

# Poverty and Distributional Impact of Gas Price Hike in Armenia

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## Abstract

Armenia meets about 75 percent of its energy needs through imports, with natural gas imports from Russia accounting for about 80 percent of total energy imports and 60 percent of total primary energy supply. Because of high dependence on imported energy, Armenia is vulnerable to external energy price shocks, which are often beyond the control of its policymakers. A most recent case in point was the 2010 Russian gas tariff increase, which led to a nearly 40 percent increase in the retail gas price for residential consumers. Coming on the heels of the global economic recession that hit Armenia's economy hard, the price hike amplified the impact on households that rely primarily on gas for heating and

cooking. Using aggregate energy consumption data and a nationally representative household survey immediately before the crisis, this paper provides an overview of household energy consumption patterns, highlights Armenia's energy vulnerability, and estimates the direct poverty and distributional impacts of the increase in the cost of imported gas. The analysis shows that the gas price hike resulted in a significant increase in energy expenditures, with disproportionately higher impact on the poor and vulnerable households. The paper concludes with a discussion on the effectiveness of the mitigation measures employed by the Government of Armenia.

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# Poverty and Distributional Impact of Gas Price Hike in Armenia

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## 1. Introduction

One of the enduring legacies of the socialist era in Armenia and other formerly planned economies is that household energy consumption is subsidized and supplied at below market prices. Since the transition to a market economy, one of the priorities for policymakers in the energy sector has been to increase energy prices to cost recovery and economically efficient levels. Such measure would lead to more efficient consumption patterns and improved financial viability of the energy sectors, as well as ease the burden on the state budget. There are also other reasons, often beyond the control of policymakers, that necessitate energy price increases, such as heavy reliance on imported sources of energy, which has been the case of Armenia.

Armenia meets about 75 percent of its energy needs through imports, with natural gas imports from Russia accounting for about 80 percent of total energy imports and 60 percent of total primary energy supply. High dependence on imported energy has made Armenia's economy and households vulnerable to external energy price shocks. A most recent case in point was the 2010 gas tariff increase. On April 1, 2010, the retail price of gas increased from AMD 96 to 132 per cubic meters (m<sup>3</sup>) for small consumers (consuming less than 10000 m<sup>3</sup> per month) and from \$215 to \$243 per 1000 m<sup>3</sup> for large consumers (consuming more than 10000 m<sup>3</sup> per month). This meant that the cost of gas for residential consumers increased by nearly 40 percent and for enterprises and large consumers by 13 percent (Table 1). The change in the retail price of gas was in response to an increase in the import price of the Russian gas from \$154 to \$184 per 1000 m<sup>3</sup>, a 17 percent hike.

The increased gas price, the second largest on most residential consumers since 2000, had considerable impact on households, as the residential sector consumes a large share of the imported gas. With households' heavy dependence on gas for heating, cooking and lighting, the gas price hike may have significant implications for prices of other sources of energy, transportation and consumer goods. Unlike earlier gas price hikes, the 2010 gas tariff increase had come on the heels of the global economic slowdown that hit Armenia's economy and households hard (see, for example, World Bank, 2010a). The crisis could exacerbate the

hardships arising from gas price hike on households that rely heavily on gas for heating, cooking and lighting.

**Table 1: Recent Gas Tariff Increases in Armenia**

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Import price (USD per 1000 m3)			55	55	110	110	110	154	180
<i>Change (% Increase)</i>					100			40	17
<b>Tariff</b>									
for small consumers (<10,000 m3 per month), 1000 AMD per 1000 m3	51	51	59	59	90	84	84	96	132
<i>Change (% Increase)</i>			16		53	-7		14	38
for large consumers (>=10,000 m3 per month), USD per 1000 m3	79	79	79	79	147	153	153	215	243
<i>Change (% Increase)</i>					85	3		40	13
Date the tariff became effective	Jan 1, 2000		Mar 1, 2004		Apr 10, 2006	Jan 1, 2007		Apr 1, 2009	Apr 1, 2010

*Source:* Publications of and contacts with Public Services Regulatory Commission, Republic of Armenia

Using data from a nationally representative household survey of 2008 and national energy statistics, the paper provides an overview of household energy consumption patterns, highlights Armenia's energy vulnerability, and analyzes the poverty and distributional impact of the latest gas price hike.<sup>2</sup> The higher gas price is anticipated to significantly increase the share of energy expenditures of most households, particularly during the cold winter months. Heating during the cold winter months accounts for the bulk of household energy use in Armenia (Sargsyan, Balabanyan and Hankinson, 2006). Households living in urban and rural areas are likely to face different choices of energy sources, as would those households living in different housing conditions. The results of the analysis show that the April 2010 gas price increase would result in a significant increase in households' energy expenditures and would have an adverse impact on poverty. The paper draws policy implications for designing of mitigation measures to

<sup>2</sup> Baclajanschi et al (2006) undertook similar analysis of gas price hike in Moldova.

compensate the affected households, particularly the poor and vulnerable households, as well as discusses some policy options that may reduce Armenia's vulnerability to imported energy and improve its long-term energy sustainability.

