THE ENERGY SECTOR OF UZBEKISTAN: PRESENT STATE AND PROBLEMS

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In this century Uzbekistan's socioeconomic development will be determined by the degree of efficiency with which it will exploit its fuel reserves. This calls for an all-round investigation of the energy generation and consumption in all spheres of national economy as well as for monitoring energy consumption level and the long-term dynamics created by the state's tax and price policy. A careful analysis of power consumption in individual branches of our country and in the developed countries should prompt ways and means of lowering this index in the economy of Uzbekistan.

Table 1 presents the key indicators of the world and Uzbekistani power production. The republic exceeds by 23% the average world level

where per capita power consumption is concerned and is below by 20% in per capita electric-power consumption which means that Uzbekistan is close to the average world level. These resources, however, are used inefficiently: the national economy's power consumption is 9 times higher than the world's average level while electricity intensity per GDP unit is 6 times higher. A gap between Uzbekistan and the developed countries is much wider: 2,228 and 1,114 times, respectively. This discrepancy is caused by the artificially lower fuel prices that existed in the Soviet Union and were inherited by many of the CIS countries that had never required, and is not requiring, energy-saving measures. In the West the energy crisis of 1973-1974 speeded technological progress in the energy-saving sphere; Austria, Denmark, Germany, Norway, Sweden, Switzerland, and Japan acquired the best results in energy saving mainly because all of them with the exception of Norway, are fuel importers. The developed legal basis, reliable and vast statistics, the ramified system of norms and standards as well as integrated and systemic research were behind their achievements in the energy-saving sphere.

This shows that no sustainable national economic development in Uzbekistan is possible without structural changes in the economic sphere and a complex of measures designed to considerably reduce power consumption.

Table 1

Key World and Uzbekistani Power Sector Indicators in 2000

Indicator	The world as a whole	Uzbekistan	Place in the world
Population, million	6,023.17	24.75	39
Gross Domestic Product (GDP), billion dollars	3,4037.0	12.01	82
Per capita GDP, USD/capita	5,651	485	113
Primary energy production (PEP), Mtoe (tonnes of oil equivalent)	10,078	55.07	35
Export of energy fuels, Mtoe		4.89	39
Primary energy consumption (PEC), Mtoe	10,109.6	50.15	33
Per capita PEC, toe/capita	1.68	2.03	58
PEC per GDP unit, toe/1,000 USD	0.30	4.18	2
Electrical Consumption (EC), TWh	14,114.5	44.02	39
Per capita EC, kWh/capita	2,343	1 778	73
EC per GDP unit, kWh/USD	0.414	3.67	7
CO_2 emission, Mt	23,444.2	117.52	32
CO_2 per capita emission, t	3.89	4.64	57
CO_2 emiss./GDP unit, kg/USD	0.69	9.57	6
CO_2 emiss./PEC unit, t/toe	2.32	2.29	7

Source: *Key World Energy Statistics from the IEA,* 2002 Edition, IEA, Paris, 2002.

1. Fuel Industry

Oil and Gas Sector

In 1992, the republic acquired the National Corporation of Oil and Gas Industry "Uzbekneftegaz"; in 1998, by a presidential decree it was transformed into the National Holding Company "Uzbekneftegaz" that comprised eight firms: Uzgeoneftegazdobycha (prospecting and extraction); Uzneftegazstroi (equipping the fields and construction of oil and gas pipelines); Uznefteprodukt (distribution of oil products by region); Uzneftepererabotka (refining crude oil), Uztransgaz (transportation of gas along the main gas pipelines); Uzburneftegaz (prospecting and drilling for oil and gas); Uzneftegazmash (equipment for oil and gas extraction); Uzneftgazishchita'minotchi (trade and services).

Hydrocarbons are the main energy fuels in the republic the reserves of which are comparable with the reserves of the Netherlands and Indonesia. (It should be added that Uzbekistan is one of the world's 15 gas-richest countries.) Since 1996 the country has been completely covering the domestic demand for energy; it is the world's eighth largest natural gas producer. According to geologists, 60 percent of the country's territory may contain oil and gas (171 deposits were discovered in five oil- and gas-bearing areas).[1] Today oil is extracted from 51 fields; gas, from 27 fields, and gas condensate, from 17 fields. Thirty-two percent of oil has been already extracted from the proven oil reserves; the figure for gas is 37%.

Natural Gas

The natural gas resources are estimated at 5,430 Bcm.[2] Twelve major deposits (including Gazli, Shurtan, Pamuk, and Khauzak) contain commercial reserves; together these deposits account for over 95% of gas extracted in Uzbekistan. All of them are found along the Amudarya River and close to the city of Mubarek. Gazli is the largest and oldest field; Shurtan comes second. It was developed in 1980; in 2000, it produced over one-third of the total volume of extracted gas.

