KYRGYZ REPUBLIC: ENERGY POLICY AND PROJECTS

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By Way of Introduction

Kyrgyzstan's energy policy is largely determined by its geographical position, its primary energy resources and its interdependence with neighboring countries in developing the fuel and energy complex (FEC). According to a report by the CIS Economic Cooperation Department for 1991-2008, the countries of the Central Asian Region (CAR) have achieved certain successes in institutional and structural transformations: in privatizing state property, creating the basic institutions of a market economy, and applying monetary and exchange controls and other market instruments.

From the perspective of economic development, the period under review is clearly divided into three stages. They can be briefly characterized as economic recession, recovery and expansion. At present, all CA states are feeling the impact of the world economic crisis, whose effects can be assessed based on the results of their social and economic development for 2008-2011.

Conditions and Prerequisites for Cooperation in FEC Development in Central Asia

The economy of CA countries is very energy-intensive, as indicated by the energy intensity of their GDP (see Table 1). As the table shows, Kazakhstan and Turkmenistan also have a high level of CO_2 emissions both per unit of consumption of fuel and energy resources (FER) and per capita.

During the crisis, FER production and FEC development remain priority development areas.

Central Asia is endowed with huge water and energy resources, but they are distributed unevenly. For example, 77.4% of hydrocarbon fuel is found in Kazakhstan, 12.7% in Uzbekistan, and 6.7% in Turkmenistan; these countries have a surplus of energy. Kyrgyzstan and Tajikistan, on the contrary, have energy shortages and are currently experiencing a deep energy crisis because their oil, coal and gas reserves are insufficient and are largely concentrated in hard-to-reach mountain areas with difficult climatic and mining conditions.

Table 1

Selected Energy Indicators for Central Asian Countries

Country	Area (thousand sq km)	Population (million)	Share of FEC in industry, %	Energy intensity of GDP (toe/$1,000)*	CO_2 emissions to FER, tons/toe	CO_2 emissions per capita (tons/person)
Kazakhstan	**2,724.9**	**15.1**	**52.2**	**2.01**	**2.87**	**12.3**
Kyrgyzstan	**199.9**	**5.2**	**15.0**	**1.7**	**1.96**	**1.09**
Tajikistan	**143.1**	**7.0**	**11.5**	**2.24**	**1.77**	**1.02**
Turkmenistan	**491.2**	**6.3**	**46.0**	**2.95**	**2.55**	**9.13**
Uzbekistan	**447.4**	**25.1**	**27.0**	**2.62**	**2.33**	**4.22**
CAR, total	**4,006.5**	**58.7**				

* For comparison: for the world as a whole, this indicator is 0.32, and for Asia, 0.65.

Sources: *Commonwealth of Independent States in 2008. Statistical Yearbook*, Interstate Statistical Committee of the CIS, Moscow, 2009; *World Energy Statistics*, International Energy Agency, 2008.

Since Tajikistan and Kyrgyzstan are located in the upper drainage basins of the Syr Darya and Amu Darya rivers, their water reserves amount, respectively, to 43.4% and 25.1% of the combined flow of the two rivers (116.4 cubic kilometers). In other words, from the perspective of water availability Tajikistan and Kyrgyzstan are in a more advantageous position; but, just as Kazakhstan and Uzbekistan, they experience an acute water shortage, especially in summer.[1]

The FEC share of industry is 52.2% in Kazakhstan, 46.0% in Turkmenistan, 27% in Uzbekistan, 15% in Kyrgyzstan, and 11.5% in Tajikistan.

An analysis of the structure of FER production and consumption shows that while producing 92.7 million tons of coal the CAR countries consume 67.8 million tons, or 75% (see Fig. 1). Thus, 25% of the coal produced can be exported.

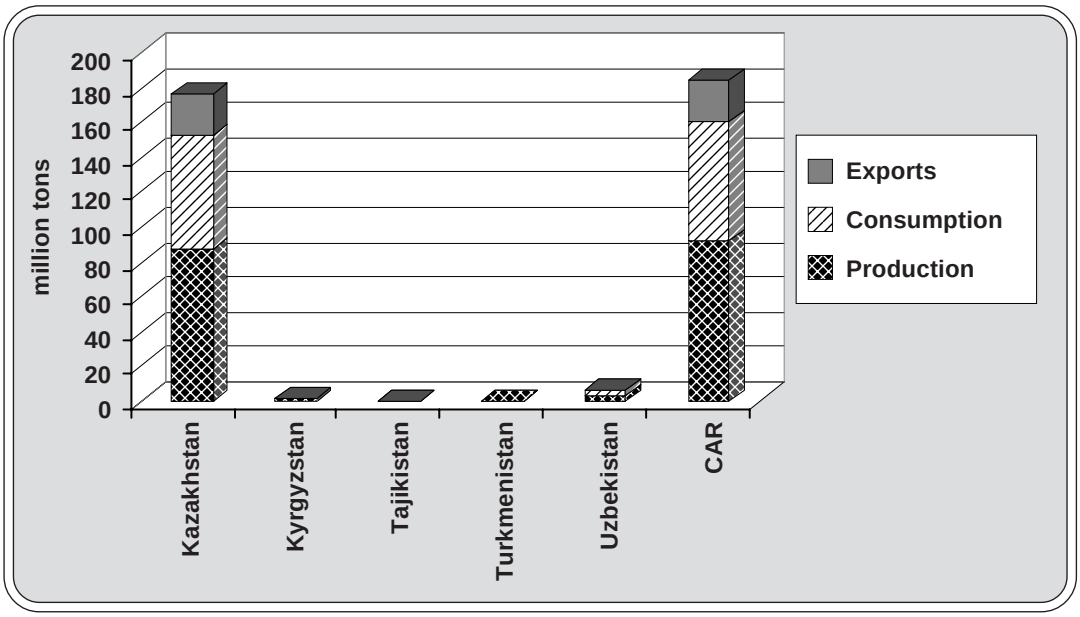
Kazakhstan produces 88 million tons of coal (96% of total coal production in CAR countries), which makes it the main producer of this type of fuel. But most of the coal produced is consumed in Kazakhstan itself (about 95% of total coal consumption in CAR countries, or 74% of the coal produced in Kazakhstan), and only 26% is exported.

In 1990-2008, coal production dropped from 142 million tons to 90 million tons (to 63.3% of the 1990 level); in Kyrgyzstan, it decreased 10-fold, in Tajikistan and Kazakhstan by 65.8%, and in Uzbekistan by 44%.

[1] See: U.N. Special Program for the Economies of Central Asia (SPECA), ECE, ESCAP. Project Working Group on Energy and Water Resources, *Strengthening Cooperation for Rational and Efficient Use of Water and Energy Resources in Central Asia*, U.N., New York, 2004.

Figure 1

Coal Production, Consumption and Exports in CAR Countries



The main reasons for the decline in coal production include the abolition of state subsidies to the coal industry, deterioration and obsolescence of mining and transportation equipment, high rates for coal delivery and transit by rail, closure of coal-mining enterprises, and insufficient numbers of new mines and pits.

It should be noted that Uzbekistan fully meets its own coal requirements, and Kyrgyzstan and Tajikistan only partially.

Oil production for the region as a whole in 1990-2008 increased 1.84-fold to 65 million tons; Kazakhstan accounts for over 78%, Turkmenistan has 11%, and Uzbekistan 9%. Kazakhstan consumes only 11 million tons (17% of the oil it produces), and Turkmenistan 5.2 million tons (53%), which enables them to export oil to neighboring countries and regions (see Fig. 2).

In 1990-2008, natural gas production fell from 136 billion cubic meters (bcm) to 112 bcm (78% of the 1990 level), with Uzbekistan producing 53% (1.4-fold increase), Turkmenistan 24% (the highest rates of growth in production in this country were recorded from 1999 to 2005), and Kazakhstan 22.5% (see Fig. 3).

Natural gas accounts for more than half of the total consumption of fuel and energy resources in the CAR, and about three-quarters of the total is used in Uzbekistan. The largest producers are Turkmenistan (68 bcm) and Uzbekistan (62.7 bcm). Overall, the CAR countries consume only 46% of the gas produced, and 54% is exported.

In 1991, upon the completion of a 500 kV energy circuit, the power systems of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan were united into an integrated Central Asian Power System (CAPS).

Since the generating facilities that are part of CAPS differ significantly in structure (see Fig. 4), they are balanced within the system; this determines its integrating role as the basis of regional energy security.

