

POLICY BRIEF



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Contents:

1. Global and Regional Energy Perspective
2. Uzbekistan in the Global and Regional Energy Perspective
3. Primary Energy Resources
4. Electric Power Sector
5. District Heating and Hot Water Sector
6. Energy Conservation and Efficiency
7. Policy-Making, Regulatory and Operational Aspects
8. Energy Sector and Future of Uzbekistan
9. Conclusions and Recommendations
 - 9.1 Choices for Economic Reforms
 - 9.2 Choices for Institutional Reforms
 - 9.3 Recommended Policy Measures

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Options for Continuing Energy Reforms
in Uzbekistan

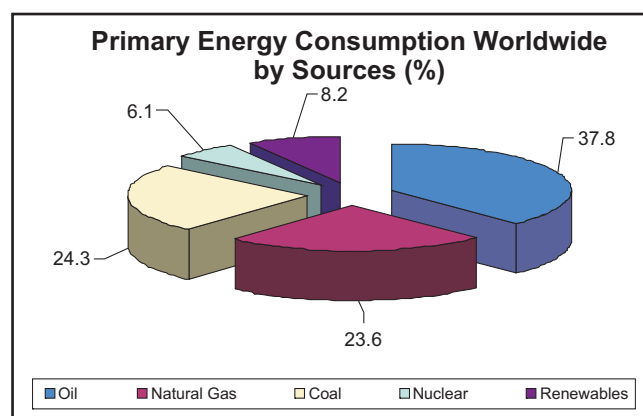
1. Global and Regional Energy Perspective

According to most estimates, world fossil fuel reserves make up more than 1 trillion barrels of oil, around 168 trillion cubic meters of natural gas and 1 trillion tons of coal. In addition, there are more than 3 million metric tons of uranium available for nuclear power. However, these resources are unevenly distributed across the world. For example, the developing world has a much greater share of natural gas reserves at 77 percent, oil reserves at 75 percent and coal reserves at 58 percent. Developing countries also possess 50 percent of global uranium reserves. By contrast, the developed countries have only 24 percent of the world's natural gas, 25 percent of the oil and 42 percent of the coal.¹

Currently, fossil fuels account for 85 percent of the world's primary energy consumption, with nuclear and renewable resources providing only 14 percent. Of this, more than 60 percent of all oil is consumed by developed countries, although the proportion of natural gas used is, at 55 percent, slightly less due to its widespread use in the CIS countries. The share of coal used by the industrialized countries is roughly 46 percent, as coal remains a popular energy source in many developing countries like China.

Developed countries are also key users of nuclear power, with 83 percent being generated in developed countries. Eastern Europe and the CIS account for 11 percent and developing countries for 6 percent. This situation is changing, however. According to International Energy Outlook 2006, produced by the EIA, world consumption of primary energy will grow by 33 percent by 2015 and by 71 percent by 2030, compared to 2003. Demand for oil is expected to grow from 111 million tons per day to 136 million by 2015 and up to 164 million by 2030. However, it is expected that the developing Asian countries will record the highest rates of demand growth: at least 3 percent a year on average.

Natural gas consumption worldwide is expected to increase by 2.3 percent a year on average up to 2025. This compares with worldwide oil demand growth of



¹ Global Energy Resources: an overview Resources for the Future. Background material for "Energy Resources and Global Development," Science 302 (5650), 28 November 2003. Resources for the Future, www.rff.org

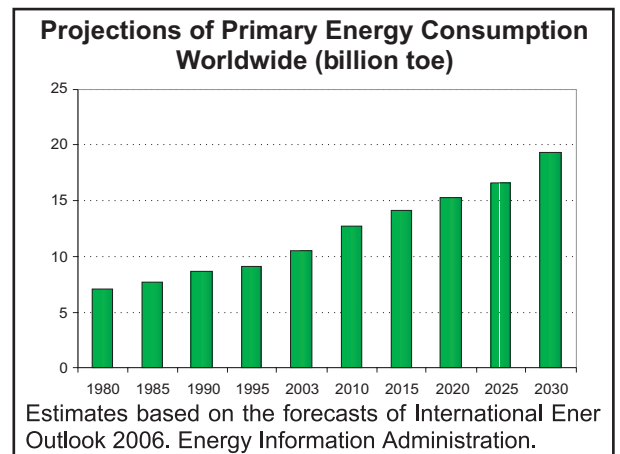


1.9 percent, while coal consumption will rise by 2 percent. In physical terms, the consumption of natural gas is expected to be 5.1 trillion cubic meters per annum in 2030, or a 70 percent increase on the 2003 figure. This means that its share of overall primary energy consumption will reach 23-25 percent. This is partly because consumption is expected to rise rapidly in developed European countries: by 2 percent per annum. This will create a demand for 670 billion cubic meters (bcm) by 2030, an increase of 34 percent in Europe alone, compared to 2003.