Seven large deposits (one gas and six gas condensate) were discovered.[3] Shakhpakhty, Urga, and Akchalak are the largest among them: their initial reserves (by industrial category) are over 95 Bcm. Six investment blocks were identified in the Ustyurt Region.[4]

In 2002, 58.4 Bcm were extracted; to compensate for decreasing extraction from the Uchkyr and Iangikazen fields the Gabri and Kandym gas fields are being developed at a fast pace. Gas is mainly extracted by Mubarekneftegaz, Shurtanneftegaz and Ustyurtgaz companies.

The composition of the natural gas extracted in Uzbekistan varies from one deposit to another: methane is accompanied by large quantities of light and heavy hydrocarbons. On the whole, large quantities of extracted gas should be processed because of the high sulphur content (2.5-2.7%). This is done at the Mubarek Gas Processing Works and at the Shurtan Gas-chemical Complex.

The first phase of the Mubarek Works was commissioned in 1973. It was intended for desulphurization and sulphur production as well as for low-temperature separation and condensate stabilization. Today, the works processes about 24 Bcm of gas and produces over 330 thou tons of sulphur a year.[5] It needs rehabilitation and enlargement to increase desulphurization; it is planned to increase an output of gas condensate to 745 thou tons a year to fully cover the market demands.

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[1] See: *Environmental Performance Review of Uzbekistan*, U.N. Economic Commission for Europe, September 2001, Geneva.

[2] See: "Gazprom planiruet uvelichit pokupku uzbekskogo gaza" [www.uzreport.com], 21 December, 2002; "Britanskaia kompania v Uzbekistane," *Energia i promyshlennost Rossii* [www.ep.spb.ru/epr/info/sklad/015/oil_gas.htm].

[3] See: *Environmental Performance Review of Uzbekistan*.

[4] See: "Neftegazovaia promyshlennost. Uzbekneftegaz" [www.uz/eng/industries/ung.htm], 19 March, 2003; for more detail, see: *Showcase Europe: Energy Guide for Uzbekistan* [www.sce.doe.gov/documents/market_brief/pdf/uzbekistan.pdf].

[5] See: "Neftegazovaia promyshlennost. Uzbekneftegaz."

Table 2

Natural Gas Production, Consumption and Export in Uzbekistan in 1992-2000

		1992	1995	1996	1997	1998	1999	2000
Production	**Mtoe**	**34.95**	**38.13**	**38.32**	**39.72**	**44.61**	**45.26**	**45.92**
	Bcm	**43.1**	**47.1**	**47.3**	**49.0**	**55.1**	**55.9**	**56.7**
Consumption	**Mtoe**	**33.57**	**32.73**	**33.93**	**34.04**	**40.93**	**41.57**	**41.32**
	Bcm	**41.4**	**40.4**	**41.9**	**42.0**	**50.5**	**51.3**	**51.0**
Export	**Mtoe**	**0.81**	**3.43**	**3.97**	**5.81**	**3.68**	**3.69**	**4.60**
	Bcm							

Source: *Energy Balances of Non-OECD Countries 1999-2000,* 2002 Edition, IEA, Paris, 2002.

Late in 2001, a pumping station of the Shurtan Gas-chemical Complex still in under construction was commissioned (the total cost of the complex is assessed at $1 billion). Upon completion the complex will produce annually 125 thou tons of polyethylene; 137 thou tons of liquefied gas and 37 thou tons of light condensate. By 2010, this complex together with the modernized Mubarek Works will bring up the volumes of processed gas to 45 Bcm (the figure for 2001 is 30 to 35 Bcm) and extend the product range.

As soon as the Gazli fields had started producing gas in industrial amounts Uzbekistan became a gas exporter. Today, it supplies Kazakhstan, Kyrgyzstan, Russia and Tajikistan with gas through main pipelines. Russia is the largest and most reliable customer: its gas companies always pay on time. This cannot be said about the customers from other republics, therefore Tashkent has to stop gas supplies from time to time while waiting for debt settlement.

Gazprom of Russia and Uzbekneftegas concluded an agreement[6] on gas supplies from Uzbekistan for 2003-2012 under which by 2005 Russia would buy 10 Bcm (preliminary figure for 2003 is 5 Bcm).

Under the 2001 general agreement between KazTransGaz and Uztransgaz[7] Uzbekistan pledged itself to deliver the needed volumes of gas to Kazakhstan on the agreed-upon prices. The Kazakh side failed to pay for gas deliveries on time and in 2003 had to cut down its purchases by half (under the agreement it bought 600 Mcm of gas paying up-front $40 per 1 thou c m of gas).[8]

Uztransgaz and the Kyrgyzgaz joint-stock company concluded a general agreement[9] on natural gas supplies in 2003 for the price of $42 per 1 thou c m. Under this agreement Kyrgyzstan was to pay for 45% of the total amount in material and technical resources and for the remaining 55% in hard currency. On average, Kyrgyzstan buys 600 to 650 Mcm of Uzbek gas every year.