Figure 2

Oil Production, Consumption and Exports in CAR Countries

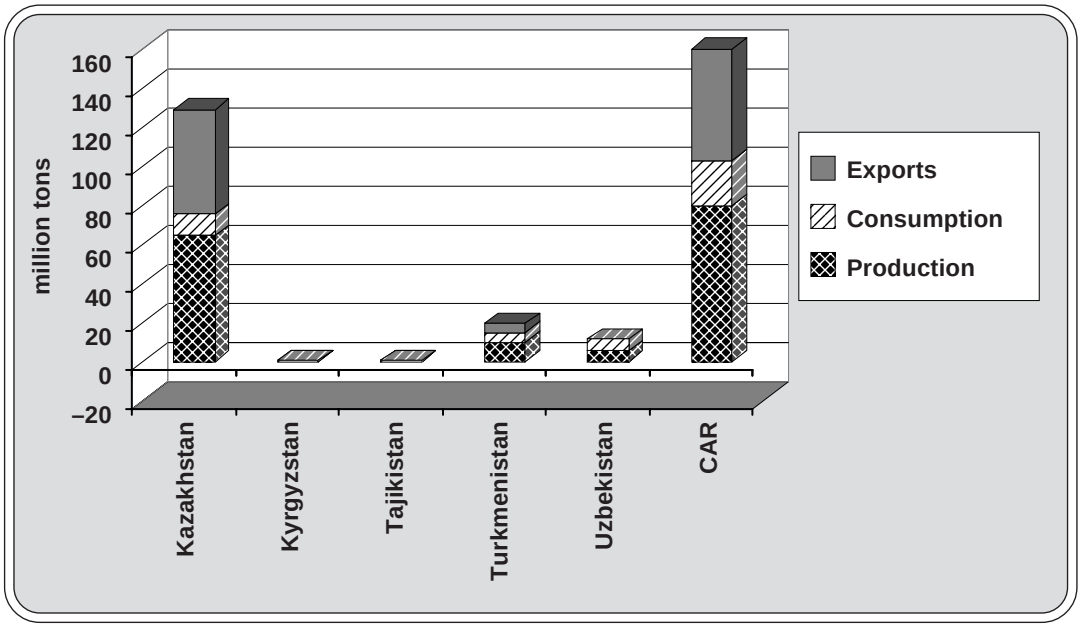


Figure 3

Gas Production, Consumption and Exports in CAR Countries

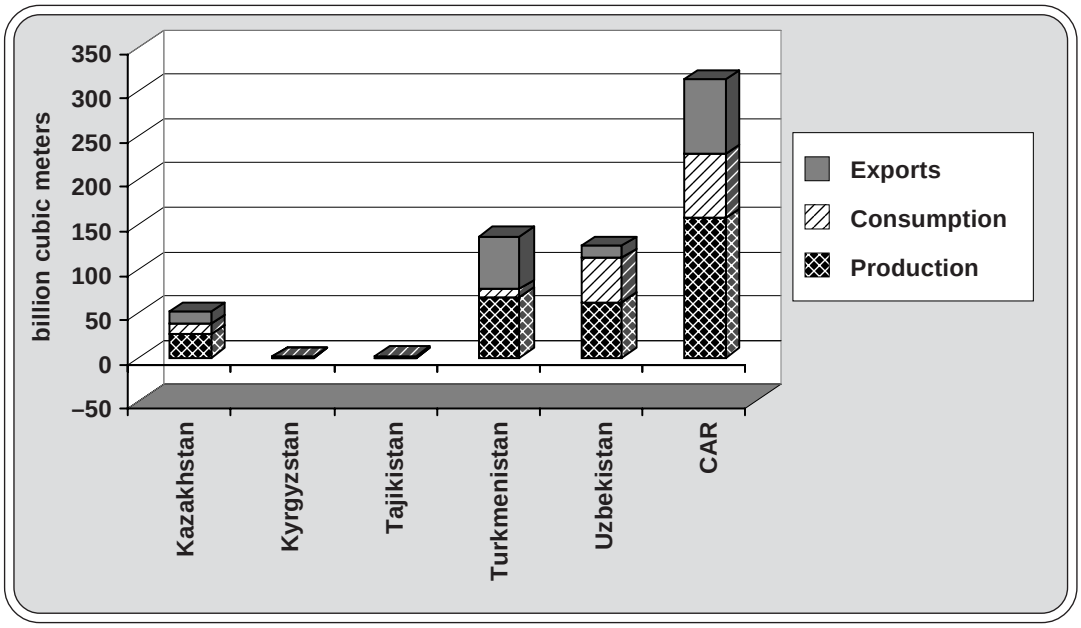
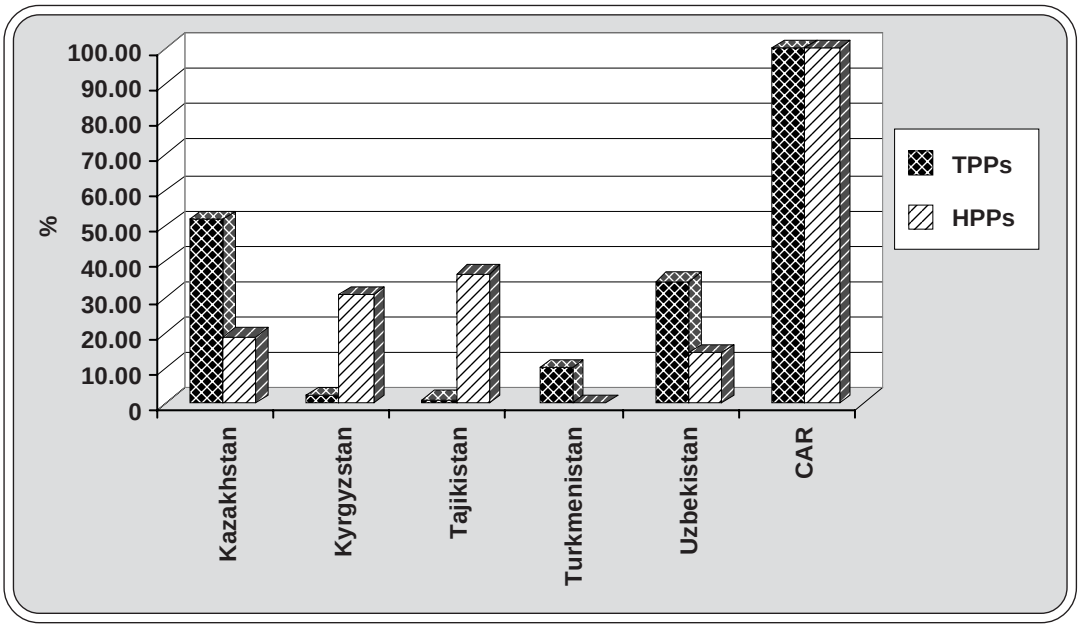


Figure 4

Installed Capacity of Power Plants in CAPS



Thermal power plants (TPPs) in CAR countries generate almost three times more electricity than hydroelectric power plants (HPPs).

In the common Central Asian power supply system, the largest share of TPPs is in Kazakhstan (87.5%), Uzbekistan (85.9%) and Turkmenistan (99.9%), while the largest share of HPPs is in Kyrgyzstan (83.5%) and Tajikistan (92.7%).

The amount of electricity generated by HPPs throughout the region in 1995-2006 increased from 38 billion kWh to 44 billion kWh (by 16%); Kazakhstan contributed 17% of the regional total, Uzbekistan 13.6%, Tajikistan 38%, and Kyrgyzstan 31% (see Fig. 5).

The decline in electricity production in 1990-2008 in almost all CA countries except Kyrgyzstan (1.4-fold for the region as a whole) is directly connected with the economic downturn in the transition period.