The demand in developing Asian countries is likely to grow even more rapidly. China is expected to see an increase in gas consumption of 7 percent per annum and India of 6 percent on average, from a low base. Both countries will have to meet up to 40 percent of their demand from imports by 2030. The average primary energy demand in developing Asian countries is expected to increase by 5 percent per annum.

Coal consumption is expected to nearly double by 2030, amounting to 10.6 billion tons, meaning that coal's share of the global energy balance will reach 27 percent by 2030, with China and India accounting for 70 percent of the growth in coal consumption.

The rate of economic growth in Asia is expected to be 5.5 percent per year up to 2030. This will have a substantial impact on the global energy environment and should create regional energy markets. In the period up to 2015, developing Asia will demonstrate the highest rate of demand growth for primary energy. It will account for 43 percent of the global increase in oil consumption, 73 percent of that of natural gas and 81 percent of that of coal.



This will have a significant impact on Eurasia and Central Asia, since China and India will both strive to gain access to its energy resources. Central Asia does not have the prominence in the global energy debate of, say, the Middle East. However Central Asian countries do have reserves of all kinds of primary energy resources, notably oil, gas, coal and uranium reserves. Given the lack of geological prospecting here, reserves may indeed increase. Furthermore, instability in the Middle East itself is already encouraging interests in Central Asian energy.

The Central Asian countries are actively continuing to develop their own energy capacity and export capabilities. These may play an important role in the future to cater for the energy demand in energy-scarce regions of Asia and elsewhere. Kazakhstan, Turkmenistan and Uzbekistan are producing and exporting oil and natural gas, by pipeline and as liquefied natural gas. In addition, Tajikistan and Kyrgyzstan both have substantial hydropower resources, which are currently under-utilized.

Kazakhstan has the highest potential for energy exports in the region. Total production of primary energy supplies, mostly oil, exceed 105 million tons of oil equivalent (toe), while domestic consumption is less than 50 million toe. The government of Kazakhstan intends to increase oil production to 178 million tons by 2015.² It is also planning to increase gas production to 40 bcm through its Caspian offshore production. The projected reserves of this project amount to 2 trillion cubic meters.³ In Turkmenistan, total production of primary energy is about 60 million toe, of which natural gas is roughly 50 million tons and oil about 10 million tons. Nearly 34 percent of natural gas and two-thirds of oil, including petroleum products, are exported. Kyrgyzstan and Tajikistan have much smaller supplies of primary energy reserves. Domestic production in Kyrgyzstan only covers half of the country's needs and more than 80 percent is provided by hydropower. In Tajikistan, energy is also generated mainly from hydropower, and its share is even higher than in Kyrgyzstan at almost 96 percent.

² Energy Information Administration, <http://www.eia.doe.gov/emeu/cabs/kazak.html>.

³ <http://www.newsru.com/finance/22may2006/kazgaz.html>.



Box 1. Energy Potential of Central Asian Countries⁴

Indicator	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan	Entire CA	Share of CA in world reserves, in percentages
Oil ^a , million tons	1 300	13	2	76	82	1 473	0.8
Natural Gas ^a , trillion m ³	1.82	- ^d	-	1.98	1.85	5.65	3.3
Coal ^a , billion tons	31	0.8	-	-	3.9	35.7	3.9
Uranium, thousand tons U ^b	816	-	-	-	116	932	19.7
Hydropower ^c , billion kW/hr	27	52	317	2	15	413	-

^a – proven fossil reserves;

^b – uranium that can be produced at a cost of less than \$130 per kg;

^c – technical capacity;

^d – reserves missing or very insignificant.

However, reserves are not the whole story. Central Asian countries are landlocked and have limited export capacity to reach worldwide markets. Currently, gas and oil exports mainly go through Russian pipelines. Consequently, expanding the capacity of Central Asia to export is directly related to the issue of bringing in investment for the exploration of new resources and the development of new deposits and export pipelines. Increasing the hydropower capacity of Kyrgyzstan and Tajikistan also requires substantial investment in developing generating capacity and energy infrastructure.

2. Uzbekistan in the Global and Regional Energy Perspective

There are more than 190 deposits of natural gas, oil, coal and gas condensate within Uzbekistan constituting the reserve base. Total reserves amount to an estimated 2.1 to 5.7 billion toe.⁵ Natural gas forms the largest reserve base, with proven reserves amounting to 1.8 to 2 trillion cubic meters.