The paper is organized as follows. Section 2 provides some background on energy supply and consumption patterns in Armenia. Section 3 deals with the poverty and distributional impacts of the gas price hike. Finally, Section 4 concludes the paper and discusses policy implications.

## **2. Energy Supply and Consumption in Armenia**

Natural gas, imported mainly from Russia, comprises about 80 percent of energy imports and 60 percent of total primary energy supply (TPES). Petroleum products account for 20 percent of all energy imports and the electricity imports represent less 2 percent of all energy imports (Table 2). Domestic sources account for only 29 percent of Armenia's total energy supply, with most of it coming from the hydropower plants and the nuclear plant. About 2 percent is destined for export. The industrial sector accounts for the bulk of the final energy consumption (43 percent). The second largest consumer of energy is the residential sector, which accounts for 29 percent of the total consumption. Thus, the energy consumption in the residential sector is a considerable portion of total energy consumption and any price increases would have real effects on overall energy production and consumption.

Armenia's domestic energy production, largely based on nuclear and hydropower, is inadequate for meeting domestic consumption needs. Per capita consumption of energy in Armenia of 0.95 tons of oil equivalent (toe) is significantly lower than Central and Eastern Europe countries (2.45 toe/pc) and OECD countries (4.64 toe/pc). Given already low energy consumption, there is little room for Armenian households to reduce their demand in response to the rising energy prices.

**Table 2. Armenia's Energy Balance**  
(1,000s tons of oil equivalent –ktoe)

		Percent of Supply /Consumption	Percent of Imports
<i>Sources</i>			
<b>Total Primary Energy Supply (TPES)</b>	2,844	100	
<b>Internal sources</b>	825	29	
<b>Imports</b>	2,126	75	100
<b>Petroleum</b>	426	15	19
<b>Gas</b>	1,664	60	80
<b>Electricity</b>	34	1	1
<b>Exports</b>	(49)	(2)	
<b>Gas</b>	(21)		
<b>Electricity</b>	(28)		
<b>International Aviation Bunkers</b>	(58)	(2)	
<i>Uses</i>			
<b>TPES</b>	2,844		
<b>Energy Conversion and Distribution Losses</b>	(839)		
<b>Total Final Consumption (TFC)</b>	2,005	100	
<b>industry sector</b>	860	43	
<b>transport</b>	188	9	
<b>agriculture</b>	60	3	
<b>Commercial and Public Services</b>	71	4	
<b>residential</b>	579	29	
<b>other</b>	247	12	

Source: International Energy Agency, *Energy Statistics*, 2007

Between 2002 and 2008, both import and consumption of gas have more than doubled. Household (residential) consumption has led the growth in demand for imported gas. Household consumption of gas increased from only 102 million m<sup>3</sup> in 2002 by nearly six-fold to about 590

million m<sup>3</sup> in 2008 (Table 3). The proportion of residential consumption grew substantially from only 11 percent of total consumption in 2002 to 33 percent in 2009. The pattern of household gas consumption before and during the crisis suggests gas demand is likely to increase with income growth, but less likely to decrease during income decline. In other words, household demand for gas is inelastic, i.e., the price increase would have large impact on household budget. However, note that the substantial decline in energy consumptions by the industrial and energy sectors in 2009, underscoring the significant slowdown in construction and manufacturing sectors in the aftermath of the global recession.

Armenia's dependence on import for energy consumption increased over the last decade. Residential consumption, as a share of total energy import increased by nearly three-fold from about 10 percent to 30 percent in 2009. While total energy consumption as share of imports increased by 5 percentage points between 2002 and 2009, residential consumption grew by more than three times as fast as total energy import. This shows growing vulnerability of Armenian households to external energy sources and to frequent gas price hikes.