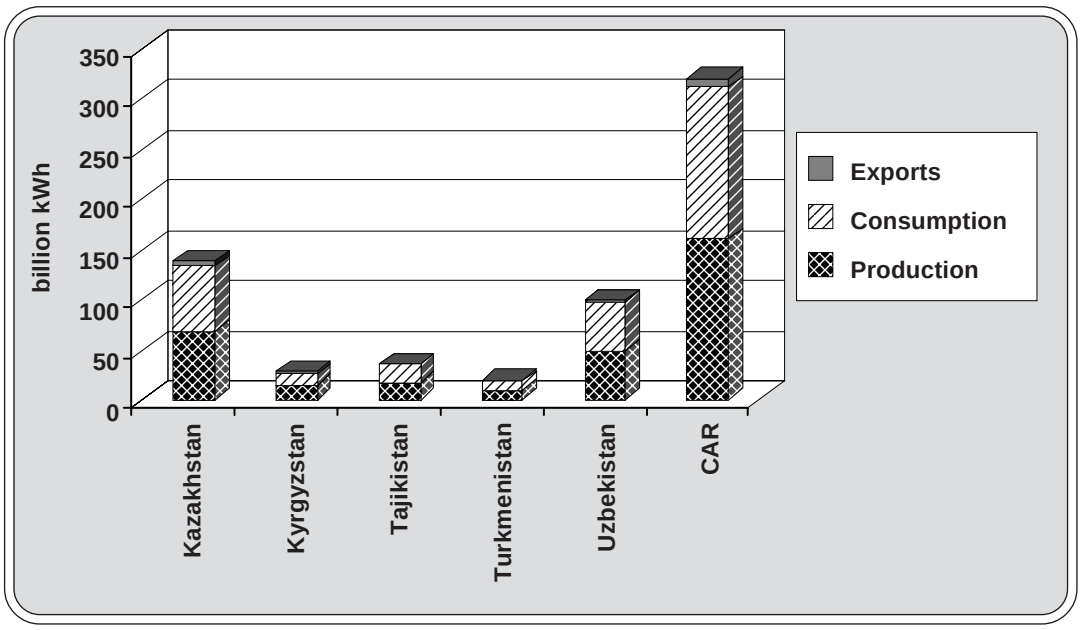
In Kyrgyzstan, electricity consumption patterns have changed: the share of the public utilities sector and the population has increased while consumption in the real sector of the economy has decreased.

Despite the decline in the production of the main types of fuel and energy resources, the general trend in their production and consumption by CA countries shows that these countries can fully provide themselves with energy resources and even export them.

The energy independence policy pursued by power-surplus states prevents the development of an electricity market in CAPS. The "water-electricity-fuel" mechanism for electricity exports does not work because the parties are obliged to go over to cash payments for imported fuel. In particular, electricity exports from Kyrgyzstan fell from 4.0 billion kWh in 1990 to 2.5 billion kWh in 2007. In addition, due to the low water levels and severe winter of 2007-2008, by 1 April 2008 the water level in the Toktogul reservoir fell to a critical point (6.4 billion cubic meters with a design volume of 19 billion cubic meters), and neighboring countries received less than the required amount of water and electricity.

Figure 5

Electricity Production, Consumption and Exports in CAR Countries



In 2008, the Kyrgyz government acknowledged the existence of an energy crisis. It resorted to rolling blackouts and imposed severe restrictions on electricity consumption; exports were reduced to 553 million kWh. How the situation will develop depends not only on the state of water resources, but also on the policies of neighboring countries: Kazakhstan, Uzbekistan and Turkmenistan, which are richly endowed with energy resources, are striving for energy independence. In Kazakhstan, for example, most power plants run on coal; Kyrgyzstan and Tajikistan tap the hydropower potential of water resources; and Uzbekistan and Turkmenistan use natural gas and fuel oil.

It should be noted that use of gas and fuel oil to meet peak and intermediate demand is very unprofitable, while HPPs are better able to vary their power output and, since there is no fuel component in their cost structure, are more economical. This is exactly why CAPS was created with special emphasis on optimizing the operating regimes of TPPs and HPPs in coordination with the operating regime of reservoir systems in the Naryn-Syr Darya basin so as to ensure irrigation releases from the Toktogul reservoir in the vegetation period with a simultaneous increase in electricity generation from HPPs, and in fall and winter to accumulate water in the reservoir with maximum electricity generation from TPPs.

Today the work of this mechanism, regulated by intergovernmental agencies (Unified Dispatch Center Energia and Basin Water Association Syr Darya), is disrupted. Moreover, the heads of state of Uzbekistan and Kazakhstan object to the construction of large HPPs in the basins of Syr Darya (Kambarata HPP-1) and Amu Darya (Rogun HPP) and demand an environmental impact assessment.

But a similar assessment should be made, in the first place, with regard to energy facilities running on hydrocarbon fuel (Novo-Angren, Chimkent and Dzhambul GRES power plants) and located close to the border with Kyrgyzstan. Pollutant emissions exacerbate the environmental crisis in the Aral Sea basin and have a negative impact on climate change in the CA region and the Caucasus.

For example, greenhouse gas emissions in CO_2 equivalent both per unit of FER consumption and per capita are highest in Kazakhstan (2.87 tons/toe and 12.3 tons/person), Turkmenistan (2.55 tons/toe and 9.13 tons/person) and Uzbekistan (2.33 tons/toe and 4.22 tons/person); these figures are on average much higher than global and Asian indicators. Meanwhile, some time ago these states acceded to the U.N. Framework Convention on Climate Change.

In the Soviet period, power supply in the CAR was effected through the Integrated Power System of Central Asia and Southern Kazakhstan, which strictly ensured the optimal performance of TPPs and HPPs operating in parallel mode. Their generation schedule was connected with the operating regime of multi-year and seasonal regulation reservoirs, in which water was stored for irrigation purposes; water management problems in the region were addressed in a centralized way, and the integrated gas supply system ensured an uninterrupted supply of gas to all CA republics and the European part of the U.S.S.R. Today the integrated water, electricity and fuel supply system in the CA republics has been destroyed. Given the rising prices of natural gas, oil, oil products and coal, and also of their transportation and delivery, Kyrgyzstan and Tajikistan are obliged to spend significant amounts of money on their imports.

It is clear that with the disintegration of the U.S.S.R. and the emergence of new sovereign states the conditions of water, fuel and energy use changed radically. The CA states encountered unresolved problems in three main areas: supply of energy resources to the upper basins of rivers; supply of water to the lower basins of rivers; and ensuring environmental security.

In order to strengthen economic ties and develop integration processes, the Central Asian Economic Community (CAEC) created an appropriate institutional framework. In 1998, the governments of Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan signed framework agreements On the Joint Use of Water and Energy Resources of the Syr Darya and Amu Darya Basins and On the Parallel Operation of the Energy Systems of CA States; they also explored the issues of creating an International Water and Energy Consortium (IWEC). But Uzbekistan's withdrawal from CAEC and the subsequent dissolution of this important interstate economic community triggered disintegration processes in the area of ensuring rational use of energy and water.

In subsequent years, the agreements and understandings between the CA heads of state in developing integration in the use of water and energy resources and mitigating the effects of the environmental crisis in the Aral Sea basin were not implemented properly.

After the dissolution of CAEC, Kyrgyzstan and Tajikistan joined the Eurasian Economic Community (EurAsEC), later followed by Uzbekistan. A working group within the EurAsEC framework prepared updated drafts of a new accord and concept of cooperation in the efficient use of water and energy resources and of a Eurasian Water and Energy Consortium, but they were not signed by the heads of the states concerned.

Later on, at the end of 2008, Uzbekistan withdrew from the EurAsEC, and numerous problems have remained unresolved; an additional threat to energy security is the republic's intention to withdraw from the parallel operation regime of CAPS. In view of this, it is necessary to introduce a set of principles and economic mechanisms for reimbursing the expenses incurred by upstream countries in supplying water to downstream countries in the Naryn, Syr Darya and Amu Darya basin, as practiced in many river basins of the world (e.g., the Columbia River basin between the United States and Canada).

Assuming that "water is the God-given common heritage of nations," the CA heads of state tried to solve this problem. The operating regime of the Toktogul Reservoir was changed: in winter it operated in power generation mode to meet the growing needs of Kyrgyzstan, and in summer, in irrigation mode to meet the needs of neighboring states, so that water levels often dropped to a critical point.

Thus, the solution of worsening energy supply problems and improvements in the environmental state of the region require joint efforts by the Central Asian states. It should be noted that since the attainment of independence the attempts of CA states to implement an independent energy and water policy have usually led to instability and sometimes even to critical situations. This was particularly

pronounced during the severe winter of 2007-2008, causing an escalation of the energy crisis in Kyrgyzstan and Tajikistan.

The Energy Crisis in Kyrgyzstan: Factors and Forms

The energy crisis is due to the fact that the Kyrgyz Republic is an energy-deficient country and meets only 52% of its energy needs with its own energy resources (mainly electricity generated by HPPs); the rest is imported from Uzbekistan (natural gas), Kazakhstan (coal), Russia and Kazakhstan (oil and oil products).

The total generating capacity of the Kyrgyz power system is 3,680 thousand kW, and electricity generation totals 12-14 billion kWh.

The republic's power grid includes more than 70 thousand km of transmission lines ranging from 0.4 kV to 500 kV (546 km of 500 kV transmission lines, 1,714 km of 220 kV lines, and 4,380 km of 110 kV lines). The system also includes 490 35-500 kV transformer substations with a total capacity of more than 8,000 MVA, so that the population is fully supplied with electricity.