In terms of production, Uzbekistan is the second largest gas producer within the CIS, while its share in world output is 2.3 to 2.5 percent. In the second half of the 1990s, Uzbekistan sharply increased its oil production, thereby reducing oil imports to zero, which previously had cost around \$485 million in 1995. However, oil production has somewhat subsided, and

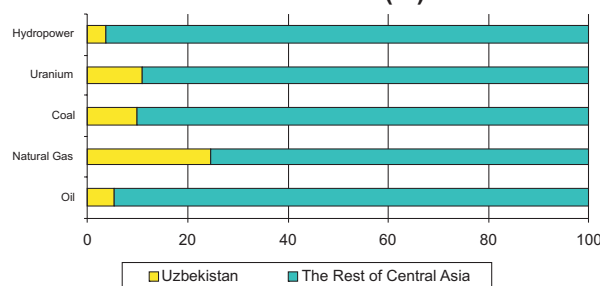
Uzbekistan imported some crude in 2005 to supply its own refineries. According to media reports, these oil imports increased in 2006.

Uzbekistan has significant coal reserves, but their production and utilization is still insignificant due to a lack of investment and economic inefficiency. Coal production has fallen by nearly 40 percent since 1992, while coal's share in the energy mix is now less than 2 percent.

Uzbekistan is among the top ten countries in the world in terms of uranium deposits and has both the technology and the capacity to produce it. The country is currently producing around 7 percent of the global output. The country also has a good potential for renewable energy, including hydropower, solar power, wind and biomass, but as yet, development is still minimal.

The total output of primary energy was estimated to be 55.7 million toe in 2003. Around 4.5 million toe were exported and about 1 million tons were imported. Electricity accounted for the bulk of these imports, whereas Uzbekistan exported approximately the same amount of power. In practice the net level of

Uzbekistan's Share of Primary Energy Reserves of Central Asia (%)



⁴ This table cites conservative estimates of energy reserves, disregarding projected reserves. The International Energy Outlook 2006, Energy Information Administration (EIA); Uranium 2005: Resources, Production and Demand, OECD publishing 2006; «Which dependency is better?» //Neftegazovaya Vertikal N°6, 30.04.2006.

⁵ Including: natural gas 1460-1622 mln. toe; oil 82-245 mln. toe; coal 586-1714 mln. toe



exports was not substantial, amounting to around 6.3 percent of output. Most of this was natural gas.

3. Primary Energy Resources

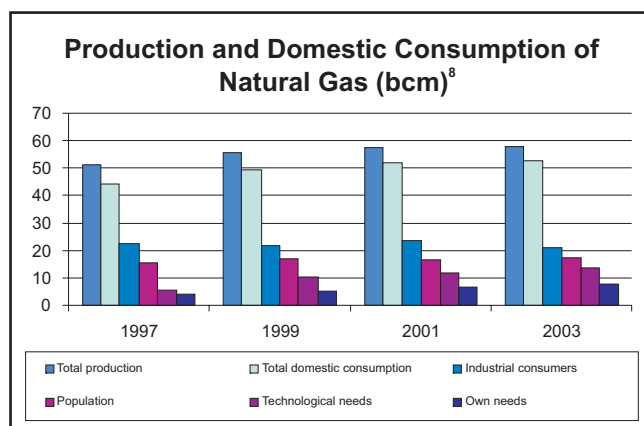
Natural Gas. Approximately 66 percent of proven natural gas reserves⁶ are concentrated in nine major deposits, of which eight are under development.⁷ According to official sources, in January 1, 2005, the potential level of reserves was as high as 5.9 trillion cubic meters. The most promising area is believed to be the Ustyurt region in the north-west of the country. Here Uzbekneftegaz National Holding Company is conducting geological prospecting jointly with Russia's LUKoil and Gazprom under a production sharing agreement (PSA). However, new reserves have yet to be confirmed.

The country's natural gas supplies overall are sufficient for 30 years at current rates of production. However, the deposits which currently provide 85 to 95 percent of current output will last for only 20 more years at the current rates of production. Natural gas production accounts for 85 percent of primary energy production. Its output increased by 45 percent during 1990-2004, moving from 38.1 to 55.8 bcm a year. At the end of 2005, output had reached nearly 60 bcm. In the first half of 2006 production increased by 3.1 percent, reaching 31.28 bcm.⁹

In recent years, 60 percent of natural gas output has been supplied to the UzbekKommunHizmat state agency.¹⁰ This is responsible for the gas supply to consumers. The household share in UzbekKommunHizmat's distribution stood at around 45 percent in 2002-2003, but fell to 41 percent in 2004, amounting to around 15.5 bcm. Uzbekenergo State Joint-Stock Company is the largest consumer of natural gas in the country, accounting for 35 percent of total consumption.