**Table 3. Gas Import and Consumption in Armenia**

*(in million cubic meters)*

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2009/ 2002
Import Volume (mln m3)	1,070	1,201	1,333	1,685	1,716	2,055	2,400	1,814	2,100	2
Total Consumption (mln m3)	952	1,034	1,222	1,516	1,586	1,869	2,080	1,661	1,980	2
Energy Sector	518	495	537	619	511	507	607	366	680	1
Industry	194	209	275	348	344	404	368	260	260	1
Residential	102	153	223	311	402	532	590	553	556	5
Fuel Stations	65	88	111	149	219	286	347	306	307	5
Other	73	89	77	90	110	140	168	176	177	2
Total Consumption (%, Import)	89	86	92	90	92	91	87	92	94	1.0
Residential Consumption (%, Total Consumption)	11	15	18	21	25	28	28	33	28	3
Residential Consumption (%, Import)	10	13	17	18	23	26	25	30	26	3.2

Source: Publications of and contacts with Public Services Regulatory Commission, Republic of Armenia



On the other hand, the increases in electricity production and consumption during the 2000s are unremarkable, compared to gas import and consumption. Between 2003 and 2008, electricity production and consumption increased by only 10 and 20 percent, respectively (Table 4). In contrast, as shown above, gas import and consumption more than doubled during the same period. Residential electricity consumption increased by only 30 percent, compared to a six-fold increase in residential gas consumption. The increase in gas consumption may have been driven by rapid gasification in the country as gas-based heating remains less costly than electricity-based heating. On the other hand, electricity production and consumption are more responsive to shocks than gas import and consumption.

**Table 4. Electricity production and consumption in Armenia**  
(in million Kilowatt hours (KWh))

	2003	2004	2005	2006	2007	2008	2009	(2008/ 2003)
Production	5,501	6,033	6,317	5,941	5,898	6,116	5,671	1.1
Total Consumption	3,654	3,961	4,180	4,309	4,806	4,785	4,379	1.3
<i>of which:</i>								
Residential	1,345	1,437	1,498	1,531	1,715	1,712	1,554	1.3
Budget Institutions	184	200	198	203	254	249	211	1.4
Industry	795	911	1,020	1,039	1,244	1,147	1,009	1.4
Transport	119	119	113	115	124	127	119	1.1
Irrigation	223	261	229	227	92	112	124	0.5
Water supply and sewage	255	207	193	178	181	183	164	0.7
Other	733	827	930	1,017	1,197	1,255	1,199	1.7
Total Consumption (percent, Production)	66	66	66	73	81	78	77	1.2

*Source:* Publications of and contacts with Public Services Regulatory Commission, Republic of Armenia

In Armenia, residential use of energy accounts for about 29 percent of total final energy use. As shown in the next section, space heating accounts for the largest share of residential energy expenditures. Heating energy is critical in Armenia to avoid freezing of the population during the cold winter months. As a result, energy expenditures are a significant portion of household total

consumption expenditures. An important question then is: How do households adjust their consumption due to higher energy prices? While there is no evidence of price elasticity of demand for Armenia, as is the case for most transition economies. However, a post gas hike survey of residents of multi-apartment buildings shows that the use of gas-based heating declined in 2010 given the sharp increase of gas tariffs for small consumers (EDRC, 2011). According to this survey, while gas remained the dominant heating source, the share of households relying on it decreased from 72.5% during the 2008-2009 heating season to about 69.8% during the 2010-2011 heating season. There was increased use of electricity and firewood for heating during the same period. In the following section, the impact of current gas price hike is simulated for different household groups, under a range of assumptions about price elasticity of demand.

### **3. Welfare Impact of the Gas Price Hike**

Gas is an important fuel for heating and cooking, as well as an input into the production of many goods and services (see Table 5). The gas price increase can therefore influence the cost of the basic consumption basket and the price of other alternative energy sources such as electricity and fuelwood. Ideally the welfare impact should be analyzed in a general equilibrium framework that takes into account such linkages. However, general equilibrium modeling is data intensive and sensitive to a number of assumptions. In this paper, the analysis is necessarily limited to the *direct* impact of the gas price increase on household welfare.

