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REPORT

**Policy and Institutional Analysis Report
Energy Efficiency in the District Heating
System of Bishkek**

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KYRGYZSTAN

ENERGY EFFICIENCY
IN THE DISTRICT HEATING SYSTEM
OF
BISHKEK

POLICY AND INSTITUTIONAL ANALYSIS

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ACRONYMS AND ABBREVIATIONS

BHSE	Bishkek Heating Systems Enterprise
b/d	barrels (of oil) per day
CIS	Commonwealth of Independent States
Gcal	Gigacalorie
IRG	International Resources Group
kg	Kilogram
kWh	Kilowatt hour
m³	cubic meter (of natural gas)
MW	megawatt
NIS	Newly Independent States (of the former Soviet Union)
TES	Thermal Energy Station
USAID	U.S. Agency for International Development

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IRG also would like to thank the U.S. Agency for International Development, New Independent States Task Force, Office of Energy and Infrastructure for coordinating the activities under the Energy Efficiency and Market Reform Project. IRG hopes that the initiatives undertaken in this project will contribute to the economic development of Kyrgyzstan.

EXECUTIVE SUMMARY

After the collapse of the Soviet Union in December 1991, long-standing inter-republic supply arrangements for energy inputs were disrupted, and the economies of the Newly Independent States (NIS) steadily deteriorated. As a result, during the winter of 1991-1992, a number of energy enterprises failed, causing tens of thousands of people to go without heat or electricity for significant periods of time. In order to provide immediate technical assistance to alleviate the problem, the United States Agency for International Development (USAID) agreed to fund an initiative to improve the performance and efficiency of selected facilities within the district heating system of Bishkek. International Resources Group, Ltd. (IRG) of Washington, DC was chosen to serve as the contractor to USAID for the *Energy Efficiency and Market Reform Project* in Kyrgyzstan.

The project entailed two components: (a) the technical auditing task was designed to combine in-plant, on-the-job training with the identification and implementation of low-cost or no-cost energy efficiency initiatives, and; (b) the development of recommendations for policy and institutional reforms to enhance energy efficiency management and investment decision-making at the enterprise-level, and to promote the development of national initiatives and legislation which foster energy efficiency. This analysis addresses the second of these tasks.

Energy and Economic Situation

Government decision-making in Kyrgyzstan occurs against the backdrop of severe economic instability. In 1993, industrial output has plummeted by 20-25 percent; hyperinflation, estimated at a rate of 40 percent/month in early 1993, is rampant; ruble devaluation was widespread prior to issuance of a new currency (SOM) in May 1993, and; real worker wages have eroded to the extent that many people now spend their total income on food. There is no reliable, functioning banking or taxation system. Labor discipline is becoming a more serious issue and there is only limited foreign investor interest.

The situation in the energy sector is particularly strained. Kyrgyzstan suffers from near total dependence on energy imports: crude oil and petroleum products are imported from Russia, Kazakhstan and Uzbekistan and natural gas is supplied from Turkmenistan and Uzbekistan. Although there are indigenous resources of coal, fifty-five percent of coal supply is provided by Kazakhstan and Russia, and the domestic coal industry is in crisis with sagging output and rising costs.

Overwhelming foreign dependence has led to skyrocketing prices, frequent supply disruptions, and massive shortages of gasoline, diesel fuel, mazut (heating oil), and natural gas. Despite an overall decrease in energy demand throughout the economy, especially in the industrial sector, the lack of metered electricity consumption has led to rising consumption in the residential and commercial sectors.

Energy Efficiency: The Role of Government

To address these problems, the Government in 1992 drafted a new energy policy whose central components are (1) development of the nation's vast hydroelectric potential, (2) a major commitment to enhanced energy efficiency (through higher prices, installation and utilization of meters, and replacement of outdated fuels burning equipment), and (3) development of renewable resources – solar, biomass and wind.

The *Energy Program of Kyrgyzstan*, developed in 1992 by the Kyrgyz State Energy Company and the Ministry of Economy and Finance embodies these goals, including incorporation of a strong commitment to energy efficiency. The Government estimates that between 33-55 percent of the nation's total current energy consumption could be saved with the effective introduction of energy efficiency measures. To implement this new policy, the Government plans to create an inter-governmental agency to promote energy efficiency policies and programs, assist in the research and development, installation, and procurement of equipment and technologies, and to develop and administer tariff regulations. In addition, there are plans to create an Energy Efficiency Fund financed through the imposition of .5 percent surcharge on all energy sold. Although it is not clear how these surcharges will be collected

when enterprises are already in arrears on payments and unable to pay current bills, the adoption of a National Energy Program and other appropriate government decrees is expected by the end of 1993. The Government has requested assistance from USAID in drafting a these programs.

Energy Pricing

The price setting process in Kyrgyzstan is largely outside the control of Government officials. IRG estimates that 90 percent of the final cost of generating one Gigacalorie (Gcal) of heat is the cost of the fuels burned. Since most of the primary fuels utilized in the generation of steam, heat, and electricity are imported (mazut, natural gas, and to a lesser extent coal), the timing and often magnitude of price increases are in large part dictated by suppliers in Turkmenistan, Uzbekistan, Russia and Kazakhstan. Given the inability to pay for natural gas and mazut, the consumption of electric power and thermal energy in the industrial sector has decreased sharply.

The Government has made a deliberate decision to raise thermal and electricity tariffs on industrial customers at a faster pace and to higher levels than on residential and commercial consumers in an effort to continue subsidies for households, thus cushioning the impact of rising prices on the average consumer and limiting potential social and political backlash. Tariffs for commercial customers remain lower than industrial tariffs owing to the fact that most public buildings are state-owned institutions or facilities and traditionally have been entitled to subsidized services from all utilities.

Despite increases in all consumer categories, tariffs for thermal energy and electricity remain well below production costs and even below the costs of primary fuels. Although industrial customers are increasingly recognizing the importance of energy efficiency owing to higher energy costs, there is an urgent need to raise all tariffs, especially in the commercial and residential sectors, to provide market incentives for investments to improve the rational and efficient use of energy. Finally, the policy of virtually free energy service to state-owned institutions and public buildings needs to be ended as soon as possible.

Financing and Foreign Investment

Prospects for financing projects to improve energy efficiency are not promising. Tariffs are insufficient to provide the necessary capital to finance such activities from internally generated capital, and loans from commercial banks have prohibitive interest rates. In addition, there is a 20 percent value added tax (VAT) and other import duties, both of which raise the price of imports of energy efficiency equipment. There are no government programs such as grants for technology demonstration or audits, subsidized interest loans, loan guarantees, or tax-related incentives for energy efficiency investments. However, as indicated, legislation is being developed incorporating some of these financing mechanisms.

There are severe constraints to significant foreign investment: Kyrgyzstan is remote from the rest of the world and landlocked; the ruble remains non-convertible, and; the ability to repatriate profits is uncertain. Despite the obstacles, there are considerable opportunities for foreign participation. A joint venture law with clear guidelines and documentation requirements has been established. Joint ventures for the supply and/or manufacture of meters and other energy efficiency instrumentation and equipment holds considerable promise for the foreign investor, and has generated much interest in Kyrgyzstan. In addition, there is a strong commitment to liberalization and privatization of the economy by President Akayev.

Energy Efficiency in the District Heating System

The system as a whole is inefficient; government ownership, energy price subsidies, and centralized planning and control have, on the institutional level, resulted in a general lack of concern for the significance of energy efficiency. In addition, many enterprise managers are unaware of their real costs given the fluidity of the economy (ie., constantly changing prices, inflation, and exchange rates). Moreover, inadequate and/or lack of modern equipment and systems allows tremendous scope for energy savings through installation of modern instrumentation and controls. The IRG Audit Team estimated that on the production side alone, there is the potential to achieve savings as high as 20 percent, and on the demand side, the removal of energy price subsidies together with the institution of rational billing can yield energy savings of 30 percent.

There is a need to upgrade the skills of plant management in cost accounting procedures, business management, and the economic and financial evaluation of potential projects, including training in concepts such as return on investment, net present value and discounted cash flow. In addition, there is also a need to create formal energy management teams and to increase awareness of energy efficiency in all district heating facilities as well as in all other industrial enterprises. The lack of an indigenous energy efficiency industry and other organizations which provide services also limits the promotion and widespread adoption of energy efficiency equipment and practices.

Recommendations

It is clear that as long as thermal energy and electricity prices remain subsidized, there will be little incentive for energy efficiency. Thus, there is a pressing need for the continued removal of energy price subsidies.

The Government needs to examine the viability of implementing various financial incentives for energy efficiency, specifically: (a) reduction or elimination of the VAT and other duties on imports of energy efficiency equipment; (b) granting of priority access to foreign exchange for industries making efficiency investments; (c) various funding programs such as grants/no-risk loans, subsidized interest loans, loan guarantees, or revolving credit funds, and; (d) tax-related incentives.

Experience in other countries indicates that one of the most important ingredients in promoting energy conservation and implementing a successful national program is a demonstrated commitment at the highest political levels of government. Legislation and regulations should be enacted and enforced under a coordinated national energy plan, administered by a separate governmental energy efficiency institution. Specific policies include mandatory energy efficiency standards and regulations for enterprises; energy efficiency labeling and standards for energy-using equipment such as electric motors, HVAC systems, boilers, and household appliances, and; energy efficiency building codes.

At the plant-level, enterprises should develop incentives and awareness-building programs to promote worker productivity and improve overall energy efficiency. In addition, greater decision-making autonomy will assist in the move toward operating as profit- and market-oriented businesses. Continued decision-making decentralization is required to increase in-house energy efficiency capabilities at all levels. Also, there is a strong need to establish training programs for enterprise managers in the technical aspects of energy efficiency improvement, the basics of business management, and free market principles.

A massive influx of equipment and technology is required to assist individual enterprises to rebuild and become competitive. Most energy efficiency technologies/practices are inadequate or simply absent. Equipment needed includes small-scale, low-cost, no-cost, fast payback instrumentation and control systems such as, microprocessors, gas analyzers, flow meters, flue gas oxygen analyzers, heat meters and thermostatic controls, automated PC-based control and monitoring systems, infrared and contact thermometers, and pipeline insulation. Rational billing systems and steam traps are other examples of systems/technologies which can be inexpensively and quickly implemented with fast paybacks.

Finally, there is the need to develop a domestic energy efficiency industry. The Government and USAID should encourage the creation of joint ventures between U.S. firms and Kyrgyz enterprises, whether to form an energy efficiency company to provide services, training and market support, and promote private sector investment, or to establish a joint manufacturing capability.

INTRODUCTION

In the aftermath of the collapse of the Soviet Union, the former republics are faced with a host of problems in the energy sector, which historically has been plagued by inefficiencies resulting from subsidized energy prices, lack of instrumentation and control for energy inputs, lack of investment, and the overall aging of the energy infrastructure. During the past few years this situation has been aggravated by steadily deteriorating economic conditions, resulting in decreased industrial output. Moreover, with the dissolution of the Soviet Union, long-standing inter-republic supply arrangements for energy inputs have been disrupted, leading to production and distribution bottlenecks in the process of procuring raw material inputs (especially coal and natural gas) for electricity and heat generation. Simultaneously, it has become necessary for most republics to pay for energy supplies with scarce hard currency or through barter. As a result of these developments, during the winter of 1991-1992, a number of energy enterprises failed, causing tens of thousands of people to go without heat or electricity for significant periods of time.

Project Origin and Rationale

Recognizing the critical nature of the energy problems confronting the NIS, the Energy Working Group of the Washington Coordinating Conference of January 1992 developed an action plan for addressing the energy problems of these now sovereign countries. The Coordinating Conference was a meeting of representatives from over 50 countries and international donor organizations to develop an assistance plan for the region. As part of this plan, USAID agreed to fund a technical assistance initiative designed to improve the performance and efficiency of selected district heating systems in the NIS. This initiative is the *Energy Efficiency and Market Reform Project*.

In each newly independent state, one or two district heating networks were selected as target systems for audits. Systems were selected on the basis of potential for significant energy savings, the applicability of results to similar plants in the NIS, and the importance of the system

in the overall context of the country's economic development.

Project Description

International Resources Group, Ltd. (IRG) of Washington, DC was chosen to serve as the contractor to USAID for the *Energy Efficiency and Market Reform Project* in Kyrgyzstan. The IRG Audit Team visited the Republic of Kyrgyzstan in March 1992 to discuss energy-related needs with development officials, and to develop the scope of the project, which is the initial energy activity under the new U.S. Economic Assistance Program for the Commonwealth of Independent States (CIS).

In Kyrgyzstan, the IRG Audit Team chose to audit the Bishkek Heating Systems Enterprise (BHSE), the Bishkek Thermal Energy Station #1 (TES-1), and selected end-use facilities. The technical auditing phase of the project is designed to combine in-plant, on-the-job training with the identification and implementation of low-cost or no-cost energy efficiency initiatives. The specific goals of this phase are to:

- 1) foster improved management of energy use in the heating plants by identifying and implementing cost effective "low-cost/no-cost" energy efficiency improvements;
- 2) transfer energy auditing and management techniques including financial and technical analysis techniques;
- 3) provide equipment support to implement low-cost options, improve monitoring and energy management; and
- 4) identify additional energy efficiency opportunities.

This project also includes a Policy and Institutional Analysis component, which is the subject of this report. It seeks to:

- 1) describe the role of government entities, including district heating organizations, in influencing the investment decision-making process for energy efficiency;
- 2) review possible reforms under consideration;
- 3) examine management and investment decision-making practices for energy efficiency at the enterprise and plant-level; and,
- 4) identify options for enhancing energy efficiency management and investment climate at the national and plant levels.

I. BACKGROUND: THE ENERGY SECTOR

In late November 1992 the President of Kyrgyzstan, Mr. Askar Akayev, characterized the economy of his country as catastrophic, warning that the situation will worsen in 1993. The economy of Kyrgyzstan is in rapid decline with industrial output likely to fall 20-25 percent in 1993. Inflation, imported from Russia, is at hyperinflation levels, and although salaries have increased substantially, in real terms the average worker is faced with declining purchasing power, to the extent that perhaps as much as all of monthly income must be spent on food, and even that may not be sufficient. There is no reliable banking or taxation system and labor discipline continues to decline.