A relatively small amount of natural gas is liquefied or used in the production of propylene. Seven companies within UzbekNefteGaz Holding Company produce LPG (Liquid Petroleum Gas; a propane-butane mix), with the Shurtan Gas Chemical Complex and the Mubarek Refinery accounting for the bulk of production. According to official statistics, production of liquefied gases grew by 8 percent and amounted to 200,000 tons in 2005.

Currently, this level of production is sufficient for domestic demand, but insufficient for exports to neighboring countries. Current LPG exports are worth \$10 million, while propylene worth \$73 million was exported in 2005. The government intends to increase LPG production threefold, reaching a capacity of 615,000 tons per annum. A new \$64 million facility at the Shurtan gas and chemical complex is planned with an annual capacity of 180,000 tons of LPG and 100,000 tons of gas condensate.¹¹



⁶ Around 1.8 to 2 trillion cubic meters.

⁷ Shurtan, Kokdumalak, Zevardi, Alan, Pramuk, etc.

⁸ Based on the presentation of U. Nazarov, Director General of UzLITIneftgaz OJSC, Strategy of Developing Oil and Gas Sector of Uzbekistan and Sector's Transition towards Energy-efficient Course of Development, International Conference "Energy Markets of Central Asia: Trends and Prospects", Tashkent, December 6-7, 2005.

⁹ Uzbek oil, gas condensate production down in half-year. Interfax news agency, Moscow, 18 July 2006.

¹⁰ According to the Resolution of the President "On Measures to Improve Operation of UzTransGaz Joint-Stock Company", functions of maintaining gas distribution networks and supply natural gas to consumers was transferred to UzTransGaz JSC.

¹¹ Neftyanie Vedomosti, http://www.neftevedomosti.ru/news.asp?issue_id=80&news_id=224.



Propylene is produced at the Shurtan State Holding Company in a plant commissioned in 2001 to produce 150 types of polyethylene in high, medium and low densities. Its design capacity is 125,000 tons of polyethylene per year. The company also produced 137,000 tons of LPG, 130,000 tons of light condensate, 4.2 bcm of tank gas and 4,000 tons of sulfur. A second gas and chemical complex is planned at the Surgil gas condensate deposit in the Ustyurt region. It will cost \$1.1 billion and will be constructed by 2009. The project is envisioned as a joint venture for the production of polyethylene and propylene with a design capacity of 150,000 tons a year.¹²

Natural gas is exported to Russia as well as Kazakhstan, Kyrgyzstan and Tajikistan. However, the export volume was relatively low at 11.5 bcm in 2005. Of this, 8.15 bcm was supplied to Russia. The planned export volume in 2006 was 12.6 bcm, with Russia remaining the largest purchaser at 9 bcm and exports to Kazakhstan, Kyrgyzstan and Tajikistan reaching 3.6 bcm compared to 3.35 billion in 2005.¹³ Starting in 2007, Uzbekistan is planning to export 10 bcm to Russia alone and is planning to increase exports to 16 bcm by 2014 and to 20 billion by 2020.

On January 1, 2006, Uzbekistan raised prices to Kazakhstan, Kyrgyzstan and Tajikistan from \$42 to \$55 per 1,000 cubic meters (tcm). Gazprom is buying Uzbek gas at \$60 per tcm and paying for transit at the rate of \$1.1 per tcm over 100 kilometers. Starting from January 1, 2007 Uzbekistan increased the price of exports to \$100 per tcm.

Funding and investment in geological prospecting and surveying has fallen sharply since 1991. Consequently, the main effort has been on increasing production from existing fields. The geological structures to be surveyed are complex and require new technology. The main objective for the oil and gas sector is to ensure the future, by expanding reserves and facilitating their development, not least because of increasing export commitments. To this end, the Government is actively seeking production-sharing agreements with, among others, Russian companies. The aim is to launch the search for new fields. Meanwhile Russian import demand is being met with existing capacity.

According to the "Concept of Geological Surveying for Oil and Gas" produced by UzbekNefteGaz National Holding Company for 2005-2010, it is expected that hydrocarbon reserves will increase by 521.1 million tons of standard coal equivalent during the period. It is expected that more than half of this growth in reserves, or 54 percent, will be from the natural gas deposits in the Ustyurt region. Deep drilling of 144 promising sites is envisioned for 2005-2010. Of these, 74 will be in the Bukhara-Khiva area and 34 in the Ustyurt region. The remaining 34 will be in the Ferghana (18), Surkhandarya (10) and Gissar (6) regions.¹⁴ These are only forecasts, however. If this exploration and drilling effort is not completed, Uzbekistan's export commitments and, indeed, its own domestic demand will be hard to meet.