#### ***Methodology and data***

The 2008 ILCS data is used in the simulation of the impact of gas price hike on April 1, 2010. The ILCS collects data from nearly 8,000 Armenian households surveyed year round. It is based on a representative sample of about 2,000 households surveyed each quarter. It contains detailed information on household composition, energy use, income, public and private transfers, expenditure, saving and debt, and other indicators of welfare.<sup>3</sup> Household consumption

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<sup>3</sup> For detailed description of the 2008 ILCS, please refer to NSS (2009).

expenditures are constructed as measure of welfare.<sup>4</sup> Regional price differences have been accounted for by weighting the welfare aggregate by regional price indices. Similarly taken into account are economies of scale within the household. Therefore, the data is suitable to analyze household energy expenditures and simulate the likely impact of the gas price increase on household welfare.<sup>5</sup>

The impact of the higher energy costs on households depends on several factors. First, the impact will vary by location (i.e., large cities such as Yerevan, small towns and rural areas), as the degree of household dependence on gas varies by location (see Table 5). Second, it depends on whether a given household is a consumer of gas and other alternative energy products that could also see their prices go up. Third, the degree of impact also depends on the level of consumption across different income groups. Finally, the impact depends on the relative share of gas and other alternative energy products in total household budget. For example, households that spend larger share of their consumption budget on energy could see greater impact from the gas price increase. Although not directly addressed in this paper, for a given household, the impact of the gas price increase will also depend on substitution and income effects. Since there is no variation in gas price, it is not possible to estimate a household demand function for gas. We therefore estimate the welfare impact of the price increase by assuming the elasticity of gas demand to price changes is zero<sup>6</sup> and that households do not change the quantity of gas consumption due to higher prices and the consumption patterns before price change hold. Before estimation of the welfare impacts, we look at the incidence, the level and the relative budget shares of gas, electricity and fuelwood consumption in Armenia.<sup>7</sup>

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<sup>4</sup>Household consumption expenditures, rather than income, are used, as income suffers from widespread underreporting in household survey instruments. Consumption is also commonly used in poverty analysis.

<sup>5</sup>Ideally, the ILCS data would be matched with household-level data from the utility companies on gas and other alternative energy consumption and payment to allow a more accurate analysis of the residential demand and the distributional consequences of price changes. Unfortunately such data is not available for this exercise.

<sup>6</sup> This assumes household don't resort to other and cheaper sources of energy.

<sup>7</sup> All data on energy access, use and expenditures come from the 2008 ILCS.

### ***Who are the gas consumers in Armenia?***

About 80% of all Armenian households have access to central gas supply. While electricity connection is near universal, access to gas supply varies by location and, to lesser extent, by consumption quintile (see Table 5). Urban households have greater access to gas supply than their rural counterparts. Regardless of location, richer households have better access to gas supply than poorer households. In terms of use, around 70% of urban households use gas for heating, compared to less than 40 percent of rural households. A larger share of households in non-Yerevan urban areas uses gas for heating than those who reside in the capital, where nearly one out of every three households uses electricity for heating. In rural and in urban areas outside Yerevan, use of electricity for heating is quite limited. In these locations, particularly in rural areas, a significant share of households relies on fuelwood for heating. About 50 and 20 percent of households use fuelwood for heating in rural and non-Yerevan urban areas, respectively.

The majority of Armenian households use gas for heating during the winter months (58 percent). The second commonly used source of energy for heating is fuelwood with about 26 percent of households reporting use of it. Use of electricity for heating comes in third. The dependence on gas for heating is higher among richer households. In contrast, the poorer the household is, the larger its reliance on fuelwood for heating. The geographic differences in household energy consumption patterns are remarkable. The percentage of households using fuelwood is considerably higher in rural areas (51percent), followed by non-Yerevan urban areas (19 percent).

**Table 5. Access To and Use of Different Energy Sources**  
(in percent of all households, 2008)

<i>Quintile</i>	<b>Access</b>		<b>Heating Use</b>			
	<i>Central Gas Supply</i>	<i>Electricity</i>	<i>Gas</i>	<i>Electricity</i>	<i>Fuelwood</i>	<i>Other</i>
<b>Armenia</b>						
<i>Poorest</i>	66	87	49	11	31	19
<i>2</i>	67	98	51	12	31	20
<i>3</i>	75	100	59	13	26	15
<i>4</i>	74	100	59	15	25	12
<i>Richest</i>	79	100	66	19	17	7
<i>All</i>	73	97	58	14	26	14
<b>Yerevan</b>						
<i>Poorest</i>	70	82	56	26	11	8
<i>2</i>	79	100	67	29	9	0
<i>3</i>	80	100	65	26	8	1
<i>4</i>	79	100	65	34	6	1
<i>Richest</i>	80	100	66	34	3	0
<i>All</i>	78	96	64	30	7	2
<b>Other Urban</b>						
<i>Poorest</i>	77	85	61	8	25	10
<i>2</i>	81	95	63	10	26	7
<i>3</i>	84	100	72	9	17	5
<i>4</i>	90	100	77	8	16	2
<i>Richest</i>	89	100	77	11	13	2
<i>All</i>	85	96	71	9	19	5
<b>Rural</b>						
<i>Poorest</i>	47	95	29	3	57	39
<i>2</i>	49	99	29	4	51	43
<i>3</i>	56	100	37	4	51	39
<i>4</i>	59	100	42	4	51	32
<i>Richest</i>	65	100	50	2	46	24
<i>All</i>	56	99	39	3	51	35