The situation in the energy sector is particularly strained. In the past, the availability of cheap (subsidized) energy from the Soviet Union, in whatever amounts were required, resulted in a focus on increased industrial output with little concern for energy conservation and efficiency. In the years prior to 1990, the supply of fuels and energy in Kyrgyzstan increased 2-3 percent annually, and the consumption of fuels and energy grew at a similar rate. This of course led to high rates of consumption of energy per unit of national income, which continues unabated.

<u>YEAR</u>	<u>KG OF STANDARD FUEL/RUBLE OF OUTPUT¹</u>
1990	1.193
1992	1.355
1993 (est.)	1.650

In the period 1990-1992, the energy situation in Kyrgyzstan steadily deteriorated (See TABLE 1). Energy production, imports and exports, and consumption all decreased reflecting the decline in industrial activity and higher prices for heat, petroleum products and electric power.

¹ *The Energy Program of Kyrgyzstan, 1992.* Prepared by the Ministry of Economy and Finance and the Kyrgyz State Energy Company.

TABLE 1
KYRGYZSTAN ENERGY BALANCE²
1990-1992

<u>Item</u>	<u>Unit of Measure</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1992</u> <u>As % of</u> <u>1990</u>	<u>1992</u> <u>As % of</u> <u>1991</u>
<u>Total Consumption</u>	Thousand tons of standard fuel	12,446	11,714	10,249	82.3	87.5
<u>Energy</u>						
Of which:						
Electric power	Million kWh	9,257	9,762	9,760	105.4	100.0
Fuel	Thousand tons of standard fuel	9,437	8,541	7,077	75.0	82.9
Of Fuel:						
Coal	Thousand tons	4,880	4,400	4,300	88.1	97.7
Natural gas	Million cu. meters	2,136	2,214	1,947	92.1	87.9
LPG	Thousand tons	118	125	80	68.1	64.3
Mazut	"	1,006	887	570	56.7	64.3
Diesel fuels	"	599	562	390	65.1	69.4
Motor gasoline	"	707	566	370	52.3	65.4
Jet fuel	"	116	105	60	51.4	57.1
Other pet. products	"	247	265	80	32.4	30.2
<u>Production of</u>	Thousand tons of standard fuel					
<u>Energy, Total</u>		6,878	6,943	5,805	84.4	83.6
Of which:						
Electric power	Million kWh	13,235	14,055	12,140	91.7	86.4
Coal	Thousand tons	3,742	3,483	2,250	60.1	64.6
Crude oil	"	155	143	125	80.6	87.7
Natural gas	Million cu. meters	96	70	68	70.9	96.3
<u>Imports of</u>	Thousand tons of standard fuel					
<u>Energy, Total</u>		9,161	8,754	7,269	79.3	83.0
Of which:						
Electric power	Million kWh	3,220	4,123	3,600	111.7	87.3
Coal	Thousand tons	2,840	2,157	2,800	98.6	129.8
Natural gas	Million cu. meters	2,040	2,144	1,879	92.1	87.6
LPG	Thousand tons	118	125	80	68.1	64.3
Petroleum products	"	2,675	2,385	1,470	55.0	61.7
<u>Exports of</u>	Thousand tons of standard fuel					
<u>Energy, Total</u>		3,593	3,983	2,825	78.6	70.9
Of which:						
Electric power	Million kWh	7,198	8,416	5,980	83.1	71.1
Coal	Thousand tons	1,720	1,740	1,170	68.0	67.2
Crude oil	"	155	143	125	80.6	87.7

² The Energy Program of Kyrgyzstan, 1992.

As a member of the Soviet Union, Kyrgyzstan was overwhelmingly dependent on imports of energy. There are no refineries in the country and all petroleum products are brought in from Russia, Kazakhstan, and Uzbekistan. Natural gas is supplied primarily from Turkmenistan and Uzbekistan and, although there are domestic reserves of coal, imports from Russia and Kazakhstan account for 55 percent of total supply.

Thus, in the aftermath of independence Kyrgyzstan has found itself extremely vulnerable to the vagaries of external forces. As the winter of 1992-93 approached, supplies of gasoline (imports) were running just 56 percent of the previous year's level, while imports of diesel fuel were off about 51 percent, and those of mazut (heating oil) were down 66 percent. The main supplier of petroleum products, Russia, has indicated that exports to Kyrgyzstan will be cut in half in 1993 because of its own reduced oil production.

In order to enhance energy self-sufficiency, priority has been given to the development of significant indigenous hydropower resources and to the introduction of energy efficient equipment. Moreover, *authorities are very aware of the need to reduce energy consumption through a combination of higher prices, the installation and utilization of meters, and the replacement, to the extent possible, of out-dated fuels-burning equipment.* Extensive studies conducted by Kyrgyz energy authorities reveal that there is a potential for energy savings (electric power, heat and boiler-furnace fuel) approaching perhaps as much as one-third of present consumption levels.

In addition to untapped hydropower potential, Kyrgyzstan offers reasonable opportunities for the use of renewable sources of energy – solar, wind and biomass. The prospects for solar energy appear particularly good, owing to an estimated 3,000 hours of sunlight per year. Yet, the development of renewable energy sources is not likely to make a significant contribution to the energy mix of the country in this decade.³

³ Nevertheless, President Akayev has established an independent business project whose purpose is to assure the large-scale introduction of new techniques and technology for encouraging the use of renewable energy.

The following is a brief description of the energy sector in Kyrgyzstan.

A. Electric Power

There are 20 electric power generating units within the electricity network of Kyrgyzstan, of which 18 are hydropower and the remaining two stations provide heat and power to the cities of Bishkek and Osh, burning combinations of coal, mazut and natural gas. Annex A presents an overview of the electricity sector in Kyrgyzstan.

The consumption of electric power has risen 5.4 percent since 1990, owing principally to heavily subsidized tariffs for residential and agricultural consumers and the absence of metered consumption, both of which remove any incentive for efficient energy use. Not surprisingly, residential electricity demand has risen sharply, resulting in distribution bottlenecks. On the other hand, industrial consumption of electric power has decreased in 1992, both in absolute and relative terms, as a result of the decline in industrial output and rising tariffs (See Section II-A). The electric power industry is the only branch of the energy sector which is capable of meeting all domestic requirements while providing a reasonable export potential. Substantial exports of power to other Central Asian countries continue and electricity sales abroad should grow as sales to China are developed. However, overall Kyrgyzstan remains a net energy importer.

Hydropower

Clearly, utilization of the country's tremendous hydropower potential represents the best - and possibly only - prospect for future energy security. Currently, only 9 percent of the estimated hydropower potential in Kyrgyzstan has been developed. In 1992, hydropower provided more than three-quarters of total electricity supply, with the largest station, the Toktogul facility, scheduled to provide 4,860 million kWh in 1992, or slightly more than 40 percent of the nation's total supply of electric power.⁴

⁴ In contrast, the scheduled 1992 output of electric power of TES-1 was expected to be roughly half that of Toktogul.

Not only could increased utilization of hydropower resources enhance Kyrgyzstan's energy self-sufficiency, but it also could replace a substantial amount of power currently generated at its thermal stations. In addition, the economics of hydropower generation appear very favorable relative to thermal generation. An examination of the comparative costs of thermal and hydroelectric power generation in Kyrgyzstan, conducted by Kyrgyz energy authorities, vividly demonstrates the cost advantages of using hydro resources (See TABLE 2). Moreover, the costs of generating electric power at the two thermal power stations can be expected to remain extremely volatile owing to the rising costs of primary fuels (See Section II-A).

TABLE 2
COMPARATIVE COSTS OF ELECTRIC POWER GENERATION⁵

	<u>Kopecks/kWh*</u>
Average for system	54.33
Of which:	
Fuel	45.2
Operating costs	2.9
Overhead	2.2
Other	3.0
 Average cost of power generation by hydropower stations	 8**
 Average cost of power generation by thermal power stations	 92

* There are 100 kopecks/ruble.

** A range of 5 to 7 kopecks per 1 kWh was also quoted for hydropower stations.

⁵ Source: *The Energy Program of Kyrgyzstan*, 1992.

fallen even more sharply in relative terms. For the country as a whole, Kyrgyz authorities look to a deficit in petroleum product supply of 1 million tons (20,000 b/d), a very severe deficit when considering that consumption of all products in 1992 is likely to be less than 1.5 million tons (or about 30,000 b/d). Shortages are expected to be especially severe for motor gasoline and residual fuel oil.

Kyrgyzstan hopes to attract foreign investment capital and advanced technology to improve oil recovery levels and to expand the search for new supplies. At best, however, authorities look to stabilize crude oil production at around 135,000 metric tons per year (or approximately 2,700 barrels per day), still far short of domestic requirements.

Domestic production of natural gas in Kyrgyzstan plays only a small role in meeting annual requirements (See Annex C). Gas is supplied to the northern portion of the Republic, particularly to Bishkek, via the Bukhara (Uzbek)-Tashkent-Bishkek-Almaty gas pipeline, completed in 1970. Over the years, the demand for gas along the route of the line has continued growing to the extent that the carrying capacity of the pipeline has become inadequate. Construction of a second section began in 1989, as well as reconstruction of compressor stations at Dzhambul and Sokuluk. It is projected that the Kyrgyz portion of the new pipeline will be completed in 1993. Gas to the southern region of the Republic arrives from Turkmenistan and Uzbekistan.

Consumption of natural gas by the two thermal power stations and in the industrial sector accounts for 80 percent of total consumption. However, natural gas demand is declining owing to foreign suppliers sharply raising prices and requesting payment in hard currency, as well as to the decrease in industrial output. Thus, the very high reliance on imports places Kyrgyzstan in a very vulnerable position. It simply does not have the financial means to meet the rising costs of natural gas, a situation complicated by the political unwillingness of the government to raise heat and electricity tariffs for residential, commercial, and agricultural consumers to cover these higher primary fuel costs.

II. ENERGY EFFICIENCY: ROLE OF THE GOVERNMENT

Although as of the date of this report the Government has not established a formal national energy policy, Kyrgyz energy officials have expressed a strong commitment to energy efficiency. Senior government policy-makers recognize that specific mechanisms to promote the rational use of energy need to be developed and many of these incentives and legislative tools already have been outlined in the *Energy Program of Kyrgyzstan*, prepared by the State Energy Company and the Ministry of Economy and Finance in 1992. The *Program* estimates that 33-55 percent of total current energy consumption can be saved through energy conservation.

Plans call for the establishment of an inter-governmental agency which will develop and implement energy efficiency policies and programs, promote and install new equipment and technologies, and develop and administer tariff regulations. Within this agency an energy efficiency fund will be established, which will collect a .5 percent surcharge from enterprises on all energy sold. This fund will be operated under the Ministry of Economy and Finance and will be used to implement national energy efficiency programs, including the promotion of new energy technologies. One potential problem with this fund is that if most enterprises are already in arrears for payment on energy purchases, how can these entities afford an additional surcharge?

The *Energy Program of Kyrgyzstan* states "...the government must pass legislation to promote more efficient use of energy resources by means of economic, legal, and administrative regulations and other measures." Indeed, the government has considered in detail a broad-based program of specific policies designed to encourage energy efficiency. These include economic, administrative and organizational measures such as a system of fines, tax exemptions, grants, and the implementation of energy standards. The adoption of a National Energy Program and other appropriate government decrees is expected by the end of 1993. The Government has requested assistance from USAID in drafting this legislation.

A. Pricing

In a free market environment energy pricing is the primary force that encourages producers and consumers to use energy efficiently. Energy prices should reflect the full costs of extraction, production/conversion, transportation and distribution, including the cost of capital for additional supplies of energy. Officially, the Government is committed to the gradual liberalization of all prices but, as discussed in this section, higher prices still do not cover costs and/or are too substantial a burden on consumers.

Tariffs for electric power, heat, and steam in Kyrgyzstan are set by the Committee on Prices and Tariffs.⁶ The Planning and Economics Department of the Kyrgyz State Energy Company develops estimates of tariff changes, which generally reflect the rising cost of fuels consumed in the generation of heat and electric power, as well as other costs such as labor, construction and spare parts. These tariff change recommendations are then sent for review/approval to the Committee on Prices and Tariffs. At the higher levels of government review, however, the social and political ramifications of higher prices result in the setting of tariffs below costs in order to protect the household consumer.

To a large degree, however, this price setting process in Kyrgyzstan is outside the control of Government officials. IRG estimates that for the Bishkek Heating Systems Enterprise, 90 percent of the final cost of generating one Gigacalorie (Gcal) of heat is the cost of the fuels burned, and 10 percent is other, mainly labor, costs. Since most of the primary fuels utilized in the generation of steam, heat, and electricity are imported (mazut, natural gas, and to a lesser extent coal), the timing and often magnitude of price increases are in large part dictated by outside forces and this has led to dramatic changes in the consumption of primary fuels in the district heating system (See TABLE 3). The relative shares of natural gas and mazut consumed in the generation of electric power and thermal energy have fallen, primarily owing to their reduced availability. Turkmenistan and Uzbekistan, suppliers of natural gas, have raised prices sharply and would prefer to market their gas elsewhere for hard currency. Russia is

⁶ The organizational structure of the district heating system is discussed in Section III-A.

encountering very serious difficulties in maintaining its crude oil production and in turn has curtailed supplies of mazut.

TABLE 3
TES-1: FUEL CONSUMED⁷

<u>Fuel</u>	<u>Percent of Total</u>	
	<u>1990</u>	<u>1992</u>
Coal	20	50
Natural Gas	60	40
Mazut	20	10
Total	100	100

A brief review of recent price changes reveals the vulnerability of Kyrgyzstan to price changes dictated by external suppliers. The increases in the price of coal to consumers indicated in TABLE 4 result from price changes within Russia. The dominant role of Moscow, a supplier of energy not only to Kyrgyzstan but also to all other former republics, results in internal price rises in Russia affecting the internal price structure elsewhere.

Prices for imported natural gas also have risen sharply. In 1989, Kyrgyzstan purchased natural gas from Turkmenistan for 20 rubles/1,000 m³. In late 1992, the cost rose to 10,000-12,000 rubles/1,000 m³, and as of May 1993 the cost was estimated at 38,000 rubles/1000 m³. This assumes that the gas is available. Turkmenistan, in seeking to maximize the profitability of its gas sales and earnings of hard currency, is turning increasingly to Western markets. It sees no advantage in selling natural gas to Kyrgyzstan at prices below world market levels and with payment in rubles or in kind.