Out of the republic's 14 HPPs, the best known is the cascade (system) of five Toktogul HPPs in the lower reaches of the Naryn River, including the Toktogul HPP (with a capacity of 1,200 MW), Kurpsay HPP (800 MW), Tash-Kumyr HPP (450 MW), Shamaldy-Say HPP (240 MW) and Uch-Kurgan HPP (180 MW).

The list of irrigation facilities of particular importance to Central Asia also includes the Toktogul multi-year regulation reservoir with a design capacity of 19 billion cubic meters and a number of downstream seasonal and daily regulation reservoirs of the above-listed HPPs.

In addition, there is the At-Bashy HPP with an installed capacity of 40 MW operating in the upper reaches of the Naryn River, and eight small HPPs with a total installed capacity of 29.78 MW.

Kyrgyzstan's power system began operating in parallel with the power systems of neighboring countries upon the establishment of the Integrated Power System of Central Asia and Southern Kazakhstan. The completion of the Toktogul HPP cascade (with a capacity of 2,870 MW) marked a new stage in the development of the country's power system, in enhancing the reliability and stability of the integrated power system and improving the multiple use of CA water and energy resources.

For more reliable electricity supply to consumers in the north of the republic and heat supply to the capital, a combined heat and power (CHP) plant with a capacity of up to 702 MW and an annual output of more than 4.1 billion kWh was built in the republic. In recent years, it has generated on average 850-946 million kWh a year, meeting about 13% of the needs of the northern part of the republic, although it could supply more than 62%.

Additional difficulties are associated with seasonal consumption patterns (in winter, energy consumption is almost twice as high as in summer); load ratios vary widely, so that it is difficult to ensure economically efficient operation of the energy system.

Kyrgyzstan faces the problem of reliable power supply to consumers in the north of the republic, where installed generating capacity is 718 MW, whereas in the south it is 2,920 MW. Now that the Toktogul HPP is operating at full capacity, the power shortage has been significantly reduced, and the completion of a 500 kV transmission line from the Toktogul HPP to the Frunzenskaya Substation has linked the power systems of the north and south of the republic, enhancing the stability and reliability of power supply.

The question of multiple use of the Toktogul hydrosystem with due regard for the interests of Kyrgyzstan, Kazakhstan and Uzbekistan is of exceptional importance to the region. Under the project,

the Toktogul hydrosystem was to have operated exclusively in irrigation mode, with the drawdown of up to 70% of the water in the vegetation period and only 25% in the non-vegetation period (so as to store water). Electricity generated in this process, along with the water, was supplied to Uzbekistan and Kazakhstan in the amount of more than 4 billion kWh a year.

At the same time, in order to generate CHP electricity in fall and winter, Kyrgyzstan received, by way of compensation, Uzbek gas (2 bcm) and Kazakh coal (more than 2 million tons) and fuel oil (up to 400 thousand tons). Since independence, CHP plants in Bishkek and Osh have had difficulties every year in obtaining fuel: in 1990-2008, fuel imports dropped by almost two-thirds. Overall, the share of imports in the energy balance decreased from 58.8% in 1990 to 31.6% in 2008 with an increase in the share of hydropower from 18.5% in 1990 to 52.5% in 2008, while the share of fuel produced fell, accordingly, from 16% to 3.7%.

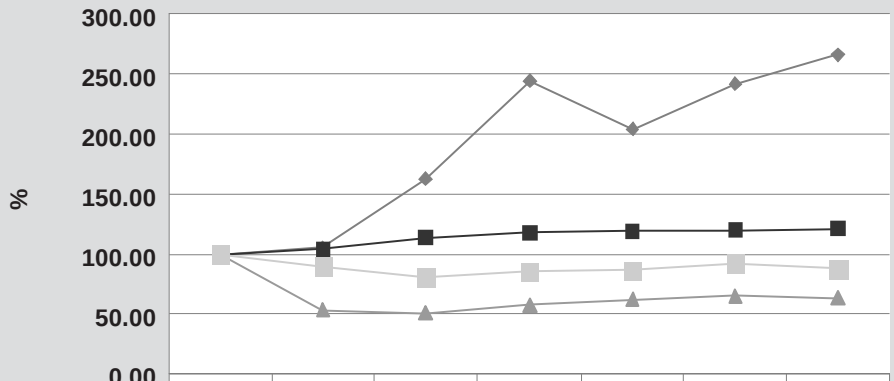
Consequently, power supply in Kyrgyzstan depends only on electricity generated by HPPs, and this, given low water conditions and instability, can hardly improve the country's energy security.

An analysis of the macroeconomic indicators of sustainable energy use for 1990-2008 shows that they have fallen as well:

- while GDP at purchasing power parity (PPP) increased 2.26-fold and the population grew 1.21-fold, FER consumption decreased 1.38-fold (see Fig. 6);

Figure 6

Dynamics of GDP, Population, FER Consumption and Electricity Consumption (1990 = 100) for 1990-2008 (excluding products of own processing)

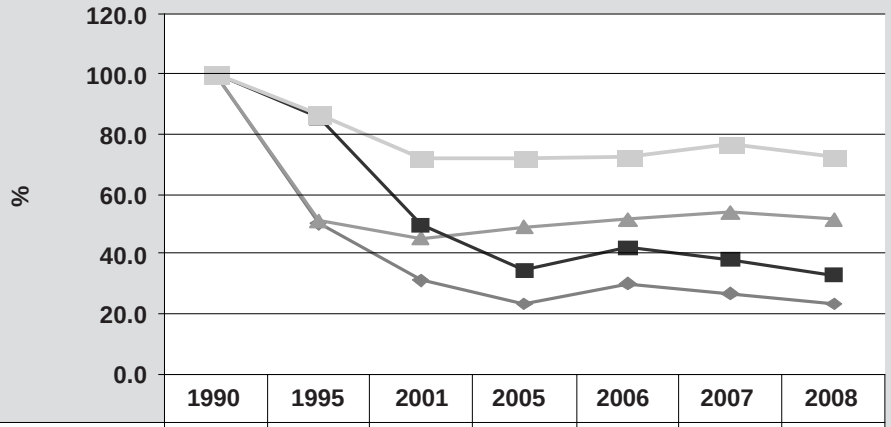


	1990	1995	2001	2005	2006	2007	2008
GDP (PPP) (US$ million)	100.00	105.75	162.59	244.40	203.94	242.31	266.29
Population (thousands)	100.00	103.84	112.62	117.93	119.10	119.89	121.08
FER consumption (thousand toe)	100.00	52.93	50.77	57.51	61.41	64.75	62.19
Electricity consumption (million kWh)	100.00	90.04	81.13	84.90	86.06	91.81	87.76

- FER consumption per unit of GDP PPP (energy intensity of GDP) fell to 50% of the 1990 level in 1995 and 28% in 2008 (see Fig. 7);
- electricity consumption per unit of GDP (electricity intensity of GDP) also tended to decrease (threefold): to 85% of the 1990 level in 1995 and 32% in 2008 (see Fig. 7);
- FER consumption per capita tended to decrease (twofold): to 50.9% of the 1990 level in 1995 and 51.36% in 2008 (see Fig. 7);
- electricity consumption per capita decreased 1.3-fold: to 86% of the 1990 level in 1995 and 72% in 2008 (see Fig. 7).

Figure 7

Dynamics of Energy Intensity, Electricity Intensity, Energy Consumption per Capita and Electricity Consumption per Capita (1990 = 100) for 1990-2008 (excluding products of own processing)



	1990	1995	2001	2005	2006	2007	2008
Energy intensity of GDP (toe/US$ thousand)	100.00	50.06	31.22	23.53	30.11	26.72	23.35
Electricity intensity of GDP (kWh/US$)	100.00	85.15	49.90	34.74	42.20	37.89	32.96
Energy consumption per capita (toe/person)	100.00	50.97	45.08	48.77	51.56	54.01	51.36
Electricity consumption per capita (kWh/person)	100.00	86.71	72.04	72.00	72.26	76.58	72.48

Data analysis confirms that economic and social development in Kyrgyzstan has been complicated by the need to acquire energy resources (coal, gas and oil products) at high prices, and also by the liberalization of prices for energy resources and deregulation of trade in these resources after 1992.

The decline in energy consumption was connected not only with the switch of many consumers to the use of electric and thermal power (whose tariffs were regulated by the state), but also with the restrictions imposed during low-water periods and the reduction in electricity generation by the Toktogul HPP cascade. In addition, disruptions in fuel supplies from Kazakhstan and Uzbekistan and the rise in fuel prices to world levels led to a decline in power generation from the Bishkek CHP plant. With the end of low-water periods, the restrictions on electricity consumption were explained by the need to store sufficient amounts of water in the Toktogul reservoir for irrigation purposes in Uzbekistan and Kazakhstan.