In the interim there are plans to reduce Uzbekistan's own consumption of natural gas down to 32 bcm a year by 2020, through energy efficiency measures. This process is absolutely necessary, if the country is going to sustain its export efforts.¹⁵

For technical reasons, natural gas use in the fuel industry itself and losses in the transportation and distribution system remain relatively high, far higher than in efficient systems where they are commonly only 2 percent. According to the assessment of local experts¹⁶, these losses are caused by both a technically outdated and elderly pipeline system as well as a lack of co-ordination among energy sector companies. However, implementing energy efficiency measures inside the industry itself, as planned for the period 2005-2010, will require

¹² Novosti Uzbekistana, №29 (311) 21 July, 2006, http://novostiuzbekistana.st.uz/29_311/v_strane.htm.

¹³ Uzbekistan will increase natural gas export by 10 percent in 2006. Oil and Gas Expert, April 16, 2006. <http://www.neftgazexpert.ru/neftgazline/neftgaztext10016.html>.

¹⁴ Shaymurotov T., director of IGIRNIGM OJSC. "State of Hydrocarbon Potential of the Republic of Uzbekistan and prospects of Increasing Oil, Gas, and Condensate Reserves", International Conference "Energy Markets of Central Asia: Trends and Prospects", Tashkent, December 6-7, 2005.

¹⁵ Majitov Sh., First deputy Chairman of Uzbekneftegaz NHC, "Uzbekneftegaz NHC in the Current Stage of Development and Its Prospects in relation to Energy Markets in Central Asia", International Conference "Energy Markets of Central Asia: Trends and Prospects", Tashkent, December 6-7, 2005.

¹⁶ Based on the presentation of U. Nazarov, Director General of UzLITIneftgaz OJSC, Strategy of Developing Oil and Gas Sector of Uzbekistan and Sector's Transition towards Energy-efficient Course of Development, International Conference "Energy Markets of Central Asia: Trends and Prospects", Tashkent, December 6-7, 2005.



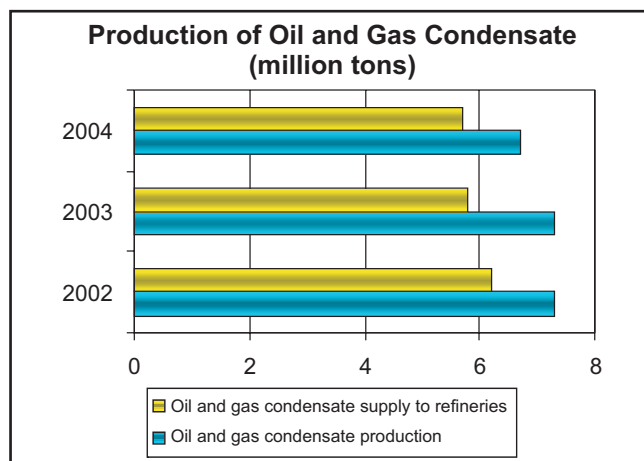
investments of \$650 million. This should reduce the natural gas consumption required for its own needs in production, refining, and transportation to 4.7 bcm a year.

Export opportunities are also hindered by the capacity of the existing gas transportation system, built by the USSR. This has not been modernized. However, according to statements by Gazprom, the company is willing to increase the transit capacity of Uzbekistan's gas pipeline network from 44 to 80 bcm per annum. This will increase the ability to ship gas from both Uzbekistan and Turkmenistan.

The program to improve the gas pipeline system started in 2005 with plans to increase natural gas exports to 16 bcm a year by 2010. It is planned to build 200 km of new export trunk lines, along with the new Sarimay gas compression station in the north-west. Twenty existing gas distribution stations and four gas-compression stations with underground gas reservoirs will be refurbished and expanded in capacity.

Oil and Gas Condensate. Proven oil reserves in Uzbekistan are estimated at 82 million tons. As of January 1, 2005, estimated potential reserves of liquid hydrocarbons were put at 817.7 million tons of oil and 360 million tons of gas condensate. The majority of the known oil fields are situated in the Bukhara-Khiva region, including the Kokdumalak deposit, which currently accounts for 75 to 80 percent of all oil production. There are other oil fields in the Ferghana valley, Ustyurt plateau and the Aral Sea basin.¹⁷

There was a major increase in oil reserves in the mid-1990s, when the Kokdumalak field was found. In general, discoveries have slowed since 1991, and by 2000, annual production had reached three times the growth of reserves. Existing oil reserves are sufficient for 20 to 23 years. However, most of the new deposits of liquid hydrocarbons are unlikely to stabilize production due to their small size and low yield.