⁷ Source: BHSE

TABLE 4
COAL PRICES*

<u>Date</u>	<u>Rubles/Metric Ton</u>
1 January 1992	47
10 July 1992	1,400
10 October 1992	2,800
1 January 1993	4,500

* Source: BHSE. Final consumer delivery prices.

Kyrgyzstan not only suffers from sharp price increases in primary fuels from neighboring countries, but also from what it perceives as unfair pricing practices. In May 1993 Kazakhstan was selling coal to domestic power plants at an estimated 1,000 rubles/ton but the price to Kyrgyz importers was 12,000-18,000 rubles/ton. A similar problem exists with gas suppliers: Uzbekistan is providing gas to its domestic consumers at 500 rubles/1,000 m³ while the import price for Kyrgyzstan is 38,000 rubles/1,000 m³.

Heat Tariffs

Tariffs for thermal energy were raised three times in 1992 and once thus far in early 1993 (See TABLE 5 and FIGURE 1). It is clear that eventually moving to prices based on long-run marginal costs is important to the district heating sector if it is to attract needed investment in modernization and supply expansion. However, given the severe impact that economic instability and rising prices are having on the average citizen, political considerations in the setting of prices remain dominant.

Thus, the industrial sector, accounting for 42 percent of thermal energy consumed, assumed the major burden of tariff increases in July 1992 and April 1993. Residential and commercial consumers have been favored with increases at levels below those imposed on industrial enterprises. The Government has made a deliberate decision to raise heat tariffs on industrial customers at a faster pace and to higher levels than on residential and commercial consumers in an effort to continue subsidies for households and to maximize revenues. Thus,

in April 1993 the industrial consumer was paying 9550 rubles/Gcal, up from only 12 rubles/Gcal in 1991. Tariffs for commercial customers remain lower than industrial tariffs owing to the fact that most public buildings are state-owned institutions or facilities and traditionally have been entitled to subsidized services from all utilities.

TABLE 5

HEAT TARIFFS FOR BISHKEK*
1991 - April 1993

		Rubles/Gigacalorie				
<u>CONSUMER^o</u>	<u>Percent of Total Heat Consumed</u>	<u>1991</u>	<u>Jan 92</u>	<u>Mar 92</u>	<u>July 92</u>	<u>Apr 93</u>
Industrial	44	12	102	268	824	9550
Commercial	25	12	12	12	50	5421
Residential	31	3	3	3	10	200

Holding tariffs to artificially low levels offers no incentive to the consumer to use heat and steam more efficiently. The higher tariffs for electric power, heat, and steam depressed consumption somewhat in the industrial sector, although the general decline in industrial activity, on the order of 20-25 percent in 1992, has imposed its own dampening influence. However, statistics indicate that consumption of electric power, heat and steam by the favored (subsidized) sectors is rising, in contrast to the general decrease in energy consumption throughout the country.

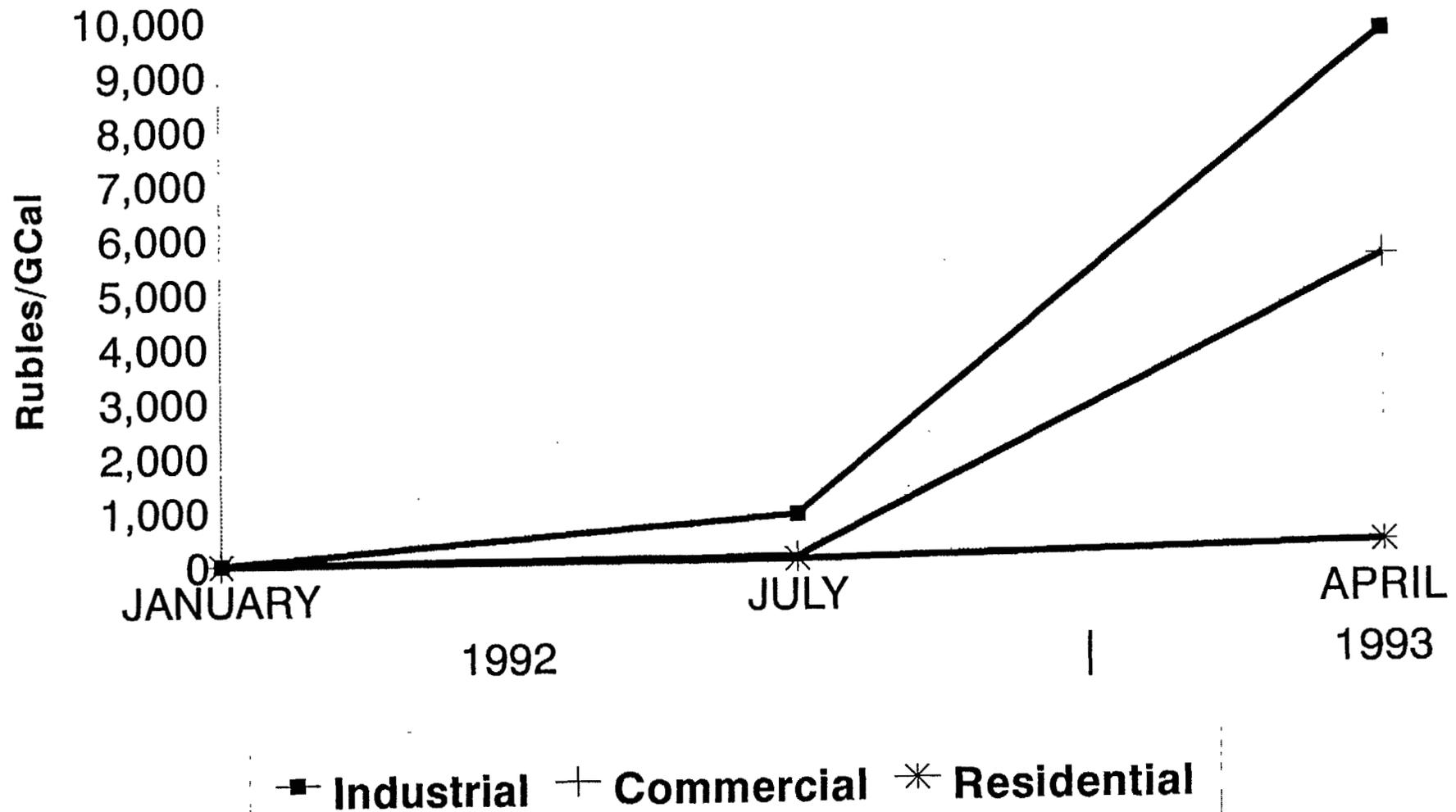
Despite the increases in 1992, it is estimated that tariffs for thermal energy are still below production costs. In December 1992, BHSE estimated that the production costs of thermal

^o Source: Kyrgyz State Energy Company.

^o Commercial consumers include schools, hospitals, institutes, greenhouses, and government consumers. The industrial tariff for steam depends upon its density. For example, in the period July-December 1992, it ranged from 728 rubles/Gcal to 948 rubles/Gcal.

FIGURE 1

BISHKEK Heat Tariffs JANUARY 1992 - APRIL 1993



energy in the district heating system were 1,400 rubles/Gcal, while heat sold at an average price of 636 rubles/Gcal. By May 1993, costs had risen by several times, hyper-inflation approached 40-50 percent/month, and the ruble dramatically decreased in value from 400 rubles/USD in December 1992 to 840 rubles/USD.

Assuming a monthly inflation rate of 25-30 percent in the period December 1992 to March 1993, and 40 percent thereafter, the Government increased thermal energy tariffs sufficiently in April to match inflation, but keeping pace with continually rising costs is problematic as tariff increases in the commercial and residential sectors have not kept pace with the increase in total costs. As might be expected, this has a critical impact on the financial capabilities and profitability of district heating operations (See Section III).

Electricity Tariffs

Tariffs for electric power were increased twice in 1992 and once to date in early 1993 in an effort to maintain partial pace with rising fuel costs. TABLE 6 and FIGURE 2 present the tariffs for electric power by individual consuming sector for 1992 and the first quarter 1993. Industrial consumers carry the major burden while residential customers, especially those in rural areas, are heavily subsidized. Some incentive is allowed for off-peak usage.

Tariffs were substantially increased in July 1992 and April 1993, but not for all categories of customers. In July 1992, there was no change in the tariffs for electric power consumed in the urban and rural residential sectors, as well as for all agricultural consumers. The Government did not wish to impose any additional financial burden on the population, already under stress as wages were falling well behind rapidly rising rates of inflation. Moreover, by holding electric power tariffs constant for consumers engaged in food production, it is hoped that costs passed on to the consumer can be held down. Any rise in the price of basic food items is a politically sensitive issue, and the Government is working hard to maintain internal stability as best it can.

TABLE 6
ELECTRIC POWER TARIFFS FOR BISHKEK¹⁰
Kopecks/kWh*

<u>CONSUMER¹¹</u>	<u>Jan 1992</u>	<u>July 1992</u>	<u>April 1993</u>
Industry	51	173	836
Electrified city transport	12	50	500
Commercial	12	32	381
Agriculture	12	12	496
Urban residential	10	10	150
Rural residential	6	6	120
Heating and hot water supply	20	20	200

* There are 100 kopecks to a ruble.

B. Financing

Prospects for financing projects to improve energy efficiency in district heating operations are very poor. Tariffs are not high enough to provide the necessary new capital, and increases in energy tariffs sufficient in scope not only to cover fuel costs but also to provide income for re-investment are not politically feasible at this time. In addition, customers are unable to pay bills, and banks charge 70-80 percent interest on loans. Although the banking system has come under severe criticism for such practices, a more critical issue is that the banks simply do not have the funds to loan, if there were willing borrowers. When considering that the inflation rate reportedly is averaging 20-30 percent per month, banks' interest rates could be significantly higher in an attempt to match soaring inflation. In addition, Kyrgyzstan may benefit from proposed efforts by Russia's central bank to lower the interest rate charged by its commercial banks. Since interest rates in Kyrgyzstan closely track those in Russia, rates in Kyrgyzstan also could come down.

¹⁰ Source: Kyrgyz State Energy Company.

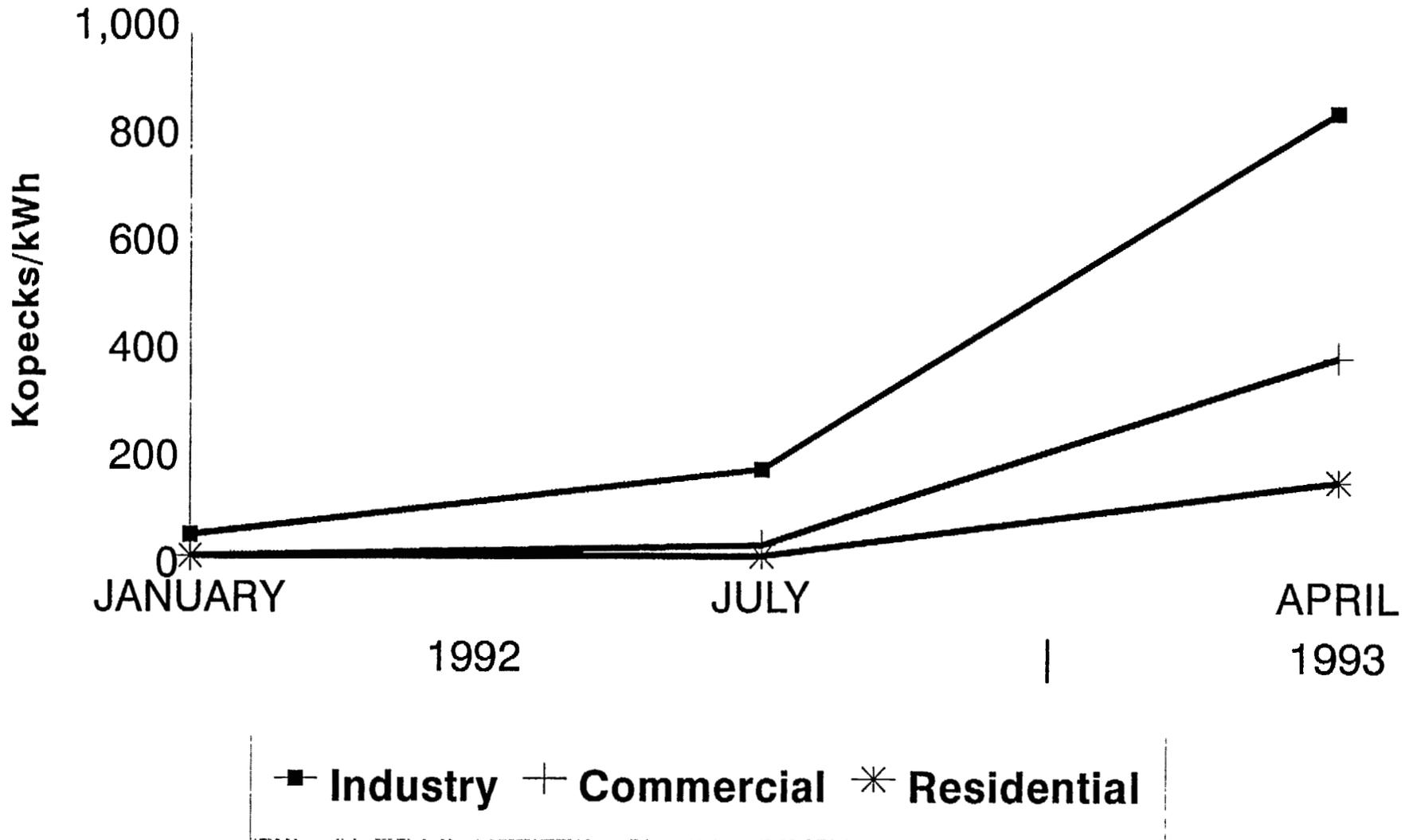
¹¹ Commercial consumers include schools, hospitals, institutes, kindergartens, and utilities for government agencies and the general public. Agriculture consumers include organizations producing milk and milk products, chicken and pig farming, and irrigation facilities. Individual proprietor farms are charged 120 kopecks/kWh as of April 1993. Heating and hot water supply figures are for night-time minimum load usage (11:00 pm to 5:00 am).