In order to end the energy crisis, apart from rolling blackouts and restrictions on electricity consumption, measures should be taken to ensure the country's energy security and, in the first place, to arrange interstate cooperation between CA countries and develop integration in energy and water use.

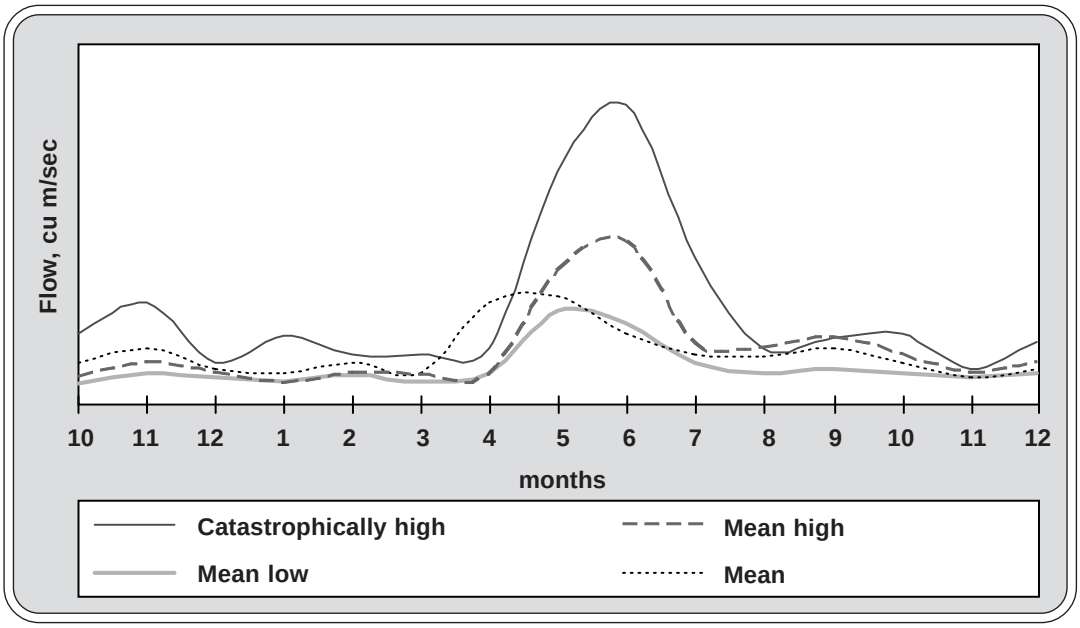
Our analysis of the factors and forms of the energy crisis shows that in the Kyrgyz Republic, in contrast to other CIS countries, the energy crisis is also fueled by the political (disintegration) factor stemming from interstate relations in the use of water and energy resources in the Naryn-Syr Darya basin and parallel operation with the power systems of Kazakhstan, Uzbekistan and Tajikistan as part of CAPS. The combination of existing factors and forms of the energy crisis, on the one hand, determines its depth and duration, and on the other, suggests possible ways to end this crisis.

The endogenous factors of the energy crisis in Kyrgyzstan include, among other things, natural climatic conditions. They influence the hydrological regime of rivers, with catastrophically high, mean high, mean, and mean low water levels. Annual water levels affect the operating regime of HPPs (see Fig. 8).

Among the endogenous factors of the crisis one can also include badly worn-out fixed assets in energy production, an irrational energy balance and pollution of the natural environment.

Figure 8

Changes in Water Flow for Several Years



A study of exogenous factors shows the impact of losses and consumer defaults in payment for supplied energy resources, discrepancies between tariffs and energy company costs, structural changes in the economy and other circumstances.

Energy crisis factors specific to Kyrgyzstan include the special impact of fixed capital depreciation, and also of consumer defaults in payment for energy supplies. This circumstance is responsible for the reproduction and financial forms of the crisis: it leads to an acute shortage of working capital in energy companies and causes problems with payments for fuel supplies, repair of power equipment and wage payments.

Such forms of the crisis sharply reduce the attractiveness of the electric power sector to foreign investors, and this gives rise to the investment form of the crisis.[2]

The levels of the investment and financial crises in the national and regional power industry can be assessed in quantitative terms. The existence and depth of the investment crisis can be determined from the ratio between actually possible investments and those required to ensure simple and expanded reproduction of assets; the existence of the financial crisis is established from the shortage of working capital at the disposal of energy companies and the availability of funding sources.

Thus, it becomes possible to determine not only the very fact of the crisis but also, to a first approximation, its level; this is necessary to determine the priorities, goals and means of anti-crisis policy.

The greatest danger lies in the combined effect of all factors and the simultaneous emergence of all forms of the crisis corresponding to them; in this case, we can already speak of a total crisis in the power industry which can lead to disaster. The presence of only some of the above factors indicates either a pre-crisis situation or a partial crisis.

A specific property of the power industry is its high economic inertia. This is manifested, for example, in a significant time lag between changes in external conditions and an adequate response to them in the form of actual changes in the fuel and energy complex. In this context, one can say that since 1991 crisis phenomena in Kyrgyzstan have gradually accumulated due to both endogenous and exogenous factors. Studies of the factors and forms of the energy crisis in Kyrgyzstan[3] have shown the following:

1. **Electricity losses** contribute to the **financial form** of the energy crisis. In 1991-2008, total electricity losses in the Kyrgyz power system increased 4.6-fold, reaching 4,583 million kWh in 2007, or 31% of total electricity output. So-called commercial losses caused by theft of electricity have appeared as well (see Table 2).

   During 1990-2008, technical losses increased almost 2.3-fold, and in the past three years have firmly remained at 19-21.6% of total electricity generation, exceeding the established rate by 10%. The increase in technical losses results from the fact that most of the capital equipment has reached the end of its safe service life, while Kyrgyz energy companies lack the resources for reconstruction and modernization due to payment defaults and the financial crisis. In addition, breakdown and wear rates have increased for both capital and auxiliary equipment.

2. **High physical depreciation of fixed assets** in the electric power industry, which has exceeded 50% (up to 70% for grid equipment), is a factor in the **reproduction form** of the energy crisis. During 1990-2008, repair and operating schedules were broken for lack of funds, which has served to increase technical losses and reduce reliability. Today more than

[2] See: L.D. Gitelman, B.E. Ratnikov, *Effektivnaia energokompania: Ekonomika. Menedzhment. Reformirovanie*, CJSC Olimp-Biznes, Moscow, 2002.

[3] See: V.M. Kasymova, *Osnovy antikrizisnogo upravlenia v energetike KR*, Insanat, Bishkek, 2009.

Table 2

Structure of Electricity Losses in the Kyrgyz Republic for 1990-2008

	1990	1995	1997	1999	2001	2003	2005	2006	2007	2008
Total losses, million kWh:	1,035	3,457	4,281	3,747	4,802	4,716	5,135	4,661	4,583	3,686
Share of generation, %	7.74	27.9	34.8	28.5	35.1	34	34.5	31.8	30.9	31.7
Of which:										
Technical losses, million kWh	1,035	n/a	2,183	2,115	2,605	2,709	2,850	2,818	2,917	2,448
Share of generation, %			17.3	16	19.1	18.3	19.1	19.4	19.6	21.1
Commercial losses, million kWh	0	n/a	2,195	1,632	2,197	2,187	2,285	1,843	1,736	1,238
Share of generation, %			17.4	12.5	16	15.7	15.2	12.4	11.7	10.6

Sources: *Energy Balance of the Kyrgyz Republic* for a number of years, National Statistical Committee of the Kyrgyz Republic.

70% of grid equipment at HPPs and CHP plants has outlived its expected useful life, so that urgent measures are needed to renew and upgrade it, while energy companies lack the necessary funds because of high levels of accounts receivable from customers.

3. **Customer defaults in payment for electricity and heat supplies rank among exogenous factors and are the main cause of the investment crisis.**

   In 1997-2008, customer receivables for electricity and heat increased almost 7-fold, peaking in 2007 at 2,997 billion soms (KGS); this is one of the main causes of the financial and investment crises in the power industry (see Fig. 9).

   Accounts payable to the key suppliers (OJSC Electric Stations and OJSC NESK) have increased accordingly: to KGS 2,414 million in 2008.