It should be noted that the main gas pipeline, which connects the Ferghana Valley with Uzbek gas fields, goes across Tajikistan that receives for this service 640-650 Mcm of Uzbek gas every year. On top of this Uztransgaz pledged itself to supply the Tajikgaz state unitary enterprise with 100 Mcm (providing

[6] See: "Gazprom planiruet uvelichit pokupku uzbekskogo gaza;" "Britanskaia kompania v Uzbekistane."
[7] See: "ZAO 'KazTransGaz' zavershil peregovory s 'Uztransgaz'" [www/kaztransgas/press/jul2001/html], 2001.
[8] See: "Kazakhstan snizil napolovinu zakupki uzbekskogo gaza" [www.uzreport.com], 17 January, 2003.
[9] See: Ibidem.

there is up-front payment). Any violation of this condition is fraught with discontinuation of gas supplies until the debt is settled.

Under present agreements the Uzbek gas transportation system is used for gas deliveries from Turkmenistan to Russia; in 2000, the volumes of transit were about 2 Bcm,[10] in the near future it may reach 7 Bcm.

Oil and Gas Condensate

In January 2000, the volumes of oil,[11] including condensate reserves, were assessed at 5,060 Mt. Only 770 Mt of them were explored reserves; the proven reserves were even lower. The Kokdumalak deposit (the Bukhara-Khiva Region) today produces about 70% of extracted oil. The Ferghana Region comes second with about 20% of the deposits. The majority of 85 oil deposits are not rich at all. The richest deposits are concentrated in the Ustyurt Region, the total amount of which is estimated at 1,120 Mt.

The following daughter companies of Uzgeoneftegazdobycha are working in this branch: Mubarekneftegaz, Shurtanneftegaz, Djakurganneft, and Mingbulakneft.

Table 3

Crude Oil and Gas Condensate Production, and Oil and Petroleum Products Consumption and Import in Uzbekistan in 1992-2000 (*Mt*)

	1992	1995	1996	1997	1998	1999	2000
Production	**3.31**	**7.56**	**7.74**	**8.15**	**8.38**	**8.36**	**7.73**
Consumption	**8.74**	**6.95**	**6.83**	**7.6**	**7.11**	**7.34**	**7.33**
Import	**5.00**	**–0.47**	**–1.09**	**–1.25**	**–1.26**	**–1.02**	**–0.40**

Source: *Energy Balances of Non-OECD Countries 1999-2000,* 2002 Edition, IEA, Paris, 2002.

There are two old oil refineries in the country (in Ferghana and Altyaryk) and a new oil refinery in Bukhara (commissioned in 1997). Sour crude oil goes for refining to the Ferghana Oil Refinery. Since 1998 Japanese companies Mitsui and Toyo Engineering have been engaged in its modernization designed to build up desulfurization facilities; in 1999, a wet desulfurization plant was commissioned. Annual production capacity of the Ferghana Oil Refinery is 5.6 Mt. It was built to produce transmission and hydraulic lubricants out of local oil. The Altyaryk Oil Refinery can process 3.2 Mt of oil a year to produce various types of fuel. The first phase of the Bukhara plant with a capacity of 2.5 Mt/year processes condensate delivered from the Kokdumalak fields to produce high quality gasoline, diesel fuel and kerosene that meet the world standards.

The Bukhara Oil Refinery brought the republic's annual processing capacities to 11.1 Mt while the country extracts from 7.5 to 7.8 Mt a year.

[10] See: *An Energy Overview of the Republic of Uzbekistan*, U.S. Department of Energy, Energy Information Agency [www.eia.doe.gov], 2002.

[11] See: *Environmental Performance Review of Uzbekistan*.

Table 4

Output of Key Petroleum Products
(*thou tons*)

Product type	1998	1999	2000
Primary oil refining	**7,177**	**6,739**	**6,787**
Gasoline	**1,621**	**1,638**	**1,722**
including motor gasoline	**1,603**	**1,622**	**1,709**
Diesel fuel	**2,219**	**2,221**	**1,972**
Heating oil	**1,976**	**1,747**	**1,709**

Source: *Energetika v Respublike Uzbekistan 2000. Statisticheskiy sbornik,* Tashkent, 2001.

Gas Pipelines

Today, the republic has over 70 thou km of gas pipelines. The state-owned joint-stock company Uztransgaz exploits 13,980 km of pipelines, 23 compressor plants and 304 distribution stations.[12] The total length of main gas pipelines with the diameter of 720-1,420 mm (in one-line terms) is over 7,700 km. The transit stretch of the gas pipeline Central Asia-Center[13] can move not more than 40 Bcm. Technical conditions of the main line's Kazakh section[14] cannot move over 30 Bcm of gas. Itera of Russia and Intergaz Tsentral'naia Azia agreed to increase the gas pipeline's carrying capacity to 60 Bcm. Moscow and Ashghabad signed an agreement[15] on supplies of Turkmenian gas to Russia in the following volumes (Bcm): 2004—5 to 6; 2005—6 to 7; 2006—10; 2007—60 to 70; 2008—63 to 73; 2009-2028—70 to 80.