FIGURE 2

BISHKEK

Electric Power Tariffs

JANUARY 1992 - APRIL 1993



There is a value added tax (VAT) on imported goods which raises prices to potential buyers of energy efficiency equipment in Kyrgyzstan. Thus, any metering or other controls purchased by Kyrgyz companies from suppliers in Russia or elsewhere would have to pay the VAT. Some relief was granted beginning January 1, 1993 when the VAT was reduced from 28 percent to 20 percent.

Similarly, Kyrgyzstan also imposes import duties on most goods, including energy efficiency equipment. These clearly pose significant physical and financial barriers in obtaining such technology. Import duties or taxes on energy efficiency equipment and instrumentation could be reduced or eliminated, resulting in more efficient energy utilization. The revenue from such duties undoubtedly is limited and the loss of revenue could easily be recouped through conservation and enhanced energy efficiency.

There are no government programs such as grants for technology demonstration or audits, subsidized interest loans, loan guarantees, insurance programs for project technical performance, or revolving credit funds. Currently, there are no tax-related incentives for energy efficiency investments, such as tax credits, tax holidays, performance-based credits, or accelerated depreciation of conservation investments. Conversely, there are no tax-related penalties. However, as indicated, legislation is being developed incorporating some of these financing mechanisms.

Nevertheless, internal financing of projects which would improve the energy efficiency of district heating operations (e.g., the stepped-up repair and maintenance of facilities, the installation of meters to measure the consumption of steam and hot water, the implementation of a computerized billing system) currently does not appear feasible in the short-term. The most likely option at the moment is the continuation and expansion of grants from organizations such as USAID. The use of USAID funding to provide technical assistance resulting in significant energy savings will be extremely important for Kyrgyzstan and other countries like it which depend almost entirely on imported fuels, but payment for such imports represents an intolerable burden on the economy.

C. Prospects for Foreign Investment

Kyrgyzstan, like many of the other newly independent republics of the former Soviet Union, sees its future economic salvation in the encouragement of foreign investment. Despite this attitude, only a few foreign ventures have been established.¹² Progress is being made in laying the foundation for closer economic cooperation between the U.S. and Kyrgyzstan, particularly in the encouragement and protection of investment (See TABLE 7). However, severe constraints to significant U.S. investment remain; Kyrgyzstan is remote from the rest of the world and landlocked, the Ruble remains non-convertible, and the ability to repatriate profits is uncertain (except through barter or the export of raw materials). Thus, Western interest in Kyrgyzstan may be marginal for some time.

TABLE 7

STATUS OF AGREEMENTS: KYRGYZSTAN - U.S.
(as of May 1993)

<u>Agreement</u>	<u>Status</u>
Trade Agreement	Yes
Most Favored Nation Status	Yes
Generalized System of Preferences	No
Overseas Private Investment Corporation	Yes
Export-Import Bank funding available	No
Investment Treaty	Yes

Despite the obstacles, there are considerable opportunities for foreign participation. A joint venture law with clear guidelines and documentation requirements has been established (See Annex D for the *Law on Foreign Investments in the Republic of Kyrgyzstan*). Joint ventures to assist with the development of the country's hydropower and mining potential, as well as for the supply and/or manufacture of meters and other energy efficiency instrumentation and equipment holds considerable promise for the foreign investor. In fact, the *Law on Foreign*

¹² Two foreign joint ventures include: the Canadian corporation, Cameco which, as part of an international cartel, has concluded negotiations regarding development of the Kumtor gold deposit, reportedly the third largest in the former Soviet Union and the seventh largest in the world, in terms of reserves; and the U.S. company Aztec-Talas, Inc. which is conducting 19 oil well workovers.

Investments provides tax exemptions for participation in numerous sectors and activities including the "manufacturing of equipment and devices that decrease air and water pollution." However, how and in what form profits are earned and repatriated is the critical question in any foreign investment. Ruble profits are meaningless for the foreign firm owing to rising inflation and rapidly declining value of the ruble versus the dollar. Some form of guarantee to protect the foreign investor from inflation will be required.

Rubles may be re-invested domestically in the short-run, but eventually the foreign investor will look to repatriate hard currency profits. Until the ruble is fully convertible, this will prove to be difficult on a large scale. A foreign investor may be willing to take his profits out in kind, using commodities which in turn could be exported to hard currency markets – although Kyrgyzstan offers few goods or raw materials for this purpose. In addition, if the foreign investor is engaged in a joint manufacturing venture in Kyrgyzstan, for example, production of meters, he may be willing to take his profits out in kind, through exporting some of the meters to hard currency markets. Article 10 of the *Law on Foreign Investments* specifically allows that "foreign investors can take away profit or part of it as products of their own industry or commodities and services bought on the market." The foreign investor will need to examine carefully any barter payment arrangement, however, especially with regard to transportation costs, infrastructure logistics, and export restrictions and legalities.

One option to compensate foreign investors is to arrange payment in terms of a percentage of energy savings as a result of equipment installation. This provides an incentive to both the supplier and the enterprise to undertake a project which yields concrete energy savings. Payment, however, is still likely to be rubles.

D. Energy Efficiency Labeling and Standards

To ensure that energy-using equipment operates efficiently, it should be subject to design and operating standards. Energy efficiency standards and labeling are most cost-effective for large energy-consuming buildings and equipment. Within the former Soviet Union consumption standards existed for energy-using household appliances such as refrigerators and

televisions and design and operating standards were in place for other equipment. However, it is clear that standards should be increased and enforced to a greater degree and, indeed, building standards (stricter building codes) with minimum thermal efficiency levels and additional efficiency standards for energy-using household appliances are under consideration by the Government.

E. Privatization

President Akayev launched a liberalization drive in October 1990 aimed at initiating free market reforms. This has included a commitment to demonopolize and denationalize industry, as well as to develop mechanisms for privatization. In fact, Kyrgyzstan has moved more rapidly to privatize its economy than its Central Asian neighbors. Privatization began in earnest in 1991 with the transfer of ownership of small enterprises and agricultural lands to the private sector. In addition, a large number of private farms have been established on land rented from the Kyrgyz Government. A National Enterprise Fund has been established to make interest-free loans available to buyers of state-owned enterprises. To facilitate the purchase of housing by private individuals, special accounts have been established.

The general decline of the economy has been a major obstacle to the implementation of the privatization program. As previously indicated, industrial output declined 20 percent in 1992, and agricultural production decreased an alarming 40 percent. These developments, in conjunction with the prospect that privatization often incorporates the closure of unprofitable enterprises, can lead to large-scale unemployment, threatening the viability of the Government's reform program.

Privatization in the energy sector remains an unsettled question. There is no consensus on how to establish the ownership of state-held energy assets, how to value them, and most importantly, whether they should be placed in private hands at all. There is still significant conservative pockets of resistance to reforms throughout the economy, and it is anticipated that the process will require considerable foreign expertise and capital to assist in the process.

Clearly, greater decentralization and managerial autonomy at the enterprise level will promote market-oriented decision-making, and thus enhance the prospect for energy efficiency investments which improve competitiveness and productivity. It remains to be seen, however, how fast this process will move, and indeed if it will include a significant number of high energy consuming enterprises.

III. ENERGY EFFICIENCY IN THE DISTRICT HEATING SYSTEM¹³

The system as a whole is relatively inefficient; government ownership, energy price subsidies, and centralized planning and control have, on the institutional level, resulted in a general lack of concern for the significance of energy efficiency. In addition, there has been little attention paid to individual metering, and billing systems within the Bishkek Heating Systems Enterprise (BHSE) are based on estimation (the average use over the entire district) and subsequently have eliminated any incentive for end-users to implement meaningful energy-conservation measures.

Until 1956, the city's heat was supplied mainly by boiler halls of a number of plants and individual small boiler rooms. In 1956, a new heat and power generation facility (the Bishkek Thermal Energy Station, TES-1) was constructed with a capacity of 50 MW. The steady increase in heat and energy demand led to a total of four lines by 1973 and total electric capacity reached 674 MW. In 1981, designs for a fifth line were started, a 300 meter smoke stack was constructed, and four boilers with a capacity of 2230 metric tonnes each were added. TES-1 primarily uses coal, mazut (fuel oil), and natural gas as fuel sources for heat and power production (See TABLES 8 and 9). Coal and mazut are transported to TES-1 by railway, while natural gas is provided by pipeline.

A. Organizational Structure

Prior to the break-up of the former Soviet Union, all of the energy enterprises of Kyrgyzstan were subordinate to the Soviet Ministry of Electric Power (Minenergo), with Kyrgyzstan's interests represented by Kyrgyzenergo. On the foundations of this organization, and incorporating a number of smaller energy enterprises and scientific-planning institutions, the Kyrgyz State Energy Company was formed after the dissolution of the Soviet Union.

¹³ This report, and particularly this section, draws data, findings, and analyses from the *Kyrgyzstan Audit Report for the Energy Efficiency and Market Reform Project*, prepared by the IRG Audit Team. For a more detailed technical summary of the district heating system, please contact IRG.

TABLE 8¹⁴

**TES-1
AVERAGE FUEL HEATING VALUES**

Fuel	Heating Value (KCal/kg)	Heating Value (Btu/lb)
Coal	3858	6900
Mazut	9530	17179
Natural Gas	8097	903 (Btu/cf)

TABLE 9

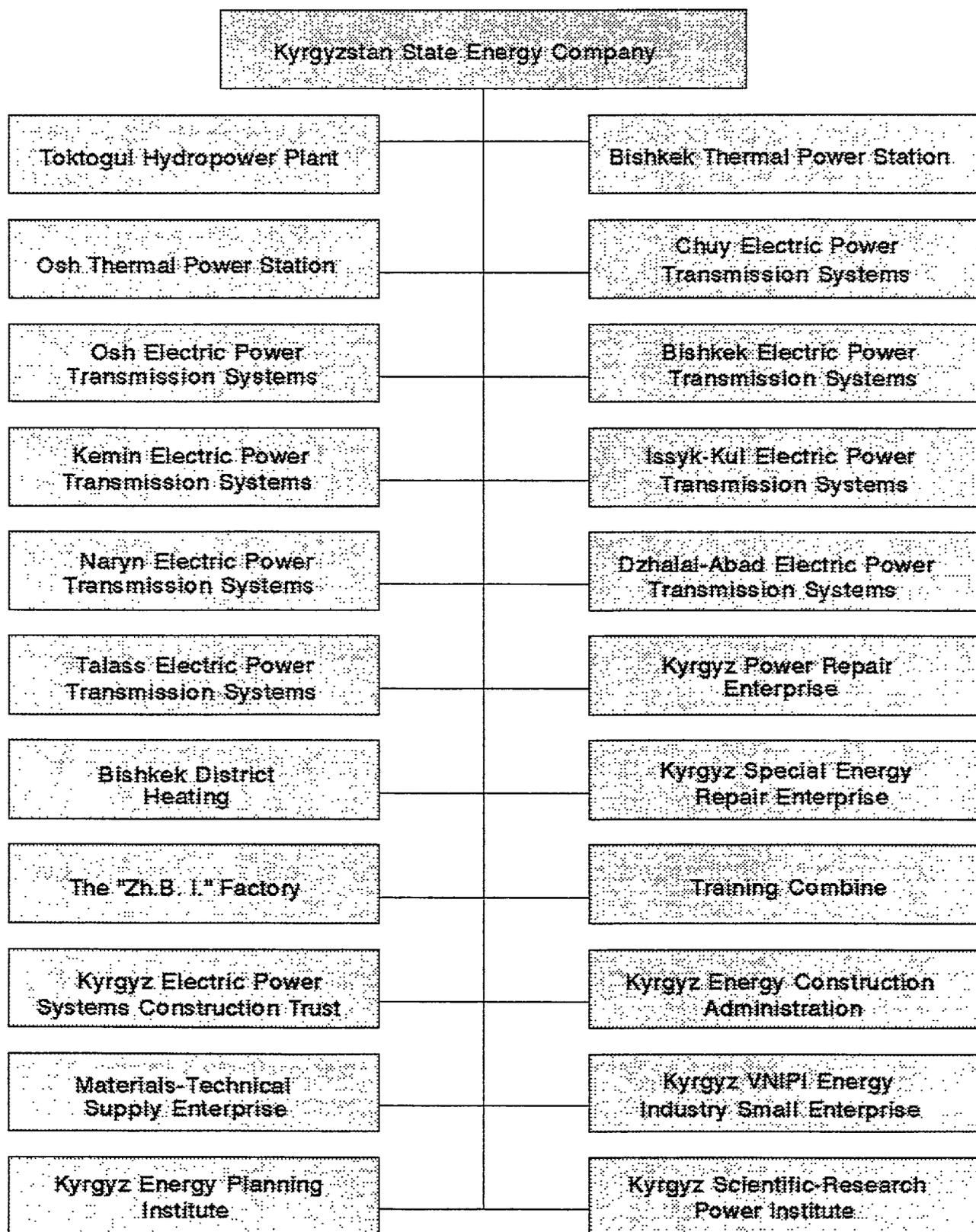
**TES-1 ENERGY PRODUCTION
1991**

Energy Type	Production Level
Electricity	3,685,223 kWh
Thermal Energy - Steam	1,354,000 GCal
Thermal Energy - Hot Water	3,006,000 GCal

In accordance with plans to privatize the economy of the country, the Kyrgyz State Energy Company is slated to be transformed into a joint-stock holding company some time during 1993-1994. The organizations which the Kyrgyz State Energy Company oversees are set out in FIGURE 3. It is thus the parent company of TES-1 and BHSE and oversees the administrative, financial, policy, and technical operation of both of these enterprises. Note that the responsibilities of the State Energy Company cover only electric and thermal power (heat and steam); they do not include coal, natural gas or crude oil.

¹⁴ Source for both Table 8 and 9 is BHSE.

Figure 3



The primary consumer of hot water and steam produced at TES-1 is BHSE. BHSE thus serves as the main distributor for heat and steam produced at TES-1 (See FIGURE 4), but does not have any responsibility for distribution of electricity generated at the station. Operationally TES-1 and BHSE are independent, although the working relationship is by definition very close.