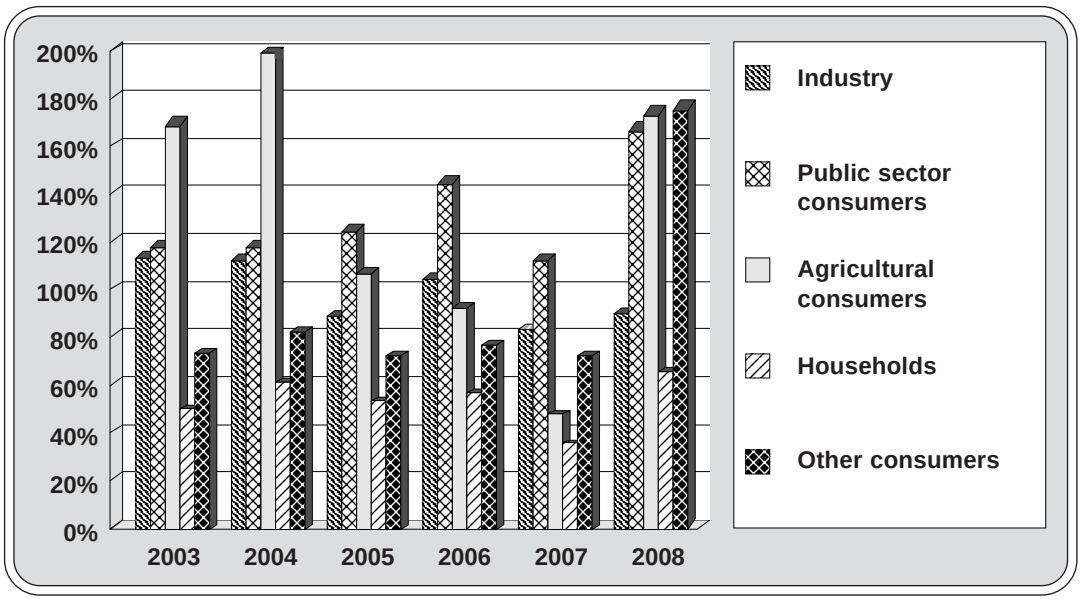
   Due to the worsening financial position of enterprises in the power industry, raising investment for the industry is an extremely difficult task, which implies the attraction of private capital, grants and own funds of companies.

4. **Inflation factors.** Inflation is another contributor to the investment form of the crisis in the power industry, which is distinguished by significant capital intensity and long payback periods.

For example, with regulated electricity tariffs the rising prices of fuel and of material and technical resources coupled with forced wage increases significantly reduce the energy companies' own investment opportunities. In the event, their depreciation funds accumulated using the traditional

Figure 9

Rate of Collection of Electricity Payments for 2003-2008



method cannot cover the rising cost of investment resources; centralized investment is virtually ruled out; and private capital takes a very cautious approach to long-term investment in view of rising inflation.

Attempts to solve the investment problem by raising tariffs with due regard for inflation expectations can produce an opposite result for the following reasons:

- first, this is yet another factor stoking inflation;
- second, the rise in the prices of material and technical resources caused by tariff increases will deal a blow, with a lag, to the electric power industry itself by pushing up production costs still further; thus, the electric power industry will "contribute" to the inflation spiral and will itself suffer from it;
- third, soaring energy costs will compel electricity-intensive enterprises, the demand for whose products is heavily dependent on prices, to cut back production.

To prevent this, tariff policy should be formulated based on a thorough analysis of the dependence of inflation rates, GDP and household income on world prices for gas, oil and oil products.

On the other hand, in order to extricate the energy sector from its current financial and economic difficulties it is absolutely necessary to set economically justified tariffs for electricity and heat enabling energy companies to cover all their costs and use their profits to create a reserve for investment in renovation and new construction. Consequently, the determining factor in pricing should be the level of allowable costs together with an acceptable profit level. The methodology used to set electricity tariffs should also help to implement an active energy-saving policy.[4]

[4] See: *Srednesrochnaia tarifnaia politika na energonositeli na 2008-2011*, State Department for Fuel and Energy Complex, Ministry of Industry, Energy and Fuel Resources of the Kyrgyz Republic, Bishkek, 2008.

Over the past ten years, tariff policy for electricity and heat was mostly based on political considerations, taking into account low per capita income levels.

In 2006, the National Agency for Antimonopoly Policy and Promotion of Competition with the assistance of the World Bank (WB) developed and put before the Kyrgyz government a draft Medium-Term Tariff Policy for Electricity for 2007-2010, which proposed a gradual increase in electricity tariffs to cost recovery levels (CRT), but the draft was rejected.

As a result of public administration reforms, the functions of regulating the development of the power industry passed to the newly formed State Department for Fuel and Energy Complex. A new Medium-Term Tariff Policy for 2008-2011 (MTTP) provided for a phased increase in tariffs enabling energy companies to recover costs incurred in the generation, transmission and distribution of electricity to consumers.[5]

However, tariffs were raised only from 1 January, 2009, with targeted social assistance (subsidies) to low-income consumers through government social protection programs for underprivileged groups of the population and social security beneficiaries.

Meanwhile, it is necessary to determine the cost recovery level to which tariffs should be raised: without an effort to reduce energy company costs, they will increase every year. Moreover, tariffs should be planned with due regard for inflation. Russia's Federal Energy Commission, for example, set a lower and upper limit on electricity tariffs for each Federation entity for a term of three years (2004-2006); for the country as a whole, the average increase in tariffs should not exceed the expected inflation rate.

Analysis shows that an increase in tariffs according to the aforesaid MTTP drafts in the Kyrgyz Republic could significantly affect the inflation rate in 2008-2011. A study of actual data on household income, inflation and electricity tariffs for 1998-2007, and also of forecasts made in the Country Development Strategy to 2010 (CDS) shows the risks of exceeding the inflation targets.[6]

With an inertial development trend, inflation is not expected to exceed 10%, driven mainly by food prices and service fees. In October 2007, the actual rate of increase in the consumer price index (CPI) was 20.4%; food prices rose by 35.3%, including 80.7% for bread and bakery products, 48.7% for meat and fats, and 25.6% for butterfat.

Given such inflation rates and the decline in household income, the Ministry of Economic Development and Trade, the Ministry of Finance and the National Bank of the Kyrgyz Republic took urgent measures to curb inflation and maintain relatively stable economic growth.

According to the Ministry of Economic Development and Trade forecast, average annual inflation in 2007 was expected at 10%, while the growth rate of real household income fell to 9.5% compared to 15.7% in 2006; in 2008, the CPI was expected to increased by 7.5%, and nominal household income, by 9.9%.[7] Consequently, according to the CDS, nominal income growth did not keep pace with inflation, so that real income declined.

Our assessment of the impact of global trends on oil and gas prices and, consequently, on electricity and heat prices in Kyrgyzstan, and also on the country's social and economic development confirms the strong correlation between these prices and macroeconomic indicators.[8]

Today the functions of a regulatory agency in the power industry have passed to the Kyrgyz Energy Ministry's Department for FEC. The Department developed a Medium-Term Tariff Policy for Electricity for 2008-2011 and a document On the Medium-Term Tariff Policy for Thermal Power for 2008-2010, approved by the government of Kyrgyzstan in 2008. They provide for a phased increase in energy tariffs to levels covering the costs of energy companies.[9]

[5] Ibidem.
[6] See: *Strategia razvitia strany na 2009-2011 (SRS-2)*, Ministry of Economic Development and Trade, Bishkek, 2009.
[7] Ibidem.
[8] See: V.M. Kasymova, op. cit.
[9] See: *Srednesrochnaia tarifnaia politika na energonositeli na 2008-2011*.

According to our analysis and to the MTTP for 2008-2011, an increase in tariffs can have a fairly strong impact on inflation. So as not to heighten social tensions, we proposed a gradual increase in electricity rates without a one-time hike: by 12.5% during the first year and 11.5% in subsequent years, broken down by quarter and half-year (see Fig. 10).