Obviously, these figures indicate that the transit stretch should be reconstructed to move these volumes of Turkmenian and Uzbek gas along the Central Asia-Center and Bukhara-the Urals pipelines. Moscow is contemplating another gas pipeline[16] Turkmenistan-Russia across the territory of Kazakhstan bypassing Uzbekistan. Its cost is estimated at $1 billion; with an annual capacity of 30 Bcm it can be commissioned late in 2006.

Coal Industry

The explored coal reserves are found in the Angren (the Tashkent Region), Baysun and Shargun deposits (the Surkhandarya Region) and are estimated at 1,900 Mt of which 1,850 Mt are brown coal (Angren deposits) and 50 Mt, bituminous coal (Baysun and Shargun deposits).

Coal is mined by the Ugol joint-stock company that comprises five enterprises. Three enterprises are working according to fundamentally different technologies: at the Angren deposit open cast mining is used; at Mine No. 9—underground mining; at the Podzemgaz station, the method of underground gasification is

[12] See: "Chisty dokhod 'Uztransgaza' za posledniy god sostavil $128.44m" [www.uzland.uz/2001/may/24.htm].

[13] See: "Prem'er-ministr Uzbekistana: 'Net nikakikh perspektiv uvelichit tranzit Turkmenskogo gaza cherez territoriu Uzbekistana'" [www.uzland.uz/2002/august/29/02.html].

[14] See: S. Smirnov, "Gazovye realii Kazakhstana" [www.kisi.kz/Parts/EconSec/07_03_01_smirnov.html].

[15] See: "Soglashenie mezhdu Rossiey i Turkmenistanom v gazovoy otrasli" [www.centrasia.ru/news2.php4?news=view&st=1050162600].

[16] See: "Gazprom" [www.petroleumjournal.kz/russian/artcles/news.html].

Table 5

Coal Production and Consumption in 1992-2000

		1992	1995	1996	1997	1998	1999	2000
Production	**Mtoe**	**1.66**	**1.08**	**1.00**	**1.04**	**1.03**	**1.05**	**0.91**
	Mt	**4.66**	**3.03**	**2.81**	**2.96**	**2.95**	**2.96**	**2.50**
Consumption	**Mtoe**	**2.18**	**1.07**	**1.20**	**0.98**	**1.03**	**1.02**	**0.88**
	Mt	**6.26**	**3.02**	**3.37**	**2.76**	**2.95**	**2.87**	**2.42**

Source: *Energy Balances of Non-OECD Countries 1999-2000,* 2002 Edition, IEA, Paris, 2002.

used to produce over 2 Bcm of gas every year out of brown coal. Two other enterprises use the method of underground mining. In 1990, 6.5 Mt were mined; in 2000, the amount of coal mined dropped to 2.5 Mt.

Combustible Renewable Energy Sources

It has been calculated that the amount of biomass and municipal waste that can be used in energy production is fairly large, yet so far the state structures prefer to ignore these sources altogether when compiling the country's fuel-and-energy balance; statistics pay no attention to them either.

The forests that cover 3.2 percent of the republic's territory are composed mainly of saxaul, juniper and Russian thistle; they are unproductive and understocked, therefore commercial felling in them is prohibited; only reforestation and non-commercial felling are allowed (between 1990 to 2000 from 50 to 80 thou c m were cut down every year).[17] No less than 50 to 80 thou c m can be obtained through sanitary felling in cities and countryside, that is, the republic can produce 100 to 160 thou c m every year, or about 30,000-40,000 toe.

Agriculture relies on irrigated land tilling; the larger part of arable land is taken by cotton, cereal crops, rice and potato. Stems and haulm are used as fodder or fuel. One hectare of cotton produces from 2.3 to 7 t of stems[18] (with natural dampness of 23 to 62 percent this amount corresponds to 2-4 t/ha of dried stems).[19] Their combustion heat is 18.0-18.8 MJ/kg that corresponds to 0.43-0.45 toe/t, or 1.33 toe/ha, on average.[20] In recent years cotton has been planted on about 1.5m ha, the energy potential of cotton stems is about 2 Mtoe, nearly two times as high as energy obtained from current coal consumption. It is very important to start registering biomass and use it as fuel.

Every year the republic accumulates about 6.5 Mt of solid municipal waste[21] (1.1 c m per capita), the density being 0.58-0.68 t/c m. Calorific power of waste varies by season—from 1,500 to 2,500 Kcal/kg—enough for continued burning. It has been calculated that 2.2 Mt of waste used as alternative fuel is economically feasible. An expected effect is equivalent to the use of 0.33-0.55 Mt of oil. Large regional centers and Tashkent, the capital of Uzbekistan, are especially promising in this respect.