Source: Author's calculations based on 2008 ILCS

### ***How much do households spend on energy consumption?***

On average, Armenian households spend about 8 percent of their budget on energy, with slightly more than half of it on gas. According to the ILCS, which provides self-reported data on energy consumption expenditures, about 60 percent of the energy consumption is for heating purposes (Table 6). The poorest quintile spend 7 and 6.5 percent of their budget on energy overall and

heating, respectively. Much of the energy budget of the households, particularly of the poor, is spent on heating during the cold winter months. Given heating energy expenditures are a substantial component of the total budget, an increase in price of gas will have important impact on their welfare.

The poorer households spend a relatively larger share of their budget on electricity. Electricity expenditures are more burdensome and account for a larger share of expenditure than gas. As such, spending on electricity is somewhat regressive: the poorest quintile spends 4.0 percent of their budget on electricity while the richest quintile spends only 2.9 percent – which indicates relatively inelastic demand for basic electricity uses such as lighting. This result is similar to the finding of a survey of household electricity expenditure in other ECA countries (Lampietti, et al., 2004; Junge, et al., 004.), which indicates that the poor spend a much larger share of their budget on electricity than the rich. In contrast, household spending on gas is neither regressive nor progressive on which the middle quintiles spend a larger share of their budget (4.8 for third quintile), compared to 3.9 for the richest quintile and 3.0 percent for the lowest quintile.

On the other hand, one of the important observations from Table 6 is that expenditures on heating energy take up a larger portion of the budget of the poor than the upper income groups. Households in the poorest quintile spend nearly twice as much (6.5 percent) of their budget on heating overall than households in the highest quintile of the income distribution (3.4 percent). This may suggest that there is a negative income elasticity of heating energy demand. Since heating needs during the winter months is a necessity, it is not surprising that poor households spend a higher share of total expenditures on heating. While higher energy prices could encourage energy efficiency investments, the immediate impact on the poor and their choice of heating fuel should be of vital concern.

**Table 6. Household Spending on Energy Consumption, 2008**

<i>Quintile</i>	<i>Amount (in drams per month)</i>				<i>Share of Total Expenditures (%)</i>			
	<i>Energy</i>	<i>Gas</i>	<i>Electricity</i>	<i>Heating</i>	<i>Energy</i>	<i>Gas</i>	<i>Electricity</i>	<i>Heating</i>
<b>Armenia</b>								
<i>Poorest</i>	4,655	2,043	2,572	3,948	7.0	3.0	4.0	6.5
<i>2</i>	7,344	3,759	3,543	4,814	7.8	3.9	3.9	5.4
<i>3</i>	8,397	4,659	3,576	4,909	8.6	4.8	3.7	5.4
<i>4</i>	9,778	5,533	4,022	5,299	8.2	4.6	3.4	4.6
<i>Richest</i>	12,441	6,922	5,366	5,869	6.9	3.9	2.9	3.4
<i>All</i>	8,743	4,727	3,886	5,018	7.7	4.1	3.5	5.0
<b>Yerevan</b>								
<i>Poorest</i>	5,392	2,216	3,176	4,048	8.1	3.1	4.9	6.1
<i>2</i>	9,202	4,252	4,950	5,151	8.6	3.9	4.7	5.0
<i>3</i>	9,776	4,794	4,983	4,665	8.8	4.4	4.4	4.3
<i>4</i>	11,600	5,667	5,789	5,169	8.2	3.9	4.2	3.9
<i>Richest</i>	13,559	6,658	6,888	5,673	6.4	3.2	3.2	2.6
<i>All</i>	10,064	4,806	5,225	4,959	8.0	3.7	4.3	4.3
<b>Other Urban</b>								
<i>Poorest</i>	4,370	2,117	2,250	3,788	7.0	3.2	3.7	6.8
<i>2</i>	7,017	3,992	2,956	4,443	8.2	4.6	3.6	5.6
<i>3</i>	8,094	4,936	3,132	4,918	9.2	5.5	3.7	5.9
<i>4</i>	9,127	6,032	3,063	5,150	9.0	5.9	3.1	5.4
<i>Richest</i>	12,115	7,823	4,211	5,755	7.8	5.0	2.6	3.9
<i>All</i>	8,396	5,176	3,176	4,879	8.3	4.9	3.3	5.4
<b>Rural</b>								
<i>Poorest</i>	4,295	1,707	2,474	4,103	6.2	2.5	3.7	6.7
<i>2</i>	6,293	2,987	3,288	4,941	6.5	3.0	3.5	5.2
<i>3</i>	7,275	4,079	2,992	4,879	7.2	4.1	3.0	5.3
<i>4</i>	9,188	5,577	3,222	5,528	7.9	4.6	2.9	5.0
<i>Richest</i>	10,624	5,945	3,971	6,280	6.6	3.5	2.3	3.9
<i>All</i>	7,749	4,216	3,222	5,209	6.9	3.6	3.0	5.1