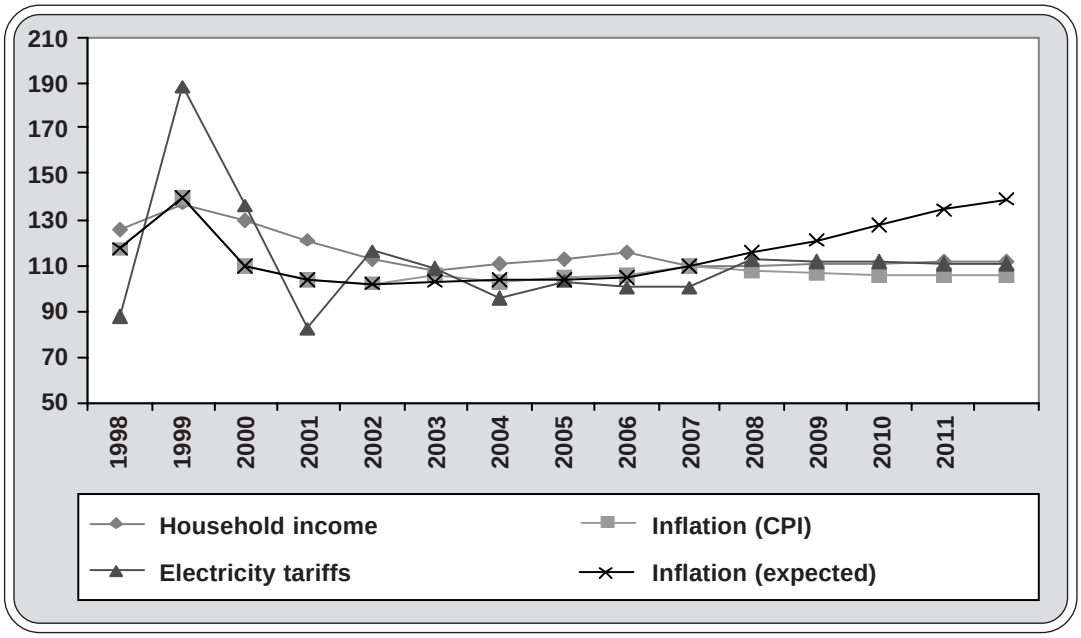
In 2009 (a year late), together with the transition to targeted support of social security recipients and low-income categories, tariffs were raised by 25% at once: from 56 tyins to 70 tyins per kWh; according to the CDS of the Ministry of Economic Development and Trade, from 2009 to 2011 inflation was expected to rise faster than nominal household income (see Fig. 10).

Thus, it is necessary to change the methodology for developing tariff policy and, instead of relying solely on current costs (which should be reduced), to monitor the trends affecting inflation and household income.

The Department for FEC together with the Ministry of Economic Development and Trade, the Ministry of Finance and the National Bank should adjust tariffs annually within the set limits before drafting the republic's state budget for the next three years.

Figure 10

Trends in Growth Rates of Tariffs, Inflation and Household Income in the Kyrgyz Republic



As for energy companies, in the next three years most of them will have to intensify their efforts to reduce costs along the following key lines:

- cutting expenditures on fuel supply to CHP plants;
- reducing energy losses;
- saving on repairs;
- optimizing staff numbers and wages;

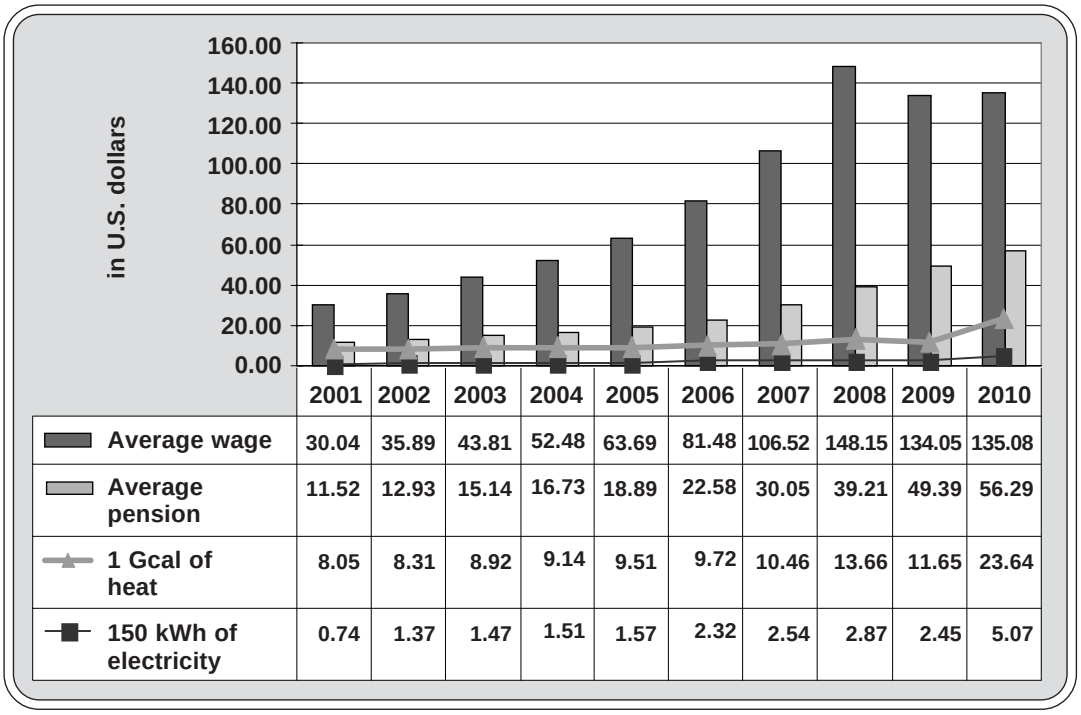
- ensuring more efficient use of materials and inventories;
- disposing of non-core businesses and unprofitable assets.

In November 2009, the State Department for FEC developed a new MTTP for 2010-2012,[10] under which electricity and heating rates were doubled from 1 January, 2010, while hot water rates increased fourfold (see Fig. 11).

Such a tariff hike caused public indignation (despite the allocation of funds for targeted assistance to low-income categories and social security recipients) and ultimately led to a social explosion in all regions of the republic and in Bishkek, with well-known consequences.

Figure 11

Dynamics of Income and Energy Expenses for 2001-2010



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Average wage	30.04	35.89	43.81	52.48	63.69	81.48	106.52	148.15	134.05	135.08
Average pension	11.52	12.93	15.14	16.73	18.89	22.58	30.05	39.21	49.39	56.29
1 Gcal of heat	8.05	8.31	8.92	9.14	9.51	9.72	10.46	13.66	11.65	23.64
150 kWh of electricity	0.74	1.37	1.47	1.51	1.57	2.32	2.54	2.87	2.45	5.07

The Kyrgyz government proved incapable of implementing a prudent energy policy, deviating from the course towards the financial and economic recovery of energy companies charted by the National Energy Program of the Kyrgyz Republic for 2008-2012.

The main clause of a decree issued by the Interim Government of the Kyrgyz Republic provided for a return to the old tariffs, which will inevitably lead to a prolonged energy crisis in the country.

Due to losses in tariffs (the difference between average billings and average collections), annual losses increased from KGS 174 million in 1997 to KGS 585 million in 2007 and KGS 688 million in 2008. In the event, damage was caused not only to energy companies, but also to the whole na-

[10] See: *Srednesrochnaia tarifnaia politika na energonositeli na 2010-2012*, State Department for Fuel and Energy Complex, Ministry of Industry, Energy and Fuel Resources of the Kyrgyz Republic, Bishkek, 2009.

tional economy in the form of a quasi-fiscal deficit (QFD), which is defined, according to the recommendations of the International Monetary Fund (IMF), as a shortage of funds resulting from a high level of technical and commercial losses, a low cash collection rate, and also from the fact that the tariff does not cover the average costs of electricity generation, transmission, distribution and sale. In 2007, the QFD was KGS 7,065.58 million or 5.1% of GDP, and in 2008, KGS 8,084 million or 4.4% of GDP.

Energy Policy, Top-Priority Projects to End the Energy Crisis and Problems in Their Implementation

Energy policy in Kyrgyzstan is currently implemented in accordance with the Law on the Energy Sector through the development of an energy strategy and a National Energy Program.

Since 1991, the Kyrgyz Republic has been developing an energy strategy and an action program designed to provide the country with energy and energy resources and to enhance its energy security.

For example, in 1992 the government approved the Energy Program of Kyrgyzstan, drafted by a working group under the direction of the minister of economy and finance. It was based on the National Program for Energy Independence of the Republic of Kyrgyzstan put before the government by the Production Association Kyrgyzenergo in 1992. In 1994-1995, in accordance with Government Decree No. 536 of 25 July, 1994, the State Committee for Economy developed a Concept of Energy Policy for the Period to 2000, which was approved and published. But due to the lack of a proper legal and regulatory framework for the operation of the energy sector and the fuel industry coupled with financial difficulties, the measures projected in these two documents were not fully implemented.

In 1998, a National Energy Program for the Period to 2005 was developed in the republic. It was approved by the government but was not considered by parliament, so that in accordance with the Law on the Energy Sector it did not go into effect.