In the 1990s, oil production sharply increased, from 3.5 million tons a year in 1990 to 9.7 million tons a year in 1998. This was followed by a period of declining production: 8.1 million tons in 1999, 7.3 million in 2002 and 6.7 million in 2004. Crude oil is 50 percent of hydrocarbon production. In the first half of 2006, Uzbekneftegaz NHC reduced output of oil and gas condensate by 10.7 percent or 2.62 million tons.¹⁸ This trend may well represent the future, as the Kokdumalak oil field has reached peak output and is now in decline. According to the experts, further efforts to increase production in this field are unlikely to reverse the trend.

The bulk of the oil is refined in three refineries, located in Ferghana, Altariq and Bukhara. The Bukhara refinery was commissioned in 1997, increasing total refining capacities to 11.2 million tons a year. However, due to decline in the production of liquid hydrocarbons, actual capacity use fell from 74 percent in 1998 to 66 percent in 2004. The production mix of the desired petroleum products has also been rather unstable. In the period between 2002 and 2004, the per annum production of gasoline hovered between 1.57 and 1.37 million tons, diesel between 1.7 million tons and 1.56 million tons, aviation fuel 0.35 and 0.21 million tons and jet kerosene 0.4 and 0.34 million tons.

Because refining technology requires a steady input stock, Uzbekistan has had to import crude oil since 2003. In 2006, these imports were expected to reach 450,000 tons. There are no oil exports beyond a small amount of petroleum products. For instance, Uzbekneftegaz NHC exports were worth \$770 million in 2005, with various petroleum products accounting for \$95 million.¹⁹

¹⁷ Central Asia Factsheet, Energy Information Administration, September 2005

[http://commercecan.ic.gc.ca/scdt/bizmap/interface2.nsf/vDownload/CABS_0022/\\$file/Centasia.pdf](http://commercecan.ic.gc.ca/scdt/bizmap/interface2.nsf/vDownload/CABS_0022/$file/Centasia.pdf).

¹⁸ Uzbek Oil, Gas Condensate Production Down In Half-Year, Interfax news agency, Moscow, 18 Jul 2006.

¹⁹ Uzbekistan is planning to increase purchase of oil in Kazakhstan, 10.07.2006. <http://www.press-uz.info/ru/content.scm?topicId=2633&contentId=7985>.

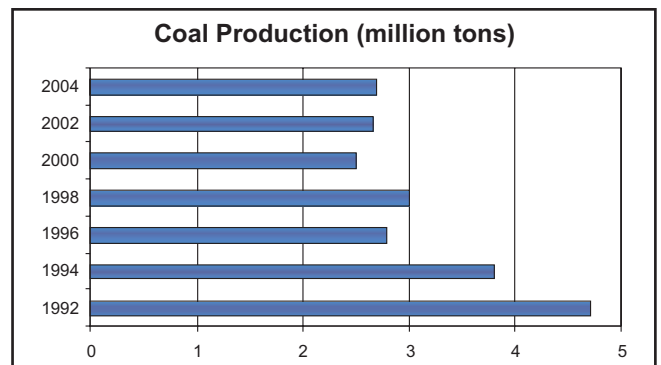


As with natural gas, the main objective of the oil sector for the foreseeable future is to increase the level of reserves. The "Strategic Program of Geological Prospecting Work for Oil and Gas in 2005-2009" was adopted in 2004, with targets to increase oil reserves by 60 million tons and condensate by 66 million tons. Oil reserves are set to increase most in the Bukhara-Khiva region.²⁰

According to estimates of total potential oil and gas reserves made by local experts, 70 percent of existing oil fields have been discovered already. These are largely shallow in the upper strata. The remaining fields are likely to require deep drilling and cost up to three times as much per field, since modern technology will be required to find and drill in the deeper productive strata.

Coal. Uzbekistan has 1.95 billion tons of proven coal reserves. The projected resources could in fact be as much as 5.7 billion tons. About 70 percent of all coal in Uzbekistan is brown coal or lignite.²¹ Black coal deposits are concentrated in the southern regions of the country, in the Surkhandarya and Kashkadarya oblasts. Currently, coal is produced from three deposits: Angren with 1.9 billion tons of brown coal reserves; and Shargun and Boysun with 50 million tons of black coal reserves.

While coal production increased from 2.7 million tons in 2004 to 3.2 million tons in 2005²², these figures are much lower than in the past. Coal's share in the overall energy balance fell from 5.6 percent in 1992 to 1.8 percent in 2004. Coal is produced by several companies using different technologies. Angrenskiy and Apartak are open pit mines.