*Source:* Author's calculations based on 2008 ILCS

### ***Distributional impact of the gas price hike***

The analysis suggests that the welfare losses are higher for the poorest than the richest in Yerevan, but neither progressive nor regressive for the rest of the country. Table 7 presents the results of the analysis of welfare losses, expressed in percent of household expenditure,

associated with higher gas prices.<sup>8</sup> Given the impact will be largely a function of expenditure levels and shares, the distributional effects should be consistent with variations in energy consumption levels and expenditure shares. Therefore, the effect of the gas price increase will be expected to cause bills of richer households to grow by a larger absolute amount than those of poorer ones.

In relative terms, the impact of the gas price increase will vary across income groups and location. The average impact of the gas price increase is about 2.8 percent of household budget, ranging from 2.4 percent for the poorest and richest households to 3.1 percent for households in the middle quintile. The distributional effect, expressed in percent of household expenditures, varies by location. While all households consuming gas are affected, the impact is most painful for households in non-Yerevan urban areas where reliance on gas is the highest.

The effects on the budgets are largest among households in the middle of the consumption distribution. For example, households in third and fourth quintiles and in non-Yerevan urban areas and in rural areas could see the gas price increase amounting to about 3.3 percent of their budget. In contrast, the gas price increase amounts to 1.9 percent of the budgets of the richest households in Yerevan.

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<sup>8</sup> The estimations do not allow for substitution away from the relatively more expensive energy products.



**Table 7. Impact of Gas Price Increase on Gas Consuming Households**

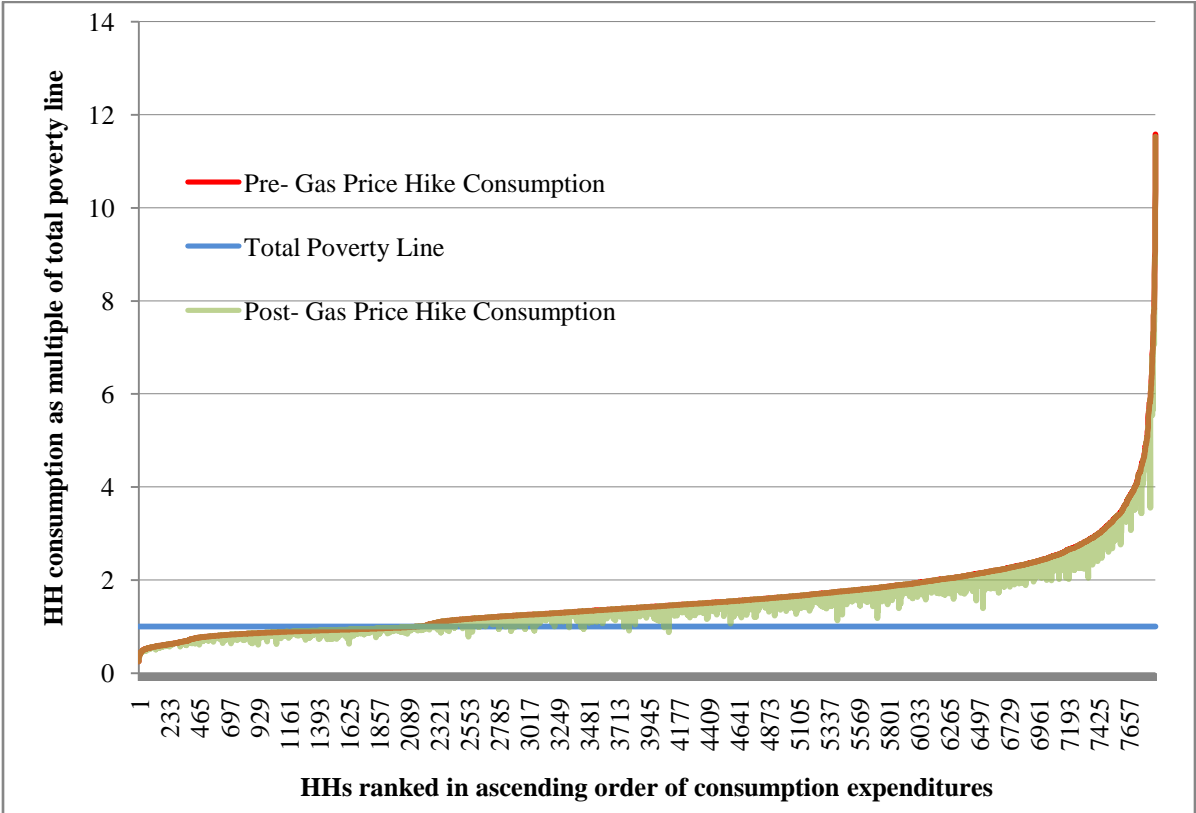
<b>Quintile</b>	<b>Amount (in drams per month)</b>	<b>Impact (% of household consumption)</b>
<b>Armenia</b>		
<i>Poorest</i>	1,680	2.4
2	2,743	2.8
3	3,047	3.1
4	3,600	3.0
<i>Richest</i>	4,274	2.4
<i>All</i>	3,221	2.8
<b>Yerevan</b>		
<i>Poorest</i>	1,782	2.5
2	2,868	2.6
3	2,945	2.7
4	3,515	2.4
<i>Richest</i>	4,079	1.9
<i>All</i>	3,148	2.4
<b>Other Urban</b>		
<i>Poorest</i>	1,590	2.4
2	2,576	2.9
3	2,985	3.3
4	3,450	3.3
<i>Richest</i>	4,317	2.8
<i>All</i>	3,164	3.0
<b>Rural</b>		
<i>Poorest</i>	1,624	2.4
2	2,653	2.7
3	3,078	3.1
4	4,252	3.5
<i>Richest</i>	4,388	2.6
<i>All</i>	3,384	2.9