The potential of combustible renewables is no less than 2.65-2.95 Mtoe.

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[17] See: *Pervoe natsional'noe soobshchenie Respubliki Uzbekistan v ramkakh konventsii OON ob izmenenii klimata. Faza 2,* Tashkent, 2001.

[18] See: T.A. Gemtos, Th. Tsiricoglou, "Harvesting of Cotton Residue for Energy Production," *Biomass and Bioenergy,* Vol. 16, No. 1, 1999, pp. 51-59.

[19] See: *Pervoe natsional'noe soobshchenie Respubliki Uzbekistan v ramkakh konventsii OON ob izmenenii klimata. Faza 2.*

[20] See: T.A. Gemtos, Th. Tsiricoglou, op. cit.; see also: H. Haykırı-Açma, "Combustion Characteristics of Different Biomass Materials," *Energy Convårsion and Management,* Vol. 44, No. 2, 2003, pp. 155-162.

[21] See: *Pervoe natsional'noe soobshchenie Respubliki Uzbekistan v ramkakh konventsii OON ob izmenenii klimata. Faza 2.*

Non-traditional Renewables

Water power resources are mainly concentrated in the Chirchik-Angren basin (33% of net potential); in the Ferghana Valley (24%), in the republic's southwest (34.8%) and in the Amudarya lower reaches (7.8%), over 100.0 TWh on the whole. Technical potential[22] is estimated at 21-27 TWh of which half belongs to small-scale hydropower plants (up to 30 MWh). Two hundred and fifty hydropower stations with the total capacity of 5,800-11,000 MW can be built on rivers, water reservoirs and canals. So far, there are only 31 hydropower stations with the installed capacity of 1,700 MW.

The republic has other renewable resources: for example, the sun shines[23] for 2,400-3,100 hours a year, its radiative balance being 6.0-6.7 GJ/sq m. The net potential of solar energy is estimated as 51 Btoe, its technical potential, at 177 Mtoe. Today, solar energy is mainly used for water heating; solar collectors are not industrially produced. Small batches of flat-plate solar water heaters are produced at a small enterprise Uzgeliokurilish. The total area covered by solar collectors[24] is not more than 24 thou sq m; in other words, the solar potential so far remains untapped which is explained not only by the low gas and electricity prices but also by the absence of a state program of renewable energy sources development.

A similar situation exists in the sphere of using the energy of wind. Its average annual speed in the country's valleys is 2-5 m/sec depending on season, in Karakalpakia and the Tashkent Region its velocity is 5 to 6 m/sec. So far, it is impossible to assess the technical potential of the most promising regions since the country lacks a network of meteorological stations able to collect and register information on the modern level that would meet the foreign investors' demands. Wind-power stations can be found in many areas in Denmark and in the north of Germany where wind velocity is the same as in Uzbekistan.[25] The net wind energy potential in our republic[26] is estimated at 2.2 Mtoe, while its technical potential, at 0.427 Mtoe.

Practically in all regions there are low-potential geothermal waters with an average temperature of 45.5°C, the warmest of them of 56°C are in the Bukhara Region, and of 50°C, in the Syrdarya Region. The potential has been estimated at 0.171 Mtoe yet the technical potential remains unidentified.

Further Development of Fuel Industry

The country has not yet acquired an energy program; there are its individual elements[27] that envisage three options of demand for energy. The first option—the demand under sluggish economic development and the absence of a possibility for the larger part of consumers to use energy-saving methods. Second—the demand under mobilization economic development that ignores the measures designed to save energy. Third—the demand under mobilization economic development, which involves new oil fields (in which geologists expected an increase in reserves) and introduction of energy-saving measures suggested by ministries, departments and individual enterprises.

Table 6 offers a forecast of the country's requirements till the year 2010 by energy type. The figures for 2000 are offered for comparison.

From this it follows that natural gas will be the main fuel even if its share drops. It should be said that by its Resolution No. 196 of 4 June, 2002 the Cabinet of Ministers approved a Development Program for Coal Industry for 2002-2010 under which coal mining is expected to reach the level of 9.4m tons while its share in energy production should grow from 4.7% in 2001 to 15%.

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[22] Ibidem.

[23] See: *Klimat SSSR. Nauchno-prikladnoy spravochnik po klimatu SSSR,* Issue 19, Gidrometeoizdat Publishers, Leningrad, 1989.

[24] See: R.A. Zakhidov, "Status and Prospects of Using Renewable Sources in Uzbekistan," in: *Proceedings of the International Congress "Business and Investment for Renewable Energy in Russia,"* Moscow, 1999.

[25] See: M.M. Kenisarin, "The State of Wind Power Development in the World," *Applied Solar Energy,* Vol. 38, No. 4, 2002.