Erostigaz OJSC uses underground coal gasification. The Shargun and Baysun black coal deposits, operated by the Shargunugol OJSC, are underground with shafts. Ugol JSC, which is part of the Uzbekenergo SJSC, produces the bulk of the coal, or 95 percent, with 80 percent of all coal produced from the Angren deposit.

Except for insignificant exports to Afghanistan, all coal is consumed domestically. The power industry consumes 90 percent of total coal production and 100 percent of underground gas.

The Program for the Development of the Domestic Coal Industry was approved by the Cabinet of Ministers on June 4, 2002. It envisages an increase of production to 9.4 million tons, as well as increasing the share of coal in power generation by 15 percent by 2010. It was planned to increase coal's share in the energy balance to 3 percent by 2005 as a substitute for oil and gas. This structural shift has yet to be achieved. The main reason is the significant price difference between coal and natural gas. Transferring industrial consumers from natural gas to coal also requires considerable investment and new technologies.

Uzbekistan is planning to invest \$254 million in its coal industry in order to increase production and reduce costs. Almost 90 percent of this effort will focus on the modernization of the Angren mine, increasing production to 7.8 million tons by 2010. The program is partially financed by Ugol JSC itself, as well as by seeking foreign loans and foreign direct investment.²³

Uranium. Uzbekistan is among the ten top countries with regard to uranium reserves. There are at least 25 uranium deposits, mainly in the central part of the country. Proven reserves of nearly 65,000 tons can be produced at a cost of \$80 per kg. In addition, there are a further 17,500 tons that can be produced at \$80-130 per kg and 47,000 tons that can be recovered at over \$130 per kg.²⁴

The main producer is the Navoi Mining and Metallurgy Combine, with a nominal operating capacity of 3,000 tons per annum.²⁵ During 2000-2005,

²⁰ "Underpinning for the Future", Neftegazovaya Vertikal, №6, 30.04.2006.

²¹ The bulk of coal produced is low calorific and high ash value, which makes it a relatively inefficient fuel.

²² Uzbekistan's coal output up 9.5 percent on year in January-April, Prime-Tass English-language Business Newswire, May 25 2006.

²³ The Mining Journal, November 12, 2004.

²⁴ Extract from the Survey of Energy Resources 2001, World Energy Council. <http://www.worldenergy.org/wec-geis/edc/countries/Uzbekistan.asp>.

²⁵ Ibid.



average annual production was 2,350 tons.²⁶ According to media reports, modernization of the operation in Navoi in 2004 enabled an increase in production.²⁷

Until 1992, all uranium mined in Uzbekistan was supplied to Russia, with the bulk of the material going to the Soviet Defense industry. Russia still remains the main buyer, but since 1992, exports have been handled by the US uranium broker Nukem Inc. Starting from 2007, Uzbekistan will supply uranium to Japan. An agreement between Uzbekistan and the Japanese Itochu Corporation was signed in 2006. It is also planned to attract Japanese companies to uranium exploration in Uzbekistan.²⁸

Russia is planning to increase imports, including from Uzbekistan. Projections for uranium demand in Russia suggest that it will need up to 18,000 tons by 2020. Russia's own output cannot meet this demand.²⁹ Hence, the plan to set up a Russian-Uzbek joint venture for developing the Aktau deposits is significant. With an investment of \$30 million, this joint venture will produce 300 tons of uranium a year. The Aktau deposits are estimated to contain around 4,400 tons.³⁰

In many respects, the production rate will depend on greater access to modern technology. A major consideration is to reduce further environmental degradation during future production. Present uranium production, including the operation at Navoi, depends on materials and equipment supplied by Russia. Although the country has had some success in localizing some of its production, Russia remains the major technology supplier in this sector.

Renewable Energy Sources. Uzbekistan has substantial potential in terms of renewable energy. The gross potential is believed to be around 51 billion toe but the practical capacity is nearer to 179 million toe using the most modern technologies. Even this exceeds the current annual volumes of production of fossil fuels by a factor of three.³¹

Solar energy is the most promising renewable technology for Uzbekistan. Gross solar energy capacity is estimated to be just below the 51 billion toe total renewable capacity. The actual capacity achievable is put at 177 million toe.³² Solar energy is accessible nationwide and its growth in the energy balance would facilitate a rapid resolution of the problem of public access to electricity and heating, with the capacity to deliver power at remote locations.