*Source:* Author's calculations based on 2008 ILCS

Another illuminating approach to examine the poverty impact of the gas price hike is to measure the extent to which the price hike is “impoverishing.” That is, if a household has total consumption expenditures with gas above the national poverty line, but their total spending without gas is below the poverty line, they could be considered to have suffered impoverishment due to gas expenses. This impoverishment due to spending on gas is illustrated graphically in

Figure 1. Households are ranked along the horizontal axis by total consumption per adult equivalent. The vertical “drip” lines represent spending on gas, and the per-adult-equivalent poverty line is indicated by the horizontal line at about AMD 25,188. When total household consumption places a household above the poverty line but spending on gas drops them below, it can be argued that impoverishment due to the gas price increase has occurred.

**Figure 1: Impoverishing Effects of Spending on Gas**



Source: Author’s calculations based on 2008 ILCS

As Figure 1 above illustrates, gas price hike has a significant impact on poverty among Armenian households. Using the concept of impoverishment we can recalculate key poverty indicators in Armenia by “netting out” increase of household spending on gas due to the price hike. As presented in earlier reports, the poverty headcount in Armenia in 2008 was 23.5, a figure based on a consumption aggregate that includes gas spending (World Bank, 2010a; NSS, 2009). If we calculate the poverty headcount without gas expenditures, it rises to 25.4 percent. Thus, an additional 1.9 percent of Armenian households would be classified as poor. Similarly a

38 percent increase in gas price would increase poverty incidence to 24.1 percent. Thus, an additional 0.6 percent of Armenian households would be classified as poor with the April 2010 gas price hike alone.

***What is the cost of protecting the poor and/or all affected households?***

The aggregate cost to the households of the gas price increase is about 0.73 percent of 2009 GDP (or about 22.5 billion drams). Table 8 presents the aggregate increase in expenditures on gas estimated to account for the increase in the gas price. The estimates are the upper bound since our simple model assumes consumption levels are unchanged (no substitution). More importantly, the calculations provide a rough cost of protecting the poor or any share of the affected households to ensure that they are as better off as they were before the gas price increase. For example, protecting the energy consumption of households from the two poorest quintiles requires energy subsidies of about 0.18 percent of GDP (or about 5.8 billion drams). However, these calculations assume perfect targeting by the subsidy program of the intended beneficiaries. In practice, it is impossible to achieve perfect targeting.

