21.3	17.1	9.2
Differentiated benefit - various households	27.2	24.7	20.7	17.0	10.5

Source: Own calculation based on KIHS 2009

In terms of poverty reduction, table 13 presents the share of the difference in poverty rates covered by the various mitigation measures. The real income after removal of the universal subsidy (see above) is increased with the value of the compensation, after which poverty rates are calculated. In the absence of electricity subsidies, poverty rates are estimated to increase by 3.3 percentage points. A lifeline tariff of 125 kWh for households with children below the age of 16 would reduce this gap with 45 per cent, while a cash transfer of 260 KGS per month would bring poverty rates almost back to pre-reform rates (table 13). Overall, none of the simulated mitigation measure would fully close the gap in poverty rates. The more generous the compensation, the larger is the reduction of the gap. In rural areas, lifelines and transfer could cover between 34 and 78 per cent of the difference in poverty before and after the price increase, while poverty rates would be back to pre-reform levels in Bishkek in case of cash transfers.

Table 13. Share of the difference in poverty rates covered by different measures

	Lifeline				Cash transfer		
	125 kWh Ch<16	200 kWh Ch<16	125 kWh Ch&el	200 kWh Ch&el	160 KGS Ch<16	260 KGS Ch<16	Differ.
Total	0.45	0.73	0.51	0.78	0.42	0.80	0.48
Bishkek	0.84	0.85	0.84	0.88	1.01	1.01	1.03
other urban	0.42	0.76	0.45	0.78	0.45	0.78	0.45
rural	0.42	0.71	0.49	0.78	0.34	0.79	0.43
single pensioner	0.00	0.00	0.01	0.71	0.00	0.00	0.35
couple, only pensioner	0.00	0.00	0.00	0.00	0.00	0.00	0.00
hh with pensioner, no children	0.00	0.00	0.73	0.74	0.00	0.00	0.00
hh with children, no pensioner	0.54	0.79	0.54	0.79	0.45	0.81	0.57
hh with children & pensioner	0.47	0.88	0.47	0.88	0.51	1.04	0.51
hh without children or pensioner	0.00	0.00	0.00	0.00	0.00	0.00	0.00
no children	0.00	0.00	0.45	0.48	0.00	0.00	0.01
one child	0.40	0.83	0.40	0.83	0.45	0.89	0.45
two children	0.49	0.88	0.49	0.88	0.49	1.06	0.49
three or more children	0.67	0.76	0.67	0.76	0.48	0.79	0.69

Source: Own calculation based on KIHS 2009

In terms of annual costs, the differences between the scenarios are more pronounced. A monthly flat cash transfer of 160 KGS for households with children heating requires an annual financial allocation of 1.7 billion KGS. Differentiated transfers depending on household type and allocated to households would cost 1.9 billion KGS per year.

Table 14. Annual costs of simulated policy options

	Average monthly benefit	Total annual costs	As % of current subsidy	as % of GDP
	KGS	mio KGS	%	%
Current electricity subsidy	**315**	**5,326**	**100**	**2.65**
Lifeline - households with children<16				
125 kWh	162	1,702	32.0	0.85
200 kWh	235	2,473	46.4	1.23
Lifeline - households with children or elderly				
125 kWh	160	2,013	37.8	1.00
200 kWh	230	2,898	54.4	1.44
Flat benefit - households with children<16				
160 KGS	160	1,683	31.6	0.84
260 KGS	260	2,735	51.3	1.36
Benefit varies per household type				
130 KGS - 160 KGS - 200 KGS	170	1,875	35.2	0.93

Source: Own calculation based on KIHS 2009

Although each of the simulated scenarios cost substantially less than the current implicit subsidy, financing might be less straightforward than it seems. Currently, energy subsidies are not a separate budget line in the Government budget. Moving from implicit to explicit energy compensations makes costs transparent.

The options to support poor and vulnerable households against massive energy tariff increases are limited. Even though providing lifeline tariffs to families with children is attractive from a pro-poor perspective, it is questionable whether such a policy is practically feasible. It hinges on the capability of energy companies to distinguish between different households and the preparedness of their billing systems to cope with differentiated tariffs. Furthermore, the Kyrgyz Republic has experience with differentiated tariffs for electricity. They have been abandoned in 2006 in order to improve transparency and ease the administration.

This leaves direct cash transfers as the most feasible instrument for energy compensations. Based on the analysis above, direct categorical cash transfers seem to be the preferred option to compensate households for higher energy tariffs. Limiting compensations to households with children is progressive. Poor households benefit relatively more.

Conclusion

Energy expenditures consume a considerable share of the household budget of Kyrgyz households. On average, they spend more than 6 per cent on energy. Solid fuels and electricity account for the largest shares, irrespective of the welfare level of a household or where it is located. Raising energy prices to full cost-recovery level would increase the average share spent on energy to 11 per cent.