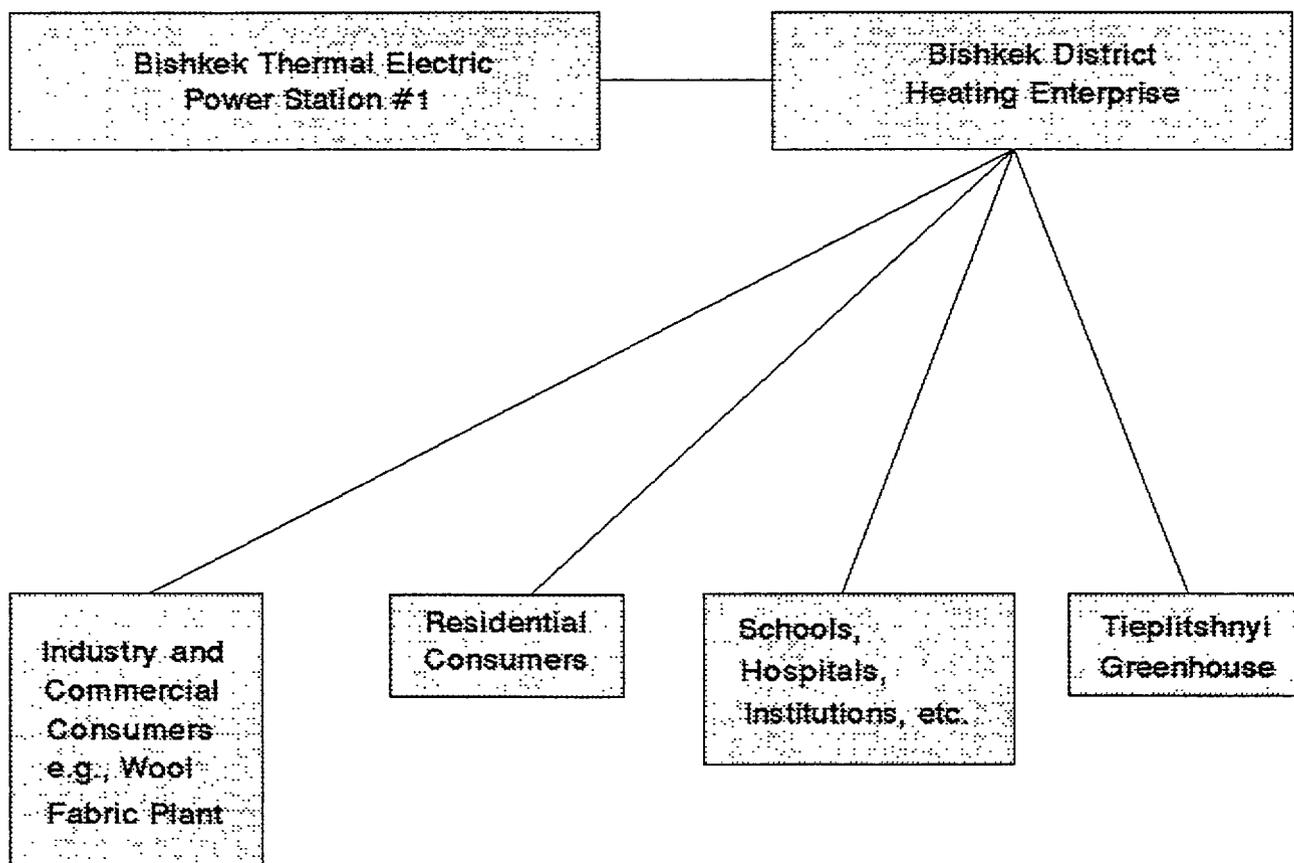
As indicated earlier in TABLE 5, BHSE distributes 42 percent of TES-1's thermal energy production to industrial customers. At present, there are 180 industrial consumers, 70 of which are steam consumers; the balance are hot water consumers.

Approximately 57 percent of the total thermal energy delivered was consumed by the residential and commercial sectors, including dwellings, apartment houses, schools, and institutions, all of which are heavily subsidized by the government. Nearly 395,000 citizens depend on the network for their space heating and domestic hot water needs and the recent load growth in this sector has been 7-9 percent annually.¹⁵ However, as with many industrial facilities, there are no measuring devices to monitor individual heat or hot water consumption.

B. Energy Pricing

Most senior policy makers and enterprise managers recognize the crucial role of higher energy prices in stimulating increased rational use of energy. BHSE managers and the Kyrgyz State Energy Company are beginning to monitor energy use more closely and identify potential energy efficiency investments. Industrial plant managers also now are experiencing the impact of rising steam, heat, and electricity prices. However, rapidly changing price levels (along with inflation, ruble-dollar exchange fluctuation and other factors) are creating a very unstable and uncertain business climate. Many enterprise managers could not identify accurately their energy costs or profit levels owing to the rapidly changing external economic climate.

¹⁵ The population of Bishkek is approximately 680,000 people. The district heating system serves a total floor area for housing of 8.471 million square meters (136 square feet per person). Buildings with one floor account for 30 percent of total buildings, while those with 2-3 floors represent 7 percent, and 63 percent have 4 or more floors.

Figure 4**Bishkek District Heating System**

C. Lack of Adequate Technology and Systems

Most equipment within the system is relatively old. The IRG Audit Team observed few instruments or measuring devices for both supply and end-use measurements. On the end-use side, little individual metering is installed and what exists is in poor condition. Although some instruments exist at consumer receiving stations, few have been used on a regular basis. At the thermal power plant, automatic combustion controls are absent, and pollution monitoring and devices are nonexistent.

The IRG Team concluded that, on the whole, the district heating system severely lacked instrumentation and that its control units must be updated. BHSE has consistently suffered from a lack of replacement parts and there is a very limited budget for upgrading old facilities. Consequently, there is tremendous potential for energy savings in all segments of system operations. On the production side, efficiency improvement resulting from the installation of modern instrumentation and controls has the potential to achieve 20 percent energy savings.

At all levels of the Bishkek district heating system, from suppliers to end-users, the lack of energy metering, control and monitoring equipment was identified as the single largest (technical) impediment to the efficient provision and consumption of energy. Without instruments to monitor and record essential variables such as flow rates, temperatures and pressure, it is difficult to make any accurate balance measurements and conduct energy efficiency analyses on which plant performance can be based.

This problem is particularly severe in the residential and commercial sectors. Few residences or commercial establishments have meters making it virtually impossible to charge consumers for the heat they actually use. Individual apartments do not have thermostats: customers are charged a fixed rate based on the area to be heated rather the amount used.

Energy accounting systems, cash flow management systems, and billing systems are generally not in place or are inadequate. For example, energy billings to customers have primarily been based on estimated averages over the entire population. Government subsidies

and ownership made customers insensitive to such billing. To make customers pay for what and how much they consume, the billing system needs to be overhauled, including the installation of meters and the hiring and training of meter readers. Without a rational billing system in place, it is difficult to implement energy conservation measures. The IRG Audit Team estimated that the removal of energy price subsidies together with the institution of rational billing has the potential to achieve 30 percent energy savings.

D. Planning and Decision-Making

Under the centralized economic system, capital investment decisions were made by the government with more emphasis placed on production capacity and meeting absolute output targets rather than productivity or efficiency. Thus, management lacks an understanding of fundamental free market principles. Most personnel unfamiliar with cost accounting procedures and have not been exposed to analyzing the true cost of energy resources and the market price of thermal energy.

There is a significant void at individual enterprises such as BHSE and end-user industrial facilities in planning, analysis, and general business management skills. There is no experience in strategic planning and thus little understanding of the techniques for evaluating and comparing alternative courses of action. In addition, there is little knowledge of how to conduct economic and financial evaluations of potential energy efficiency projects, incorporating such concepts as return on investment, net present value and discounted cash flow.

Plant management are knowledgeable in the conduct of capital-cost analyses, as indicated by their past emphasis on new construction. However, there is a serious shortage of performance criteria based on operating costs.

E. Energy Efficiency Awareness and Programs

In general, senior personnel in the BHSE system are aware of the benefits of improving energy efficiency and recognize the importance of transferring this awareness to mid- and junior levels. These personnel are acutely aware of the impact of changing price levels and the need

to increase prices to promote greater efficiency in the use of energy. However, while recognizing the political considerations involved in raising prices too rapidly, they understand where the potential for energy efficiency improvements exist, are generally aware of the extent of energy wasted, and are anxious to address specific investment/project ideas. Energy losses in district heating systems are mainly as a result of the following causes:

- water leaks within the system;
- failure to meter usage;
- inadequate insulation;
- throttling of constant speed pumps; and
- excessive pressure drops.

Managers and senior engineers appear to recognize that they must take action to reduce energy costs and increase overall efficiency. An example of this awareness is illustrated by the fact that prior to the April 1992 audit, BHSE had already developed a number of tasks designed to increase the energy and operational efficiency of the system (See Annex E). These plans are scheduled to be initiated in 1993, but shortage of capital may preclude implementation.

It must be noted that this awareness of energy efficiency is in large part owing to the fact the central business of the heating systems entities is the generation and distribution of energy, so that energy problems and the focus on how to utilize energy more rationally and efficiently is a natural, everyday concern of a plant's management. Most of the senior management at BHSE and TES-1 have given a great deal of thought to these issues.

Nevertheless, the supply, distribution and end-use entities of the Bishkek district heating system lack formal energy management (audit) teams and in-house training or other educational efforts aimed at increasing the awareness among staff of the benefits of energy efficiency. Some energy data is collected and energy use is monitored, but the frequency is limited and computer systems to collect and store data are not common. It also appears that any special plant-level programs, such as bonus systems for the implementation of energy savings measures, do not exist. Although senior staff at the district heating organizations recognize the link between improved energy efficiency and a positive impact on the environment, the ability

to factor in environmental costs and to formalize an environmental impact review process is absent.

There is widespread belief among the IRG Team and host-country senior management that one of the most important preconditions for energy efficiency improvement is a change in attitudes and behavior at all levels of enterprises, especially mid- and lower levels. Generally, personnel at these levels are not aware of, or actively involved in, energy efficiency efforts or its benefits. In particular, there is the need to recognize the potential benefit of increased energy efficiency in the supply of hot water and steam, as well as increased efficiency on the demand side, in supplanting the need to construct additional large, new generation and distribution facilities.

BHSE

BHSE personnel do not have the requisite skills to conduct strategic planning, economic or financial analyses of energy conservation investments. There is no formal, computerized system in place to examine energy consumption patterns, collect, store and analyze data. In addition, they lack a primary accounting system.

Senior managers at BHSE outlined several of the critical problems currently confronting the organization. The first major issue is BHSE's financial condition and relationship with its customers. Customers are delaying paying their bills, or in many cases are not paying at all. The decline in economic output and rising prices have severely limited BHSE's customers' ability to pay. In addition, much industrial output traditionally has been provided to Russia and several of the other Republics. However, demand for goods has declined and payment to Kyrgyz suppliers is not reliable. Thus, BHSE's customers themselves are owed money and in turn cannot keep current on its debts to BHSE. It was estimated that customer debt to BHSE at the end of 1992 totaled 150 million Rubles.

BHSE's recourse to address this situation is limited. Authorities can shut off telephones for non-payment of bills, but to shut-off the supply of heat or hot water to a customer for non-

payment, particularly in the winter, is less acceptable. As a result relations between BHSE and its customers have become difficult, and debts owed continue to mount.

Moreover, BHSE's costs continue to rise. In addition to the rising cost of primary fuels already discussed, labor costs are rising (although wages still lag inflation rates). The rising cost of supplies to BHSE make it difficult to perform even routine maintenance and repairs. For example, in 1989 BHSE could purchase one ton of pipe (used in the distribution of steam and/or hot water) for less than 1,000 Rubles. By the end of 1992, one ton of the same pipe costs 50,000 Rubles or more. Not only are suppliers demanding pre-payment, and often in hard currency, but also many of these supplies are located in Russia and other republics, and with the attendant disruption in trade links, the procurement process has become complicated and unreliable.

These factors, together with losses incurred in the manufacture of steam and hot water owing to tariffs not recovering production costs (discussed earlier), result in BHSE operating at a loss. Although managers claim that losses are made up or offset by means of the higher tariffs for heat charged to industrial customers, it is unlikely that current price levels for any end-user actually cover heat and steam production costs. High rates of inflation and rapidly changing costs throughout the economy prevent any precise determination of whether current tariffs are adequate.

A second major problem cited by BHSE senior managers is the lack of metering among its customers. The IRG Audit Team estimates that only about 10 percent of the industrial facilities in Kyrgyzstan are equipped with metering that would enable proper monitoring of energy use. Without knowing how much energy is being consumed, customers have little incentive to rationalize energy utilization.

BHSE also indicated that insufficient generation capacity is a problem, often leading to the inability to supply the quantity of heat contracted with its customers. If temperatures remain average, requirements can be met. If colder-than-normal weather ensues, then difficulties will

arise. This problem was expected to be alleviated somewhat with the commencement of boiler operations at a second Thermal Energy Station (TES-2) in December 1992. However, this station is set-up to use natural gas just at the time when gas supplies from Turkmenistan and Uzbekistan are decreasing in volume and increasing in price. Indeed, these factors led to a forced shutdown of the TES-2 boiler in February 1993.

In fact, according to discussions with BHSE authorities in December 1992, Bishkek really needs a third TES to meet growing requirements. However, such calculations by authorities presumably have been based upon continuing low tariffs. If tariffs were to be raised to at least cover fuel costs and to provide a reasonable, but limited profit, conservation and improved efficiency likely would significantly alter future generating capacity requirements. An analysis needs to be conducted to determine future demand growth and whether increased energy efficiency on the supply side as well as demand side management can address increasing demand and offset the need for additional, costly generation capacity.

Another significant issue indicated by BHSE was the increasing cost of primary fuels (discussed in greater detail in Section II-A). Fuel costs have risen dramatically since 1989 and supplies of mazut and natural gas from outside the Republic have become more expensive and less reliable. The result is that BHSE uses more coal, both local and from Kazakhstan, which is of poor quality (an ash content of 60 percent). Clearly, this trend bodes ill for the environment.

BHSE staff indicated that although there has been talk of privatizing energy organizations, it does not appear that the district heating system will be impacted in the near future. In addition, it is not clear that privatization would resolve any of the problems outlined above. Although many reformers recognize the benefits of energy efficiency in addressing many issues, there is still some opposition to rapid structural changes.

Wool Fabric Factory and the Tleplitsnyi Greenhouse

Few energy efficiency initiatives have been implemented or even considered at industrial facilities in Kyrgyzstan to date. This is in large part explained by the history of tariff subsidies which have discouraged the conservation of energy. Many commercial customers are institutional entities which are entitled to heavily subsidized services from all utilities, including hot water. Thus, these customers typically have not been concerned with energy issues, and overall energy efficiency is a very low priority. There are no in-house energy efficiency awareness programs or training efforts.