Based on government resolutions No. 71-r of 15 February, 2006 and No. 310-r of 10 June, 2006, a National Energy Program of the Kyrgyz Republic (NEP KR) for 2008-2010 and a strategy for the development of the fuel and energy complex for the period to 2025 were developed in the republic.

The NEP KR was approved by the Kyrgyz government on 13 February 2008 and passed by Jogorku Kenesh (parliament) by its Resolution No. 346 of 24 April, 2008. These documents clearly defined the Program's main goal, objectives and implementation priorities.

The main goal of the strategy was to ensure the country's energy security and energy efficiency of the economy for raising living standards and for the sustainable development of the state.

In order to achieve this goal, the following priorities were set for 2008-2010:

- financial and economic recovery of energy companies;
- reduction in commercial losses by developing and installing an automated system for commercial accounting of energy consumption;
- improvements in tariff policy by minimizing overhead expenses, ensuring cost transparency and switching energy companies to self-financing prices;
- replacement of depreciated capital;
- improvements in FEC management and regulation and in energy company management;

- creation of favorable conditions for attracting foreign investment;
- development and implementation of economic mechanisms for joint use of water and energy resources by CAR states;
- implementation of low-cost measures to save energy in the real sector of the economy and in the household sector;
- introduction of tax breaks for enterprises that enhance energy efficiency in production and increase services to the population;
- development of alternative energy sources (small hydro plants, solar panels in health resort areas, biogas units in rural areas, etc.);
- creation of a market infrastructure for developing the domestic electricity market and increasing exports to neighboring countries.

Long-term priorities (for 2010-2025) were outlined as well:

- capacity additions with due regard for capital intensity in the hydropower sector;
- construction of new supergrids, 500-220 kV substations and low-voltage grids;
- renovation, modernization and maintenance of the technical safety of hydro installations and energy facilities;
- creation of a self-regulating energy-saving system, improvements in regulatory and institutional frameworks;
- wide use of renewable energy sources, minimization of the FEC's negative impact on the environment.

Considering Kyrgyzstan's responsibility as a country that has ratified the Kyoto Protocol, the NEP KR contains proposals for reducing greenhouse gas emissions and outlines the following concrete measures:

- Improvements in the energy efficiency of economic growth and more efficient use of all types of fuel and energy through the implementation of advanced energy-efficient technologies and measures to save fuel and energy resources and reduce their losses.
- Wide use of non-conventional renewable energy sources (NRES) in Kyrgyz territory, primarily in health resort areas and nature reserves, and also in places where conventional energy construction leads to degradation of agricultural lands, pastures and forests.
- Improvements in technological processes and equipment at operating energy facilities, and also at coal, oil and gas enterprises in order to reduce environmental pollution.

The way to end the crisis in Kyrgyzstan's power industry is to achieve the main goal of the NEP KR: *ensure the country's energy security and energy efficiency of the economy*.

A list of energy facilities to be built as a matter of priority (in accordance with the NEP KR)[11] is given in Table 3.

The top-priority projects requiring the largest amount of investment include the construction of Kambarata HPP-1 with an installed capacity of 1,900 MW and HPP-2 with an installed capacity of 360 MW. Their completion will make it possible to use the Toktogul hydrosystem in irrigation mode.

[11] See: *Natsional'naia energeticheskaia programma na 2008-2010 i strategia razvitia TEK na period do 2005 goda*, Ministry of Industry, Energy and Fuel Resources of the Kyrgyz Republic, KSTC Energia, Insan, Bishkek, 2009.

Table 3

Investment Needed to Finance New Construction and Renovation Projects in the Power Industry of the Kyrgyz Republic for 2008-2025

Name	Installed capacity, MW	Construction period	Estimated cost, US$ million	2008-2010	2011-2015	2016-2020	2021-2025
Electric power industry:	New construction						
Kambarata HPP-2	360	2007-2010	280	280			
Kambarata HPP-1	1,900	2011-2020	1,900	–	500	1,400	
Upper Naryn HPP-1, 2, 3	200	2010-2015	220		220		
Ak-Bulun HPP	200	2010-2015	220			220	
Total: 1st scenario		2008-2025	2,620	280	720	1,620	
Sary-Jaz HPP	1,200	2010-2025	1,200			200	1,000
Kara-Keche HPP	1,200	2010-2015	1,200		900	300	
Total: 2nd scenario		2008-2025	5,020	280	1,620	2,120	1,000
Small HPPs	176	2008-2020	290	40	70	80	100
NRES		2008-2020	25	5	10	10	
Total		2008-2020	5,335	325	1,700	2,210	1,100
Renovation							
Bishkek CHP-1	688	2007-2010	50	50			
Uch-Kurgan HPP		2007-2010	15	15			
At-Bashy HPP		2007-2010	10	10			
Kemin Substation with 500 kV transmission lines		2007-2012	250	120	130		
Datka Substation with 220 kV transmission lines	360 km	2007-2012	55	55			

Table 3 (continued)

Name	Installed capacity, MW	Construction period	Estimated cost, US$ million	2008-2010	2011-2015	2016-2020	2021-2025
Power supply to Batken Region		**2007-2010**	**10**	**10**			
Upgrading							
High-voltage transmission lines		**2007-2010**	**60**	**60**			
Electric distribution networks		**2008-2015**	**250**	**80**	**80**	**80**	**90**

Agreements with Russia on the possibility of a soft loan in the amount of $1.7 billion for the construction of Kambarata HPP-1[12] are a great success. In the event of attraction of private investment, it will be possible to build the Upper Naryn and Alabuga HPPs.

It is also necessary to raise $50 million for the rehabilitation of the Bishkek CHP-1 plant, $15 million for the renovation of the Uch-Kurgan HPP, and $10 million for the At-Bashy HPP.

The total amount of investment required to modernize and upgrade electric distribution networks is $310 million. These funds should be used, in the first place, to install electronic meters in order to reduce technical losses and losses from theft.

In addition, it is vitally important for Kyrgyzstan's power system to obtain $290 million for the construction of small hydro plants and about $25 million for the development of solar, biogas and wind power plants.

The Kyrgyz Republic has opportunities to build 92 new small hydro plants with a total capacity of 178 MW and average annual output of up to 1.0 billion kWh of electricity; it is also possible to restore 39 previously existing small HPPs with a total capacity of 22 MW and average annual output of up to 100 kWh. In addition, there are proposals for the construction of seven HPPs on irrigation reservoirs with a total installed capacity of 75 MW and average annual output of about 220 million kWh.

A strategically important problem is that of strengthening Kyrgyzstan's position in the regional electricity and power market; in the forecast period (2010-2025), it is necessary to realize the export opportunities of the republic's hydropower sector to the maximum extent and make a contribution to CAR energy security.

For this purpose, the first thing to do is to restore the scheme for cooperation in exchanging energy resources between Kyrgyzstan, Kazakhstan, Tajikistan and Uzbekistan created within the CAEC framework back in 1998, when the heads of the four states signed intergovernmental agreements on the parallel operation of their power systems in CAPS and on the use of water resources from the Naryn-Syr Darya basin.

[12] See: Law of the Kyrgyz Republic on the Ratification of the Agreement between the Government of the Kyrgyz Republic and the Government of the Russian Federation on the Construction of Kambarata HPP-1, signed in Moscow on 3 February 2009.

When the Kambarata HPPs are eventually put into operation, it will be possible to fully ensure the dual-mode operation of the Lower Naryn cascade; the functioning of the Kambarata HPPs in winter is a big advantage, since the water released from the power plant will accumulate in the Toktogul Reservoir.

Neighboring countries will gain additional benefits if they take part in the construction of Kambarata HPP-1 by establishing an International Water and Energy Consortium. Joint efforts are the only way for CA countries to prevent an eventual energy crisis in the region, as predicted by World Bank experts.[13]

In Lieu of a Conclusion

Electricity and power exports from Kyrgyzstan through Tajikistan and Afghanistan to South Asian countries could eventually become part of interstate activity in the energy sector. This will be possible in the event of the creation of an integrated Trans-Asian Energy System (TAES) under the Special Program for the Economies of Central Asia (SPECA).

Today and in the long term, the most probable participants in integration processes in the hydropower sector and in developing electricity exports from Kyrgyzstan include, along with Russia, such countries as China and Kazakhstan, which have declared their intention to invest in the construction of HPPs in the upper and middle reaches of the Naryn River and on the Sary-Jaz River.

[13] See: *Tsentral'naia Azia na poroge energeticheskogo krizisa*, available at [www.akipress.kg] (information from a World bank report entitled *Lights Out? The Outlook for Energy in Eastern Europe and the Former Soviet Union*).