This study assessed the possible impact of an energy tariff reform on households whereby tariffs for electricity and thermal power would be raised to cost-recovery prices. It is politically highly unlikely that energy prices would rise to cost recovery level at once. More realistically, energy prices would increase in stages reaching the maximum within three to five years. Households would have to time to partly adjust their consumption habits. As such, the total costs and implications for households as identified in this study would also be spread over a number of years.

Removing all implicit energy subsidies results in considerable welfare losses for the population. The real income is estimated to decline with more than six per cent on average (seven per cent for the poorest decile). The removal of electricity subsidies is particularly painful for the poorest households and accounts for an estimated decline of five per cent. A direct move to cost-recovery electricity tariffs would increase the poverty rate with 3.3 percentage points. Households not living in Bishkek and households with children and/or pensioners would face the highest risk of falling into poverty, while these groups already belong to the poorest under the current situation. Since the simulation does not account for second-order effects, the estimated effects are likely to be underestimated.

In order to soften the impact of increasing energy tariffs and protect the energy consumption of poor and vulnerable households, the Government can consider different mitigation measures. A direct cash transfer allocated to households with children would cost anything between 1.4 and 2.8 billion KGS (0.7 – 1.4 per cent of GDP) depending on the design specifications. Because children and families with children have a higher poverty risk and relatively more poor families have children, such a categorical allocation of an electricity compensation would still be progressive.

The impact assessment presented in this report is an ex-ante evaluation and has a number of limitations mainly related to the available data. Experience from similar assessments in Armenia and Georgia has shown the analytical value of combining household survey data with administrative data from energy companies (Lampietti et.al, 2007).

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Annex

Table A 1. Possession of electric appliances, % of population, 2009

	Not poor	Poor	Total		Not poor	Poor	Total
Radio	10.6	12.6	11.2	Modem	0.0	0.0	0.0
B&W TV	33.0	40.6	35.4	Dryer	0.4	0.5	0.4
Colour TV	78.9	68.3	75.5	Washing machine	54.8	40.5	50.2
Hifi	4.7	5.3	4.9	Vacuum cleaner	22.1	6.3	17.1
Video rec	27.6	21.3	25.6	Sewing machine	51.5	43.5	48.9
Audio rec	32.6	33.4	32.8	Knitting machine	0.2	0.5	0.3
Video player	9.9	9.4	9.7	Air conditioner	0.3	0.0	0.2
Camcorder	0.8	0.1	0.6	Refrigerator	65.8	43.9	58.9
Camera	12.2	6.5	10.4	Freezer	0.5	2.0	1.0
Computer	4.8	0.5	3.5	Electric stove	15.3	16.6	15.7
Printer	0.5	0.0	0.4	Microwave	4.0	0.9	3.0
Copy machine	0.2	0.0	0.1	Electric heater	26.5	20.2	24.5
Mobile phone	71.1	59.3	67.3	Electric water heater	3.6	0.5	2.6
Satellite dish	5.3	5.0	5.2				

Source: Own calculation based on KIHS 2009

Table A 2. Estimated impact on poverty incidence, different households

	Poverty rates (absolute poverty line)			
	before	after kWh price	after Gcal price	after total
Total	31.8	35.0	32.8	36.0
Bishkek	13.7	15.4	19.7	20.9
other urban	28.6	32.5	29.0	32.9
rural	37.1	40.6	37.1	40.6
High-mountain	48.1	50.2	48.2	50.3
Semi-mountain	46.5	50.3	46.6	50.4
Flat ground	26.3	29.7	27.7	31.0
single pensioner	2.9	4.3	6.6	8.7
couple, only pensioner	3.2	3.2	6.5	6.5
hh with pensioner, no children	18.3	21.1	19.4	22.3
hh with children, no pensioner	34.7	37.8	35.3	38.5
hh with children & pensioner	41.7	47.0	43.2	48.1
hh without children or pensioner	14.6	16.0	15.9	17.2
no children	14.5	16.4	16.0	17.9
one child	22.1	26.5	23.9	28.3
two children	33.8	37.3	34.6	37.8
three or more children	50.8	54.1	51.0	54.3
one member	3.4	5.8	7.2	9.6
two members	6.1	7.1	7.0	8.3
three members	15.1	16.6	17.9	19.4
four members	27.1	32.2	27.8	32.7
five members	36.0	39.3	37.2	40.2
six members	44.3	49.4	44.4	49.5
seven or more members	56.1	57.9	56.1	58.2
employed	31.2	33.9	32.1	34.8

unemployed	35.6	40.6	35.7	40.7
pensioner oldage	30.3	34.4	31.7	35.8
pensioner disabled	33.8	42.4	37.6	44.5
other	36.3	37.0	36.4	37.6

Source: Own calculation based on KIHS 2009

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