Rising energy prices and costs have increased awareness of the benefits of energy efficiency, especially the importance of energy measuring and controls. This is a typical scenario throughout the country. In fact, BHSE is finding that today, because of rising tariffs to industry, its customers now want to "know everything." In the past, when tariffs were low, customers were indifferent. If privatization grows, it can be anticipated that indifference to rising costs will disappear. Nevertheless, currently in Kyrgyzstan only 10 percent of the industrial users have orifice-type flow meters to measure hot water/steam flow rates. Senior staff at both plants strongly indicated that installing energy metering and control technology is a very high priority.

Most industries are experiencing a deficit and, subsequently, district heating systems are operating at a loss. As a result, the government is subsidizing industry. A real dilemma exists: industrial enterprises want to increase their energy efficiency in light of rising prices but any significant steps toward improving energy efficiency entail modernizing facilities and implementing new production processes, since current facilities and production methods are already outdated by Western standards.

In other words, significant capital investment is needed to upgrade industrial operations in order to be competitive and increase productivity. Until industry achieves this level of efficiency, it will be difficult to pay for energy costs approaching world market levels. On the other hand, without the existence of world market level energy prices, industry will not attract

the substantial capital investment needed in the first place.

The **Wool Fabric Factory** was fully owned by the state until January 1992, when it became a share-holder owned enterprise. The state currently owns 51 percent of the enterprise, with 49 percent owned by private parties. Workers at the plant also have the right to purchase shares at a discount to the state-established share price. Workers can purchase 1,000 rubles worth of stock for only 200 rubles, effectively an 80 percent discount.

The plant consumes energy in the form of hot water (for space heating and domestic usage) and steam. At the receiving station, both hot water and steam flow rates, temperature, and pressure are monitored. Attendants record such data manually on a log book on an hourly basis. Instruments are quite old, and there is no submetering. Old and inefficient equipment is found throughout the entire plant. Unless electricity and thermal energy tariffs are increased to reflect world market prices, it is difficult for the enterprise to seriously consider modernizing plant equipment. It is especially true now, when there is no hard currency available for capital improvement.

The officials of the Wool Fabric Factory displayed little understanding of current heating costs. It was suggested that in April 1992 the cost of heat represented no more than 1.5 to 2 percent of the final cost of their product. By the end of 1992, it could be 30 percent, but no one seemed to know for certain. The diverse opinion among the staff as to just what percentage the cost of the heat represented in the final cost of the factory's product only reaffirmed that cost accounting has barely been introduced into business operations. The factory was aware of the need to conserve energy, and to use secondary heat recovery (and secondary use of water) if possible. There was little evidence that recognition of the need to conserve was being translated into practice.

The **Tieplitshnyi Greenhouse**, with 600 workers, is a major customer of BHSE located on the outskirts of the city. It produces vegetables (largely cucumbers, tomatoes, and lemons). Operation of the Greenhouse requires some 10 percent of the thermal energy produced by TES-

1 and distributed by BHSE. A central substation takes steam and hot water from the district heating system. There are instruments for measuring temperature, pressure, and flow rates for both steam and hot water. There is a central control station at the substation to regulate the desired temperature inside the green houses. From the central substation, hot water is supplied to the four smaller substations, one in each of the sections. These smaller substations are also equipped with control and measuring devices. Despite the apparent availability of instrumentation, Greenhouse engineers are quick to point out that this equipment is not adequate to control or regulate the heat consumed, and that if such controls were available (at an estimated cost of \$300,000), they could reduce heat consumed by at least 30 percent.

This is not an insignificant savings: heat is a major input into the operations of this large greenhouse. In 1991, the cost of heat represented 17 percent of the cost of the final product. Strikingly, it was commented that in 1991 the Greenhouse spent some 780,000 Rubles for heat, but by late 1992 and early 1993, they were spending that much every month.

The staff commented that during the past 18 months the cost of heat, electric power and water had risen 17-18 times, and that as a result product prices had risen as well. To illustrate, in 1991 the price per kilogram of product was 1.07 Rubles, while by the end of 1992 the price was 22 to 24 rubles. The Greenhouse can, and has, raised its prices as much as possible, but despite these major price increases, their sales have remained flat. The result is that the Greenhouse is able to pay their heating bills, but officials expressed that they are not sure about their ability to meet payments in the future.

It was indicated that any technical problems in the supply of thermal energy to the Greenhouse were discussed directly with TES-1 rather than the distributor, BHSE. This reveals the ongoing tensions between supplier and customer, and possibly the need to analyze the efficiency of the institutional structure and/or technical responsibilities within the district heating system.

Tieplishnyi is 49 percent-owned by the government but is in the process of privatization. The greenhouse hopes to buy back the government share within several years. The enterprise was valued at 120 million Rubles in January 1992.

F. Energy Efficiency Industry and Services

To increase energy efficiency awareness and implementation, an approach successfully implemented in many countries has been to use industry and professional organizations as primary vehicles to promote and disseminate information on energy efficiency options, costs, and returns. However, in Kyrgyzstan there are no enterprises or Government units that have adequate (or any) equipment to conduct energy audits or to identify and institute energy improvement programs. The IRG Team found no providers of industrial energy efficiency services, nor a network of reliable providers of such equipment. There are no institutes, foundations, or centers for energy conservation which might make engineering specialists, equipment, or services available to stimulate energy efficiency. While overall energy engineering skills and training is good, there is no organized pool of trained energy efficiency specialists to be tapped by enterprises needing such services.

However, one effort is emerging to address this lack of energy efficiency services. An organization is being formed under the auspices of the Kyrgyz State Energy Company consisting of government ownership and private participation to provide energy efficiency services and equipment to enterprises in Kyrgyzstan through joint ventures with foreign equipment suppliers, manufacturers and developers.

The energy efficiency equipment industry itself is severely underdeveloped. There are few, if any, producers of instrumentation/controls and other equipment in Kyrgyzstan. There are several manufacturers of meters in the other republics of the CIS, but most equipment is outdated and/or unreliable.

IV. RECOMMENDATIONS

The potential benefits of energy efficiency improvement to the district heating system enterprises and industrial end-users, as well as the economy of Kyrgyzstan in general are sufficiently great to justify continued action and assistance in this area. The following are the IRG Team's recommendations to be pursued.

1. Continued Removal of Energy Price Subsidies

It is clear that as long as thermal energy and electricity prices remain subsidized, there will be little incentive for energy efficiency. Policy makers recognize this and have made a commitment to raising prices, as illustrated in TABLE 2. However, the burden on average consumers of rising prices cannot be ignored. Therefore, pricing policy should be balanced and attempt to minimize the social and economic impact as government subsidies disappear.

2. Financial Incentives

Rather than specialized financial incentives, perhaps the most beneficial incentive is an overall economic and monetary situation which permits reduction of nominal interest rates to reasonable levels and, on a controlled basis, creation of sufficient liquidity in the financial system to permit long-term lending to borrowers based on enterprises' credit-worthiness and prospective returns from the proposed funds borrowed. Certain policies can be helpful, however, and the Government should consider some of the following policies and programs.

- A. Reduction or elimination of the VAT and duties on imports of energy efficiency equipment. This will encourage the importation of much needed equipment not found in the domestic market.
- B. Grant priority access to foreign exchange for industries making energy efficiency investments. Importing specialized energy efficiency equipment and services has a high foreign exchange component. Facilitating access to foreign exchange can

increase access to these services and equipment.

- C. Grants/No-Risk loans for audits and preliminary engineering studies. In order to enhance knowledge of the potential benefits of energy efficiency and to alleviate some of the risk and uncertainty attendant with first time investments, governments can establish grants or no-risk loans for preliminary engineering work or audits. The enterprise would be obligated to repay the loan only if the audit/engineering work identifies energy efficiency opportunities. The overwhelming benefit is that a small amount of government funds can result in significant capital outlay in energy efficiency improvements. These programs are most effective when the loans are interest-free or below market rate. The disadvantage to this program is the increased administrative burden and capital expenditure by the government.

- D. Subsidized-interest loans. Under this type of program, the government can make credit available to energy users for energy efficiency investments at a lower cost of capital than could be obtained from financial institutions at market rates. The drawback to this program is that actual capital cost is not lowered, only the financing cost is reduced. In addition, it requires capital expenditure from the government.

- E. Loan guarantees. Financial institutions may not be prepared to make loans to enterprises for energy efficiency investments owing to the perceived risk and uncertainty of such projects or concern about the stability of the borrower. A mechanism to address this problem is for the government to guarantee qualifying loans, often 80-90 percent of a loan. These programs tend not to promote marginal projects but can be implemented at relatively low cost to the government. However, in Kyrgyzstan where interest rates at local banks are in the range of 70-80 percent, this program would not offset the cost to the borrower, rather reduce the risk to the lender.

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- F. Revolving credit fund. This program creates a protected reserve of funds to be used only for energy efficiency project financing and cannot be appropriated for other purposes. Funds are lent through the government and when loans are repaid and/or as additional capital becomes available, it is added to the fund. To attract interest in this type of program, money has to be provided at below-market rates. In addition, there is an increased administrative burden to the government in implementing such a fund.

 - G. Tax-related incentives. These programs can include tax credits for energy efficiency investments and the production of energy efficiency equipment and instrumentation, accelerated depreciation of efficiency investments, and tax holidays. Tax credits allow an enterprise to reduce its tax burden based on a government-established percentage of the energy efficiency investment, eg., 10 percent of the expenditure. The disadvantages of these programs is that they will only be effective if the tax code is enforced and they require active administration by the government. In addition, tax-related incentives may strengthen enterprises' inclination to seek capital-intensive solutions to their problems, while most enterprises are not yet implementing low-cost, no-cost actions.

The government could also exempt from price or profit controls energy supply companies that provide and aggressively market energy efficiency services. This would allow supply companies to use their capital to invest in the provision of energy efficiency services.

3. Formal Government Commitment to Energy Efficiency

Experience in other countries indicates that one of the most important ingredients in promoting energy conservation and implementing a successful national program is a demonstrated commitment at the highest political levels of government. This priority must be communicated to all relevant government agencies and to the principal energy consumers in

the public and private sector. Legislation and regulations should be enacted and enforced under a coordinated national energy plan. Several policies designed to establish this commitment are presented below.

- A. Mandatory efficiency requirements and regulations for enterprises. This legislation requires enterprises of a certain size or with a certain level of energy consumption to appoint energy managers. These programs also can require firms to implement an energy management service, have energy use patterns examined over fixed periods, or develop fixed-year plans for rational energy use.

- B. Energy efficiency standards and labeling. Increasing the design and efficiency standards of energy-using equipment such as electric motors, HVAC systems, boilers, and household appliances promotes efficiency and energy savings. In addition, implementing strict building construction codes (including mandating the use of meters and insulation) to improve thermal efficiency and energy monitoring can enhance significantly rational energy use in the residential and commercial sectors.

- C. Creation of a separate energy efficiency institution. Responsibility for promoting energy efficiency is often fragmented throughout the government. Creating a separate institution, with a full-time staff, appropriate authority, technical expertise, and effective communication with other government agencies and the private sector can substantially bolster the government's ability to promote and implement a successful national energy efficiency program. This organization's responsibilities can include analyzing consumption patterns, establishing quantitative conservation goals, collecting data, undertaking special studies, sponsoring research, development and demonstration programs, conducting public awareness and outreach campaigns to educate the public on the benefits of energy efficiency, developing, enacting, and enforcing regulations and standards, and developing and implementing training programs.

4. Plant-Level Incentives and Awareness-Building

The following practices/efforts are recommended to promote worker productivity and improve overall energy efficiency:

- awarding bonuses to employees for energy-saving suggestions;
- establishing annual goals for energy consumption per unit of product, with monthly monitoring;
- creating "Energy Committees" to identify energy-saving opportunities and implement solutions;
- assigning specific individuals the responsibility for improving energy efficiency;
- holding regular meetings or seminars on energy-saving for all employees;
- completing daily (or weekly) analyses of energy consumption to detect potential problems; and
- scheduling operations to minimize energy demand.

5. Decentralizing Management in an Emerging Market Economy

Despite considerable progress of Kyrgyzstan toward a market economy, much remains to be done. Many managers still cling to the essence of central planning and to multiple layers of bureaucracy. Unnecessary layers of bureaucracy can be removed, costs reduced, and decision-making facilitated.

Entities which generate revenues (and sometimes profits) are unable to raise new capital required for maintenance, repairs, expansion and investment in energy efficiency equipment because revenue flows to other, generally administrative, levels within the hierarchy. What is returned to the operational level is inadequate for these needs. If Kyrgyzstan is to implement successfully its economic reform programs, more freedom of operation, decision-making, and full access to revenues must be granted to energy enterprises and end-users in the industrial sector. Greater autonomy will assist in the move toward operating as profit- and market-oriented businesses. In short, continued decision-making decentralization is required to increase in-house energy efficiency capabilities at all levels.

operation of heat and flow meters, temperature and pressure gauges, transmitters, thermostatic valves, heat exchangers (if the same hot water source is supplying both space heating and other uses as in Kyrgyzstan), recorders and indicators, computer consoles, modems and phone lines. Care must be taken to identify typical buildings with common physical features, such as piping layout, boiler conditions, substation design and set-up, and pipe conditions. In buildings over 30 years old, space heating systems (radiators) are equipped with double pipe systems, while newer buildings have a single pipe system. With a double pipe system it is relatively easy to apply a thermostatic control at each radiator in individual apartments. Single pipe systems require additional plumbing work to regulate and monitor usage. In addition, it should be noted that in comparison to some of the short-term equipment and technical assistance described above, this type of program is likely to be more expensive to implement and have a longer payback period. Nonetheless, it remains an area where significant gains in energy efficiency are possible.

8. Training

There is a strong need to establish training programs for enterprise managers to assist them in the technical aspects of energy efficiency improvement, the basics of business management, and free market principles. Managers and all levels of technical personnel require training to evaluate new investments, as well as in the installation and operation of energy efficiency instrumentation and equipment. Training is required in the development of energy efficiency programs, and to improve skills in the areas of economic project analysis, investment project evaluation, and long-term strategic planning. One alternative is to present intensive 3-5 day workshops on strategic planning and decision-making to invited executives from all across the district heating and industrial sectors. Other efforts can include utilizing outside experts to provide technical assistance in developing strategic plans at the plant/organizational level and sending key host country executives to training programs in the United States.