[26] See: *Pervoe natsional'noe soobshchenie Respubliki Uzbekistan v ramkakh konventsii OON ob izmenenii klimata. Faza 2.*

[27] See: *Pervoe natsional'noe soobshchenie Respubliki Uzbekistan v ramkakh konventsii OON ob izmenenii klimata. Faza 1,* Tashkent, 1999; J. Mavlany, *The Energy Sector of Uzbekistan* [www.bisnis.doc.gov/bisnis/isa/011105uzenen1.htm], 2001.

Table 6

Forecasts of Fuel Demand till 2010

Type of energy	1990	2000 (forecast)	2000 (fact.)	2005	2010
Oil (Mtoe)	12.5	7.2-7.3	7.33	7.8-8.0	8.5-10.0
Coal (Mtoe)	3.4	1.05	0.88	1.5-1.6	2.0-2.1
Gas (Mtoe)	28.6	41.5-42.6	41.32	44.1-47.1	45.0-52.0
Electric power (billion kWh)	54.2	47.7-49.2	46.84	54.5-60.4	59.4-70.1
Thermal energy (PJ)	246	220-223	194	226-252	235-280

Sources: *Pervoe natsional'noe soobshchenie Respubliki Uzbekistan v ramkakh konventsii OON ob izmenenii klimata. Faza 1,* Glavnoe upravlenie gidrometeorologii, Tashkent, 1999; *Energy Balances of Non-OECD Countries 1999-2000,* 2002 Edition, IEA, Paris, 2002.

Economic Indicators

The fuel industry with 15.3% share in the total industrial volume is one of the key national economic branches.[28] The state enterprises are responsible for 97.5% (Table 7 shows the main economic indicators of fuel industry).

Book value of capital assets by the end of 2000 was 101.68 billion soum (the republic's monetary unit), the figure being greatly understated for lack of indexation for inflation of the previous years; this is clearly demonstrated by the comparison of the sizes of capital assets and investments in basic capital. On a cabinet's decision the capital assets of enterprises and departments were reassessed as of 1 January, 2001. When the process is completed their estimated value will be close to their real market value. The level of profitability will be considerably lower. In 2000, the price of products per 1 toe was: oil and gas condensate—733.3 soum ($1.52); gasoline, diesel fuel, heating oil and other oil products—24,567 soum ($50.81); natural gas—2,311 soum ($4.78); brown coal—14,066 soum ($29.09).

Table 7

Key Economic Indicators of Fuel Industry

Indicators		1998	1999	2000
Number of enterprises		30	28	28
Including:	oil producing	7	6	6
	oil refining	5	5	5
	in the gas sphere	8	10	10
	in the coal sphere	10	7	7

[28] See: *Energetika v Respublike Uzbekistan 2000. Statisticheskiy sbornik,* Tashkent, 2001.

Table 7 (continued)

Indicators		1998	1999	2000
Number of personnel, thou		19.0	19.4	19.9
By branch: oil production		2.9	2.2	2.2
oil refining		6.4	6.6	6.7
gas		5.5	6.3	6.4
coal		4.2	4.3	4.6
Oil production, gas condensate included, Mt		8.1	8.1	7.5
Primary petroleum refining, Mt		7.18	6.74	6.79
Natural gas production, Bcm		55.1	55.9	56.7
Coal production, Mt		2.95	2.95	2.50
End-of-year book value of capital assets	billion soum	73.15	88.72	101.68
	M USD	555.0	344.9	210.3
Investments in basic capital	billion soum	33.5	39.0	44.8
	M USD	253.2	151.6	92.6
Output value	billion soum	142.4	172.0	289.1
	M USD	1,080.4	668.7	597.9
Of it: oil producing industry, billion soum		4.6	3.6	5.5
oil refining industry		83.1	99.4	164.6
gas industry		48.8	59.7	106.1
coal industry		6.0	9.3	12.8
Capital productivity index (yield on 1 soum of capital assets value)		1.95	1.94	2.84
Fuel industry profit	billion soum	25.8	14.6	30.6
	M USD	195.7	56.8	63.3
Level of profitability, %		71.7	54.0	71.4
Share of fuel in production costs, %		8.6	8.7	7.0
Output price indices as of previous December, %		173.9	104.0	191.3
Deflator index, %		145.7	146.0	144.4
Average annual exchange rate, soum/USD		131.8	257.2	483.5
Wear and tear, %			19.0	23.1
Retirement of capital assets, %			4.0	4.9

Table 7 (continued)

Indicators	1998	1999	2000
The level of use of average annual power, %			
Primary oil refining	**64.5**	**60.2**	**64.6**
Coal	**67.7**	**91.8**	**66.3**
Gas processing at gas processing plants	**77.6**	**74.2**	**75.4**

Sources: *Energetika v Respublike Uzbekistan 2000. Statisticheskiy sbornik,* Tashkent, 2001; *Strategy for Uzbekistan: as approved by the Board of Directors on 4 March, 2003,* EBRD, London.