The Government of Armenia used the Family Benefit (FB) program targeting scheme to provide compensation against the gas price hike. It introduced a lifeline tariffs for poor gas consumers who are beneficiaries of the FB program.<sup>9</sup> Under this arrangement, poor households pay AMD 100/m<sup>3</sup> instead of regular AMD132 on the first 300 m<sup>3</sup> of gas consumed during the year. This benefit became effective on April 1, 2011. Based on the FB database, the total cost of the lifeline tariffs for one year was about 1.056 billion drams (about 0.03% of GDP). For comparison, assuming the FB targeting mechanism was used and the poorest two quintiles were targeted, the fiscal cost of full compensation would have been about 0.22 percent of GDP (or about 6.9 billion drams).

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<sup>9</sup> FB, Armenia's main social safety net program, achieves a targeting performance of about 61 percent, i.e., about 61 percent of the program resources reach the poorest quintile and about 80 percent reach the poorest two quintiles. However, its coverage of the poor is low at about 33%.

**Table 8. Financial Cost of the Gas Price Increase on Households**

<b>Quintile</b>	<b>Gas Consumers (in million drams per year)</b>	<b>Percent of 2009 GDP</b>
<b>Armenia</b>		
<i>Poorest</i>	2,005	0.06
2	3,781	0.12
3	4,626	0.15
4	5,364	0.17
<i>Richest</i>	6,767	0.22
<i>All</i>	22,543	0.73
<b>Yerevan</b>		
<i>Poorest</i>	741	0.02
2	1,446	0.05
3	1,588	0.05
4	1,871	0.06
<i>Richest</i>	2,189	0.07
<i>All</i>	7,835	0.25
<b>Other Urban</b>		
<i>Poorest</i>	676	0.02
2	1,275	0.04
3	1,617	0.05
4	1,895	0.06
<i>Richest</i>	2,470	0.08
<i>All</i>	7,933	0.26
<b>Rural</b>		
<i>Poorest</i>	563	0.02
2	1,020	0.03
3	1,351	0.04
4	1,787	0.06
<i>Richest</i>	2,026	0.07
<i>All</i>	6,748	0.22

*Source:* Author's calculations based on 2008 ILCS and 2009 GDP data

The lifeline tariffs benefit scheme had several inadequacies as a measure to provide compensation against the impact of the gas tariff increase. First, the amount of lifeline tariffs benefit was only about 15% of the cost of gas price hike to the bottom poorest 20% of households and less than 5% of the total cost to households of the gas price hike (see Table 8). Second, while this compensatory measure provides some relief for the poor and low gas

consuming households under the FB program (up to 9,600 drams per year depending on consumption), it did not provide compensation for most affected households since the FB program covers only about 13% of all households. Third, as the FB program covers only about 33% of the poor, the lifeline tariffs benefit left out the majority of the poor as well. Therefore, while the FB program targets the poor well, it is not an adequate mechanism to compensate for adverse shocks like the 2010 Russian gas price hike. This is due primarily to the program's limited reach of affected households.

#### **4. Conclusions**

In this paper we briefly reviewed energy consumption patterns in Armenia; and analyzed the impact of the April 2010 gas price hike on household welfare and implications for compensation policies. The paper highlights Armenia's energy vulnerability due to its heavy dependence on imported gas mainly from Russia. Currently, imported gas supply accounts for a large share of Armenia's energy balance. The current energy strategy that relies on fuel imported mainly from Russia could offer little certainty that such supply would continue under terms that Armenia could afford.

The poverty and distributional analysis suggests that the gas price hike, one of several similar episodes in the recent past, would have a significant impact on the welfare of households, particularly those below and just above the poverty line. Over a quarter of Armenian households use fuelwood for heating. A higher proportion of the poor (over 32 percent) already rely on fuelwood for space heating. For the poorest quintile, the share of spending on heating of total household expenditures is twice as large as for the richest quintile. The increase in gas price would lead to an increase in the proportion of households using fuelwood for heating.

While the imported gas price increases are outside the influence of Armenian policy makers, the GOA had some measures at its disposal to mitigate the impact. The GOA employed its social safety net program to provide protection to the poor and most vulnerable households. This was made possible because of the existence of Armenia's well-targeted safety net program, namely,

the Family Benefit (FB). The government increased the base level of the size of the FB benefit by 3,500 AMD per month. On average, the size of the FB was increased by 15 percent to compensate for the gas price hike. However, the coverage of the poor by the FB was about one in three. There remains scope for using the FB scheme to provide further mitigation against the gas price hike.

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