9. Development of Domestic Energy Efficiency Industry/Activities

Kyrgyz district heating enterprises as well as industrial end-use facilities have little access to modern energy efficiency technologies and to companies, particularly U.S. firms, providing

those technologies. Virtually all entities contacted by the IRG Team in conducting the policy and institutional analysis expressed a strong desire to establish relationships with U.S. companies in order to improve overall energy efficiency, stimulate domestic activities, and disseminate information and technology concerning the benefits of energy efficiency. IRG highlights several recommendations to USAID that accomplish these goals:

- Assist in the development of private service firms and joint ventures. Although there are few, if any, Kyrgyz private sector companies manufacturing energy efficiency equipment, and there is interest in joint partnerships involving capital investment and technology transfer. Industrial end-use enterprises are good candidates for partnerships with American firms. Production oriented partnerships are all the more promising, given that the labor force is highly skilled and relatively inexpensive. The USAID Enterprise Fund could be a potential vehicle in addressing this issue.
- Early Involvement of U.S. Vendors in USAID Technical Assistance. This has proved to be an effective way to introduce vendors to markets. Vendors' participation at an early stage enables them to understand the specific heating systems and experience for themselves various local problems and prepare them for realistic and reasonable solutions.
- Development of an Energy Efficiency Center. This approach has been implemented in other countries. It would establish a non-profit organization dedicated to improving the country's economic development and environmental protection through energy efficiency. Although there are currently no institutes, foundations or centers dedicated to energy and energy efficiency, there is a pool of trained and skilled energy engineers, who are mostly part of government-run organizations. Once energy efficiency awareness improves throughout the country and more and more specialists in energy efficiency are trained, these individuals could form the nucleus of such an Energy Efficiency Center or Foundation. These individuals would provide audits, general services, and training to the district heating and end-user entities in order to disseminate awareness, skills and the benefits of energy efficiency.

10. **Formation of a Energy Efficiency Company**

A recent idea which has gained much support is to form a company specifically for the purposes of supplying and installing low-cost energy efficiency equipment with high payback. This company would be partly owned by a U.S. energy development firm, a U.S. equipment

manufacturer/supplier, and potentially an appropriate government and/or private sector entity in Kazakhstan. The U.S. private sector as well as U.S. government entities such as the U.S. Export-Import Bank and OPIC¹⁶ could provide some initial capital financing. The goal of such an entity would be to facilitate immediate transfer of much needed energy efficient equipment with high payback and quick impact. The most appropriate technologies for the district heating systems are water audit/leak detection equipment and steam traps.

¹⁶ OPIC, for example, has recently initiated the *Project Development Program for Central and Eastern Europe and the Newly Independent States of the Former Soviet Union*.

ANNEX A
ELECTRICITY SECTOR

KYRGYZSTAN
ESTABLISHED ELECTRIC POWER GENERATING CAPACITY
1992

	Output	
	<u>Thousand KVT</u>	<u>(Million kWh)</u>
Republic total	3,414	12,060
<u>Thermal Power Stations</u>	674	2,720
Bishkek #1	674	2,500
Osh	50	220
<u>Hydropower Stations</u>	2,740	9,340
Bystrov	9	40
Alamedinsk	31	80
Atbashinsk	40	130
Toktogul	1,200	4,860
Kurpsay	800	2,760
Tashkumyr	450	610
Shamaldysay	30	60
Uch-Kurgan	180	800

Note: All data in Annex A is from the *Energy Program of Kyrgyzstan*, prepared by the State Energy Company of Kyrgyzstan and the Ministry of Economy and Finance in 1992.

KYRGYZSTAN
ELECTRIC POWER INDUSTRY
1990-1992

<u>Item</u>	<u>Unit of Measure</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1992</u> <u>As % of</u> <u>1990</u>	<u>1992</u> <u>As % of</u> <u>1991</u>
<u>Established cap. of</u> <u>Electric Power Stations</u>	Thousand Kvt	3,434	3,384	3,414	99.4	100.9
Of which:						
Thermal	"	724	674	674	93.1	100.0
Hydro	"	2,710	2,710	2,740	101.1	101.1
<u>Electric Power</u> <u>Generation</u>	Million kWh	13,155	13,972	12,060	91.6	86.3
Of which:						
Thermal	"	4,202	3,914	2,720	64.7	69.6
Hydro	"	8,593	10,058	9,340	104.4	92.8
<u>Output of Thermal</u> <u>(Heat) Energy</u>	Thousand Gigacalories	5,725	5,805	6,100	106.6	105.1
<u>Electric Power</u> <u>Consumption</u>	Million kWh	9,177	9,680	9,680	105.5	100.0
<u>Export of Electric</u> <u>Power</u>						
To:						
Central Asia	Million kWh	7,198	8,416	5,980	83.1	71.1
China	"	--	--	1.0	--	--
<u>Imports from</u> <u>Central Asia</u>	"	3,220	4,123	3,600	111.8	87.3
<u>Net Exports</u>	"	3,978	4,293	2,380	59.8	55.4

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KYRGYZSTAN

GROWTH IN ELECTRIC POWER
CONSUMPTION BY SECTOR
1989-92

Indicator	1989		1990		1991		1992	
	<u>Million</u> <u>Kwh</u>	<u>% of</u> <u>Total</u>						
Consumption, Total	7,438.5	100	7,642.6	100	8,128.7	100	8,050	100
of which:								
Industry	3,416	46.5	3,467.8	45.4	3,508.6	43.2	2,996.0	37.2
Agriculture	1,848	25.1	1,912.7	25.0	1,985.7	24.4	1,950.0	24.2
Population	44.6	12.9	1,110	14.5	1,454.7	17.9	1,900.0	23.6
Other Needs	1,139	15.5	1,151.5	15.1	1,179.7	14.5	1,204.0	15.0

ANNEX B

COAL SECTOR

KYRGYZSTAN
COAL INDUSTRY DEVELOPMENT
1990-1992

<u>Item</u>	<u>Unit of Measure</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
Productive Capacity	Thousand tons	4,050	4,050	4,100
Of which:				
Underground Mines	"	2,150	2,150	2,220
Open Pit	"	1,880	1,880	1,880
Coal Output, Total	"	3,742	3,483	2,250
Of which:				
Open Pit	"	1,831	1,648	1,200
Underground	"	1,911	1,835	1,050
Average cost of Extraction	Rubles/ton	24.51	47.47	818.8
Coal Deliveries to Kyrgyzstan Consumers	Thousand tons	2,040	1,740	1,200
Coal Deliveries to other republics	"	1,702	1,749	1,050

Note: All data in Annex B is from the *Energy Program of Kyrgyzstan*, prepared in 1992 by the State Energy Company of Kyrgyzstan and the Ministry of Economy and Finance.

KYRGYZSTAN
COAL SUPPLY AND DEMAND
1990-1992

<u>Indicator</u>	<u>1990</u>		<u>1992</u>	
	<u>Thousand Tons</u>	<u>% of Total</u>	<u>Thousand Tons</u>	<u>% of Total</u>
<u>Supply</u>	6,600	100	5,050	100
Of which:				
Domestic prod.	3,742	56.0	2,250	44.6
Imports	2,840	43.3	2,800	55.4
From:				
Russia	450		600	
Kazakhstan	2,350		2,200	
Other republics	40		-	
<u>Allocation</u>				
Consumption	4,880	74.0	4,000	78.6
Of which:				
Thermal power stations	1,040		1,000	
Industry & regional boilers	815		800	
Population	2,765		2,060	
Other	260		140	
Exports	1,720	26.0	1,050	20.8

ANNEX C
PETROLEUM AND NATURAL GAS SECTOR

KYRGYZSTAN
THE OIL AND GAS INDUSTRY
1990-1992

<u>Indicator</u>	<u>Unit of Measure</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>
Crude Oil Production	Thousand Tons	155.0	142.7	125.0
Natural Gas Production	Million cu. Meters	96.0	83.0	68.0
New Well Completions	Units	22	10	21
Capital Investment (in 1992 prices)	Million Rubles	122.2	172.3	139.5
Value of Production	Million Rubles	10.6	18.6	195.0

Note: All data in Annex C is from the Energy Program of Kyrgyzstan, prepared in 1992 by the State Energy Company of Kyrgyzstan and the Ministry of Economy and Finance.

KYRGYZSTAN
NATURAL GAS SUPPLY AND DEMAND, 1990-92

<u>Indicator</u>	<u>1990</u>		<u>1992</u>		<u>1992 as % of 1990</u>
	<u>Million Cubic Meters</u>	<u>% of Total</u>	<u>Million Cubic Meters</u>	<u>% of Total</u>	
<u>Supply</u>					
Domestic Prod.	96	4.5	68	3.5	70.8
Imports	2,040	95.5	1,897	96.5	92.1
Total	2,136	100.0	1,947	100.0	91.2
<u>Allocation</u>					
Thermal power stations	1,015	47.5	900	46.2	88.7
Prod. needs	693	32.4	658	33.8	95.0
Transport	7.3	0.3	6.6	0.3	86.8
Communal needs	96.2	4.5	91	4.7	94.8
Population	135.8	6.4	139	7.2	91.2
Other	189.0	8.9	152.4	7.8	88.4
Total		100		100	

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KYRGYZSTAN

CONSUMPTION OF LPG
1990-1992

<u>Indicator</u>	<u>Thousand Tons</u>			1992
	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>As % of 1990</u>
Consumption	118	125.3	80	67.8
Of Which:				
Prod. Needs	3.5	4.0	2.0	57.1
Auto Transport	22.3	28.5	18.0	90.0
Communal-everyday needs and the Population	92.2	92.8	60.0	65.2

KYRGYZSTAN
PETROLEUM PRODUCT SUPPLY AND DEMAND
1990-1992

<u>Indicator</u>	<u>Thousand Tons</u>			<u>1992</u> <u>As % of</u> <u>1990</u>
	<u>1990</u>	<u>1991</u>	<u>1992</u>	
<u>Supply*</u>				
From:				
Russia	900	720	520	57.8
Kazakhstan	1,090	1,045	730	67.6
Uzbekistan	605	410	180	29.8
Turkmenistan	90	210	40	44.4
Total	2,675	2,385	1,470	55.0
<u>Consumption</u>				
Motor gasoline	707	566	370	52.3
Diesel fuel	599	562	390	65.1
Mazut	1,006	887	570	56.7
Jet fuel	116	105	60	51.7
Other	247	265	80	32.4
Total	2,675	2,385	1,470	55.0

* Because there are no refineries in Kyrgyzstan, the Republic is wholly dependent upon imports to meet its needs for petroleum products.

ANNEX D

**LAW ON FOREIGN INVESTMENTS
IN THE REPUBLIC OF KYRGYZSTAN**

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**THE LAW ON FOREIGN INVESTMENTS
IN THE REPUBLIC OF KYRGYZSTAN**

The present law is directed towards ensuring efficient participation of the Republic of Kyrgyzstan in international economic relations and attracting, in the form of foreign investments, additional material and financial resources and advanced foreign technology.

I. GENERAL PROVISIONS

Article 1. Foreign investments in the Republic of Kyrgyzstan

Foreign investments in the Republic of Kyrgyzstan are money and material contributions to the sphere of economic and other activities, and also the transfer of rights for intellectual property by foreign states, legal persons and citizens.

Article 2. Foreign investors in the Republic of Kyrgyzstan

Foreign investors in the Republic of Kyrgyzstan are foreign states, legal persons and citizens that make investments in the territory of the Republic of Kyrgyzstan.

Article 3. Participants of investment activities

Participants of investment activities in the Republic of Kyrgyzstan are legal persons and citizens of the Republic of Kyrgyzstan and other republics, foreign legal persons and citizens that provide the implementation of investments as performers of contracts or other orders of a foreign investor.

Article 4. Forms of foreign investments allowed in the Republic of Kyrgyzstan

The following forms of foreign investments are allowed in the Republic of Kyrgyzstan:

- a share in a joint venture;
- a foreign enterprise;
- acquisition of stocks and other securities;
- target money deposits;
- scientific and technological products;
- intellectual values;

Other forms of economic and other activities that are not prohibited by the laws of the Republic of Kyrgyzstan.

Article 5. Legislation of the Republic of Kyrgyzstan on foreign investment activities

Relations in connection with the implementation of foreign investment activities are regulated by the present law, other legislation of the Republic of Kyrgyzstan, and also by the provisions of international agreements in which the Republic of Kyrgyzstan is a participant.

If international agreements establish other rules that are different from those in the legislation of the Republic of Kyrgyzstan, then the provisions of the international agreement shall be applied.

Article 6. Agreement regulation of foreign investment activity

The basic document that regulates the legal position of foreign investors and participants in investment activities, is an agreement.

The choice of partners, conclusion of agreements, determination of liabilities and other conditions of economic relations that do not contradict the legislation of the Republic of Kyrgyzstan, are in the sole competence of foreign investors and participants in investment activities.

The conditions of agreements between foreign investors and participants of investment activities shall remain effective for the whole period of the agreement even in the cases if after the conclusion, the legislation of the Republic of Kyrgyzstan establishes conditions that worsen the positions of the parties.

Article 7. Guarantees for foreign investors in the Republic of Kyrgyzstan

The Republic of Kyrgyzstan guarantees stability of the rights of foreign investors and other forms of their legal protection.

The legal conditions of foreign investments cannot be less favorable than the legal conditions for investments made by legal persons and citizens of the Republic of Kyrgyzstan and other republics.

Losses (including unreceived profit) inflicted on foreign investors in connection with the approval of laws and other legal acts, limiting their rights, shall be indemnified by the State bodies that approved such acts. If these bodies of the State do not have sufficient funds, the losses shall be indemnified from the State budget of the Republic of Kyrgyzstan.

II. RIGHTS AND DUTIES OF FOREIGN INVESTORS

Article 8. Economic independence of foreign investors

Foreign investors have the right to determine independently the volumes, directions and efficiency of investments, and attract on a contract basis legal persons and citizens, including foreign, to implement investments.

Foreign investors directly or through agents have the right to buy the necessary property without limitations in volume and nomenclature from legal persons and citizens at prices and under conditions that do not contradict the laws of the Republic of Kyrgyzstan.