The table shows that the domestic prices for energy fuels are very much below the world level, which does not encourage application of the energy-saving measures in the country. The low prices on natural gas (as compared with coal prices) result in wastes of the republic's natural wealth.

Profit is another important index. In 2000, in the fuel industry it comprised merely 30.6 billion soum (nearly 50% below the investment level). This is obviously not enough for the branch's sustainable development: the capital intensity is very high while the industry needs rehabilitation.

2. Power Industry

The republic's power system (with half of the installed generating capacity) is part of the United Central Asia Power System (CAPS). Due to its geographic location and developed transmission network Uzbekistan can play an active part on the regional energy market. The installed capacity of the country comes from 37 power plants (11,200 MW), including thermal power plants with a total capacity of 9,800 MW and hydroelectric power stations with a total capacity of 1,400 MW. Its potential is equal to 56-57 billion kWh of electric power.[29]

Table 8

Electricity Generation in 1992-2000 (GWh)

	1992	1995	1996	1997	1998	1999	2000
PRODUCTION	**50,911**	**47,453**	**45,453**	**46,054**	**45,900**	**45,300**	**46,840**
Including the use of							
Coal, %	**4.89**	**3.45**	**4.02**	**4.08**	**4.09**	**4.77**	**3.98**
Oil, %	**6.87**	**11.23**	**11.16**	**11.91**	**11.91**	**9.16**	**11.27**
Gas, %	**75.90**	**72.28**	**70.45**	**71.47**	**71.46**	**73.53**	**72.21**
Hydropower resources, %	**12.34**	**13.04**	**14.37**	**12.54**	**12.54**	**12.55**	**12.54**
CONSUMPTION	**45,651**	**42,020**	**42,450**	**42,975**	**42,808**	**43 ,015**	**44 ,017**

Source: *Energy Balances of Non-OECD Countries 1999-2000,* 2002 Edition, IEA, Paris, 2002.

[29] See: "Neftegazovaia promyshlennost. Uzbekneftegaz;" for more detail, see: *Showcase Europe: Energy Guide for Uzbekistan.*

Electricity in Uzbekistan is derived primarily from thermal plants[30]: the Syrdarya (3,000 MW), Tashkent (1,920 MW), Novo-Angren (2,100 MW) and Navoi plants (1,250 MW) with 37 blocks with unit power of 150 to 300 MW. The thermal plants account for about 88% of power production; the rest is produced by hydropower plants. The thermal plants are mainly gas-fired (about 72 percent); 12 percent use heavy oil and coal.

Transmission and Distribution of Power

I have already written that Uzbekistan is part of the United Central Asia Power System; Uzbekistan owns 51 percent of its generating facilities, Tajikistan 15 percent, the Kyrgyz Republic 14 percent, Turkmenistan 11 percent, and Southern Kazakhstan 9 percent. The Unified Dispatch Center (UDC) located in Tashkent is responsible for maintaining the balanced and synchronized operation of the power transmission and distribution systems of the five Central Asian countries. The physical condition of hydropower plants and also of the CAPS and the UDC has deteriorated and requires considerable modernization.

The power transmission network of Uzbekistan includes over 230 thou km of power lines of all voltages and transformer substations of the total capacity of about 45m kVA. The main power lines with the voltage of over 10 kV are managed by Uzelektroset with structural components in all regions; 15 distributing and marketing companies are part of Uzbekenergo.

Development Prospects

In 2000, the republic produced 46,840 GWh of electric power (the figure for 1992 is 50,911 GWh). Population size increased from 21.4 to 24.8m over the same period, which says that per capita annual energy consumption dropped from 2,128 to 1,778 kWh. Uzbekenergo has offered a development program for the period between 2000 and 2010[31] which envisages, among other things, the construction of new generating capacities and modernization of the already existing ones (their total capacity being 1,379 MW) as well as commissioning new and reconstructing the already functioning distribution networks with the carrying capacity of 6,480 MW. It should be said that cost estimation was based on the foreign exchange rate $1 = 387.5 soum. As of 1 December, 2003 the exchange rate was 979 soum per $1 which brought the program's foreign exchange cost to about $1,568m (it is expected that foreign loans and direct investments from abroad will bring $855m).

According to the sluggish development option (see Table 6), in 2010, power production may increase to 59,400 GWh; to bring up by that time the per capita annual power consumption to the 1992 level (with the present rates of population growth) the republic should produce not less than 63,000 GWh, that is, power production should grow by 33.5%. This goal is hardly achievable with the planned net increase in power capacities by 1,379 MW and the present utilization ratio of the already commissioned capacities even if all new capacities are commissioned and the old ones are completely retooled.

Production and Consumption of Thermal Power

The republic annually spends about 5 Mtoe, or 10% of the total fuel consumption, to produce heat. Heat supplied to enterprises, the social sphere and homes comes from centralized sources (commonly used

[30] For more detail about thermal power stations, see: "Gosudarstvennaia aktsionernaia korporatsia Uzbekenergo" [www.uzenergy.uzpak.uz/eng/about-eng.html].