The foreign investor can give the right of property, use and disposal of investments to other legal persons and citizens according to the order determined by the laws of the Republic of Kyrgyzstan. The inter-relations of parties in the above transfer of rights shall be regulated by an agreement (contract).

Article 9. Attracting of financial funds by foreign investors

Foreign investors have the right to attract in the Republic of Kyrgyzstan financial funds in the form of credits, and to issue, according to the established order, securities and loans. As collateral for the liabilities of the foreign investor, his property can be used.

Article 10. The freedom of using the results of investments by foreign investors

Foreign investors have the right of possession, use and disposal over the results of their investments, including reinvestments and trade operations in the territory of the Republic of Kyrgyzstan.

Foreign investors can take away profit or part of it as products of their own industry or commodities and services bought on the market.

Export of goods and services bought on the market shall be made according to the order established by the legislation of the Republic of Kyrgyzstan on export-import operations.

Export by foreign investors of Soviet and foreign currency shall be made according to the order envisaged by the legislation of the Republic of Kyrgyzstan on currency regulations.

Article 11. Observation by foreign investors of financial, environmental, city-building and other requirements

Foreign investors are obliged to observe environmental, financial, city-building and other requirements established by the legislation of the Republic of Kyrgyzstan.

Article 12. Prohibition of unfair competition

Foreign investors should not admit unfair competition and are obliged to follow the requirements of antimonopoly legislation of the Republic of Kyrgyzstan.

III. ORDER OF FOREIGN INVESTORS

Article 13. Licensing of foreign investments in the Republic of Kyrgyzstan and its registration

License (permit) to make foreign investment in the Republic of Kyrgyzstan is issued by the Cabinet of Ministers of the Republic of Kyrgyzstan not later than in 30 days after receiving the application from the foreign investor.

The form of application and list of justification documents is approved by the Cabinet of Ministers of the Republic of Kyrgyzstan.

Registration of foreign investment activities is established in the amount and order envisaged by taxation law in the Republic of Kyrgyzstan.

Article 14. Beginning of realization of foreign investment activity in the Republic of Kyrgyzstan

Foreign investment activity in the Republic of Kyrgyzstan should begin not later than in 12 months after receiving a license to implement it. If after the expiration of the above period investing is not started, the license is cancelled.

Article 15. Joint ventures in the Republic of Kyrgyzstan

Joint ventures are ventures with a share of authorized capital belonging to a foreign investor(s). The size of the share is defined according to agreement.

Agreement on founding a joint venture is made between a legal person(s) or citizen(s) and a foreign investor(s).

The creation and activities of joint ventures are regulated by a special law and other legislation of the Republic of Kyrgyzstan.

Article 16. Foreign ventures (enterprises) in the Republic of Kyrgyzstan

Foreign ventures in the Republic of Kyrgyzstan are enterprises of which the authorized capital belongs in full to a foreign investor(s).

The creation and activities of foreign ventures are regulated by a special law and other legislation of the Republic of Kyrgyzstan.

Article 17. Acquisition of stocks and other securities by foreign investors in the Republic of Kyrgyzstan

Foreign investors in the Republic of Kyrgyzstan have the right to acquire stocks and other securities according to the order established by the legislation of the Republic of Kyrgyzstan.

A more favorable status of a joint venture is applied to joint-stock companies where the control package (51%) belongs to a foreign investor.

Article 18. Target money deposits and other forms of economic, and other activities of foreign investors in the Republic of Kyrgyzstan

Target money deposits (investments) and other forms of economic and other activities of foreign investors in the Republic of Kyrgyzstan are regulated by a special law and other legislation of the Republic of Kyrgyzstan.

Article 19. Taxation of foreign investors in the Republic of Kyrgyzstan

Taxation of foreign investors in the Republic of Kyrgyzstan is made according to the tax legislation of the Republic of Kyrgyzstan.

Article 20. Additional tax privileges for foreign investors in the Republic of Kyrgyzstan

Foreign investors shall be given additional privileges on the tax on the declared profit:

- If the foreign investor contributed to the capital of a legal person a proportion in hard currency in the amount of 20 or more percent, or in the amount of more than 0.3 million US dollars or its equivalent in other hard currencies, then for ten years he shall be exempt from tax on 25% of the profit;
- if the foreign investor contributed to the capital of a legal person in hard currency a proportion more than 30% or more than 0.8 million US dollars, then for five initial years he shall be exempt from tax on 30% of profit, and for five following years – from tax on 50% of profit;

- if the foreign investor contributed his share into the capital of a legal person involved into activities listed in the annex to the present law, then during the first five years he shall be exempt from tax on 100% of the profit, and in the following five years – from 60% of the profit.

Article 21. Responsibility of foreign investors in the Republic of Kyrgyzstan

If contract commitments are not observed, or taxes are not paid in due time or in full amount, foreign investors bear property or other responsibility according to the order established by the laws of the Republic of Kyrgyzstan.

Article 22. Taxation on profits taken out of the Republic of Kyrgyzstan by foreign investors

Profit received by foreign investors that have paid the profit tax, shall not be taxed on being taken out of this country.

Foreign investors exempt from profit tax shall pay a tax in the amount of 5% from the profit taken abroad.

Article 23. Preferential customs tariffs

The material contribution of foreign investors to the authorized capital during the period of its formation is imported without customs duties (duty-free).

Preferential customs tariffs for imported and exported raw materials and products are established by the Cabinet of Ministers of the Republic of Kyrgyzstan.

Article 24. Foreign investments in free economic zones

The order of making foreign investments and privileges for foreign investors in free economic zone of the Republic of Kyrgyzstan shall be established in each zone by the Cabinet of Ministers of the Republic of Kyrgyzstan according to the legislation of the Republic on free economic zones.

IV. LEGAL PROTECTION OF FOREIGN INVESTORS IN THE REPUBLIC OF KYRGYZSTAN

Article 25. The order of settlement of disputes related to foreign investment activities in the Republic of Kyrgyzstan

Disputes related to foreign investment activities in the Republic of Kyrgyzstan are considered according to the effective in the Republic of Kyrgyzstan legislation in courts, State arbitration or by agreement of parties involved in arbitration court.

Article 26. Insurance of foreign investments in the Republic of Kyrgyzstan

Foreign investments in the Republic of Kyrgyzstan can, and in cases envisaged by the legislation of the Republic of Kyrgyzstan, should be insured.

President of the Republic of Kyrgyzstan

A. AKAEV

Bishkek, 28 June, 1991
No. 536-XII

LIST OF INVESTMENT ACTIVITIES

The following is a list of investment activities, the participation in which give the foreign investor the right for tax privileges (exemptions).

1. Electronics
 - manufacturing of components
 - manufacturing of computers and computer peripherals
 - manufacturing of electronic equipment and related services of the manufacturer, including the manufacturing of electronic consumer goods
2. Manufacturing of automobile transportation means, spare parts and component for them
3. Machine-tool manufacturing
4. Manufacturing of machines and equipment for agriculture and food industry
5. In the area of manufacturing components, machines and mechanisms
 - manufacturing of cast, forged and stamped high precision components
 - manufacturing of multi-purpose spare parts and components, high quality devices and instruments, valves, hydraulic and pneumatic elements, advanced anti-friction ball-bearings and components, large and high productive synthetic components, technological materials
 - manufacturing of instruments (tools) and devices
 - manufacturing of technological ceramics
6. In the area of packing technology
 - manufacturing of packing materials and packages
 - manufacturing
7. In the area of pharmaceutic items production, means for plant protection and half-finished products
 - manufacturing of new pharmaceutic materials
 - manufacturing of new types of plant protection means
 - manufacturing of key half-finished products used in pharmaceutics and manufacturing of plant protection means
 - manufacturing of products used in veterinary

LIST OF INVESTMENT ACTIVITIES (CONT.)

8. Processing of agricultural raw materials, food and light industry production
9. Manufacturing of materials for animal and plant breeding
10. Communication
11. Tourism
 - Construction and operation of buildings for the development of mountain-climbing and resort (if the operation is performed by the builder)
 - restoration of historic monuments
 - construction and operation of hotels
12. Medical equipment
13. Development, mining and processing of mineral resources
14. Manufacturing of industrial construction materials and items
15. Manufacturing of consumer goods
16. Manufacturing of printing equipment and paper
17. Recycling of industrial and domestic waste
18. Complex coal processing, including overburden and "tails" of mining enterprises
19. Manufacturing of equipment and devices that sharply decrease pollution of air and water
20. Baby-food production
21. Manufacturing of mechanisms and means for invalids, organization of workshops and industries where invalids can work
22. Manufacturing of disposable syringes
23. Manufacturing of social-targeted technology and machines
24. Manufacturing of small machines and farming technology for private farms

The Cabinet of Ministers of the Republic of Kyrgyzstan has the right to change this Annex and give additional tax privileges to foreign investors.

REGULATIONS GOVERNING THE PROCEDURE FOR ESTABLISHING AND REGISTERING FOREIGN-OWNED BUSINESSES, JOINT VENTURES, AND INTERNATIONAL ASSOCIATIONS AND ORGANIZATIONS IN THE REPUBLIC OF KYRGYZSTAN

I. General Provisions

1. Foreign-owned businesses, joint ventures involving the participation of foreign partners, international associations and organizations, and their subsidiaries acquire the rights of a juristic person on the day they are duly registered with the government of Kyrgyzstan.

2. Registration is the responsibility of the Ministry of Economics and Finance of the Republic of Kyrgyzstan.

The Ministry of Economics and Finance of the Republic of Kyrgyzstan is responsible for keeping a register of foreign-owned businesses, joint ventures, and international associations and organizations.

The National Foreign Trade Commission of the Republic of Kyrgyzstan is responsible for examining charter documents.

3. Government registration is based on a written application submitted by one of the participants in the foreign-owned business, joint venture, or international association or organization.

The following documents must be attached to a registration application:

a) for establishing a foreign-owned business, joint venture, or an international association or organization:

- a notarized copy of an investor's license which must be issued to each foreign participant by the National Foreign Trade Commission of the Republic of Kyrgyzstan;
- a document verifying the permission of the local Council of People's Deputies in the area where the business, venture, or association or organization is established;
- notarized copies (duplicates) of the agreement establishing the joint venture, international association, or organization and its charter; and for foreign-owned business - the decision by a foreign investor to establish a foreign-owned business and a notarized copy (duplicate) of its charter;
- the findings of the charter document examiners issued by the National Foreign Trade Commission of the Republic of Kyrgyzstan;

- a document (extract from a commercial registry, certificate, or other document) verifying that the foreign participant is registered in his own country as a juristic person;
- a letter from a foreign banking (lending) institution verifying the solvency of the foreign partner.

The last two documents must be submitted by juristic persons in the form of notarized copies accompanied by translations into Russian (including the application).

Individual foreign investors are only required to submit a xerox copy of a document verifying their identity;

b) for establishing subsidiary ventures:

- notarized copies of the charter document of the foreign-owned business, joint venture, international association or organization and the charter of the subsidiary;
- a decision of the governing body of the foreign owned business, joint venture, international association or organization establishing the subsidiary venture;
- a copy of a certificate of registration from the Ministry of Finance of the USSR for the parent business, association, or organization (if the latter was registered prior to December 31, 1990) or a copy of a registration certificate;

4. Payment of fees for the registration of foreign-owned businesses, joint ventures, and international associations and organizations shall be effected in accordance with the procedure and in the amounts prescribed by law of the Republic of Kyrgyzstan.

5. Foreign-owned businesses, joint ventures, and international associations and organizations are required to notify the Ministry of Economics and Finance of the Republic of Kyrgyzstan of any amendments to their charter documents within 15 days and if necessary furnish the appropriate documents.

II. Registration Procedures

6. The registration of foreign-owned businesses, joint ventures, and international associations and organizations is an authorization procedure.

7. After reviewing registration documents for completeness and accuracy, the Ministry of Economics and Finance of the Republic of Kyrgyzstan is required to register foreign-owned businesses, joint ventures, and international associations and organizations and enter the pertinent information in its register no later than 15 days after the date of filing of the application.

ANNEX E

PROPOSED ENERGY EFFICIENCY PROJECTS 1993

BISHKEK HEATING SYSTEMS ENTERPRISE

ANNEX E

Proposed Energy Efficiency Projects 1993

Bishkek Heating System Enterprise

1. Scheduled relay of depreciated heat-systems
2. Heat insulation repair
3. Repair and replacement of faulty compensators and stop valves
4. Eliminating flooding; de-watering thermal chambers and heat channels
5. Immediate (timely) location and leak elimination in heat supply systems
6. Installing regulators and thermal meters in heating systems and consumer service inputs
7. Relay of depreciated heating systems
8. Heat insulation repair
9. Installing automatic regulation equipment in control assemblies and binding heaters in ventilating devices
10. Installing heat meters at enterprises
11. Eliminating heat losses with dead steam
12. Increasing condensate recycling
13. Conversion from steam to water heat system
14. Utilizing secondary energy resources at industrial enterprises
15. Decreasing temperature of return water in heating systems

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ANNEX E

Proposed Energy Efficiency Projects 1993

Bishkek Heating System Enterprise (continued)

- | | |
|-----|---|
| 16. | Efficient transport usage |
| 17. | High-quality repair of engine carburetors and feed systems (gasoline) |
| 18. | Avoiding the idle run of welding machines, hot water immersible electric pumps and timely repair of fuel equipment (solar oil) |
| 19. | Installing local lights at PS-1, 2, 4-8, 10, 12, 21 |
| 20. | Replacing filament lamps for discharge and electroluminescent lamps at PS-4, 7, 10, CC (Control Center) |
| 21. | Mounting light circuits with photodiodes |
| 22. | Turning-off one (out of two) transformers in summer time at PS-6, 8, 12 |
| 23. | Periodic de-energization of the PS-5 at the expense of a more effective draft scheme for heating systems |
| 24. | Reducing the number of operating pumps in heat supply system at PS-1, 4, 8 |
| 25. | Setting hydraulic operating conditions in heating systems |
| 26. | Holding heat flow temperature drop 10°C lower than required by the heat operating schedule at Bulan-Segettu electric boiler-house |
| 27. | Correcting hydraulic and temperature modes of operation |
| 28. | De-energization of the Bishkek Plant from the boiler-house |
| 29. | Developing the optimum and efficient heat supply operating conditions for summer time |