[31] For more detail, see: *Showcase Europe: Energy Guide for Uzbekistan*; J. Mavlany, op. cit.

Table 9

Key Economic Indicators of Power Production

Indicators			1998	1999	2000
Number of enterprises			84	71	68
Personnel, thou			38.9	40	40.2
Capacity of power plants, million kWh			11.726	11.726	11.702
Including:	thermal		10.017	10.016	9.992
	hydropower		1.709	1.709	1.709
Power production, billion kWh			45.9	45.4	46.9
Including:	at thermal stations		38.664	38.788	41.956
	at hydropower stations		7.270	6.584	4.908
Sold thermal power, million Gcal			41.8	39.4	39.7
End-of-year book value of capital assets		billion soum	36.76	42.78	52.52
		M USD	278.9	166.3	108.6
Investments in basic capital		billion soum	11.6	13.1	11.8
		M USD	88.0	50.9	24.4
Output value		billion soum	94.9	131.8	161.1
		M USD	720.0	512.44	333.20
Business profit in power production		M soum	11,656	15,175	–9,272
		M USD	88.44	59.00	–19.18
Capital productivity index (yield on 1 soum of capital assets value)			2.58	3.08	3.07
Share of fuel in production costs, %			71.3	73.9	76.2
Output price indices as of previous December, %			194.8	102.0	144.4
Deflator index, %			145.7	146.0	144.4
Average annual exchange rate, soum/USD			131.8	257.2	483.5
Wear and tear, %				27.7	28.5
Retirement of capital assets, %				4.3	3.8
Installed capacities' level of use, %	at thermal power plants		44.0	44.2	47.8
	at hydropower stations		48.6	44.0	32.7

Sources: *Energetika v Respublike Uzbekistan 2000. Statisticheskiy sbornik,* Tashkent, 2001; *Strategy for Uzbekistan: as approved by the Board of Directors on 4 March, 2003,* EBRD, London.

electric power plants; district and local boiler rooms) as well as from thermoelectric plants run by industrial enterprises and individual sources. Part of the heat consumed in the production and social spheres is generated by waste treatment plants and electric boilers.

Over one-third of generated thermal power is used for communal heat and hot water supply; the social sphere consumes nearly 17%; centralized heat and hot water supply is organized in nearly all cities, yet the system lacks controlling devices that lowers its efficiency and reliability: 4.5% of the total amount of heat supplied is lost in the mainlines that connect the sources and the consumers.

In industry, thermal power is used in oil refining and gas processing (about 15%), in chemical plants (about 3%), in machine building, in silk and cotton fabrics production, in food industry, in producing construction materials (including ferroconcrete products). Two-thirds of industrially used thermal power is generated by boiler rooms: there are over 75 thou of them in the republic equipped with different types of plants. Late in 2000, there were 1,186 boiler rooms with a capacity from 3 to 100 Gcal.

They belong to different departments while the largest of them (of over 100 Gcal/h) until 2001 belonged to Uzbekenergo. In 2001, the cabinet transferred all district boiler rooms to local administrations.

The designed efficiency of the largest and the most perfect boilers is 90-92%; their actual efficiency being 50-75%. I have already written that heat efficiency of the boiler rooms is not registered for lack of registering devices; the personnel measures efficiency with the help of water flow meters[32] with measurement error of over 5%. Only 0.04% of 70,000 industrial, agricultural and domestic consumers use meters. Even though large and mid-sized boiler rooms have high technical parameters their real efficiency is much below the standards because of depleted equipment. Smaller boiler rooms demonstrate 60-75% of efficiency while the absence of necessary water treatment and lack of smoke exhausters and ventilators cause intensified surface and internal corrosion of heating systems, and block distribution networks in mid-sized and small boiler rooms. The period of service of boiler pipes is shortened by half against the standard. The heating systems used for heat transmission and distribution are the most vulnerable components; the total length of communal heating systems (in two-line terms) is 3,495 km.

Economic Indicators of Power Production[33]

In 2000, the share of power production in the republic's industry was 8.5%.

In the same year the Finance Ministry and the Ministry of Power Energy raised electric power tariffs without adequate reasons, which made the branch unprofitable. According to my calculations, the cost of 1 kWh of electric power in 2000 was 2.54 soum ($0.005), of 1 kWh of thermal power, 0.90 soum ($0.002). I have already written that the book value of capital assets of power production (as well as in the entire industrial sphere) was underestimated. Only $24.4m have been invested in the branch's capital assets while the planned targets require at least $150m of annual investments. The country lacks internal resources to address the task successfully.

(*Concluded in the next installment*)

[32] See: *Pervoe natsional'noe soobshchenie Respubliki Uzbekistan v ramkakh konventsii OON ob izmenenii klimata. Faza 2.*

[33] See Table 9 on p. 136.