Currently, the only renewable with some share in the energy balance of Uzbekistan is hydropower. Despite their potential, the use of other renewables is insignificant. The potential for hydropower resources is estimated at 88 billion kWh or 9.2 million toe. The technically feasible amount is 27.4 billion kWh or 1.8 million toe, of which only 30 percent is used. The Program for the Development of Small-Scale Power Generation envisages construction of 15 small hydropower plants with a total capacity of 420 MW and an annual production of 1.3 billion kWh.³³ If the potential for small hydropower were fully realized, it could run the entire pumping stations and water transportation systems of the Ministry of Agriculture and Water Management.³⁴

Box 2. Potential of Renewable Energy in Uzbekistan

Potential	Total (million toe)	including (million toe)			
		Hydro	Solar	Wind	biomass
Gross*	50,984.6	9.2	50,973.0	2.2	-
Technical**	179.0	1.8	176.8	0.4	0.3
Developed	0.6	0.6	-	-	-

* theoretical volume of energy incoming or formed in the area.

** part of gross potential, which may be realized using existing technologies.

²⁶ Uzbekistan Profile, Nuclear Threat Initiative, <http://nti.org>.

²⁷ Uzbekistan's uranium output up 14 percent on year in 2005, Prime-Tass Business News Agency, May 2, 2006.

²⁸ Uzbekistan to start exporting uranium to Japan in 2007. Uzreport. November 2, 2006.

²⁹ Russia mulls uranium production abroad – official, RIA Novosti, April 10, 2006.

³⁰ Russian cos, Uzbekistan to set up uranium production JV 2006, Prime-Tass Business News Agency, May 2, 2006.

³¹ UNDP Project Report "Review Study to draft National Strategy for Development of Renewable Energy in Uzbekistan, 2006.

³² In the meantime, a detailed map of solar radiation distribution nationwide has not yet been drawn up.

³³ B. Teshabaev, first Deputy Chairman of the Board of Uzbekenergo SJSC, "Power Industry of Uzbekistan: current state, prospects for development, and investment climate", International Conference "Energy Markets of Central Asia: Trends and Prospects", Tashkent, December 6-7, 2005.

³⁴ Technical Assistance to the Republic of Uzbekistan for Off-Grid Renewable Energy Development, September 2003 (Financed by the Government of Denmark) Asian Development Bank TAR: UZB 37107.



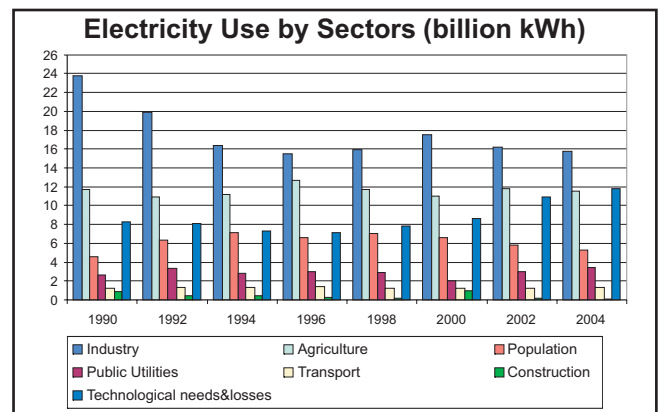
The electricity supply in Uzbekistan is quite erratic in rural areas of the country, where 60 percent of the population live. This requires the modernization and development of the transmission grids. The development of renewable energy would free many remote locations from grid connectivity, ensuring reliable supplies while also reducing the country's significant transmission losses.

The program put together by the Government of Uzbekistan for the power industry envisaged expanding the use of renewable energy by 1 to 2.5 percent by 2005-2010, but this has not been fully implemented. There is a lack of a clear policy. The current low prices for traditional energy sources - especially for natural gas - make renewable energy economically unattractive in Uzbekistan. These prices have to rise in order to create the proper investment environment for renewable energy. In all countries where renewables have some share of the energy market, the governments employ a comprehensive policy of tax breaks, investment preferences, subsidies, etc. for research, development and production of renewable energy. Uzbekistan needs to start on that path as well.

4. Electric Power Sector

Demand. The power sector in Uzbekistan is facing major challenges. While power demand from industry has fallen by 17 percent since 1990, technical needs and losses have risen by 8.5 percent over the same period. In effect, more electricity is currently being lost than is being consumed by any sector other than industry. Power losses are larger than the entire household market. Equally, these losses are accelerating and amounted to approximately 22 to 23 percent of total supply in 2004.

This creates a rather distorted picture. While gross electricity demand appears to be rising, reaching 48-49 billion kWh in 2004, in fact electricity consumption since 2000 has actually fallen by 4.5 percent averaged out across the sectors. Technical needs and losses are now the second largest call on power production in the country. In 2004, industry used 42 percent, agriculture 21 percent, households 14 percent, utilities 9 percent, transport 3.5 percent and construction 0.3 percent. To have such a significant level of losses at 22-23 percent is worrying in the light of Uzbekistan's GDP growth rate of 7 to 8 percent. It is certainly vital that the annual percentage growth rate of this category should be slowed.



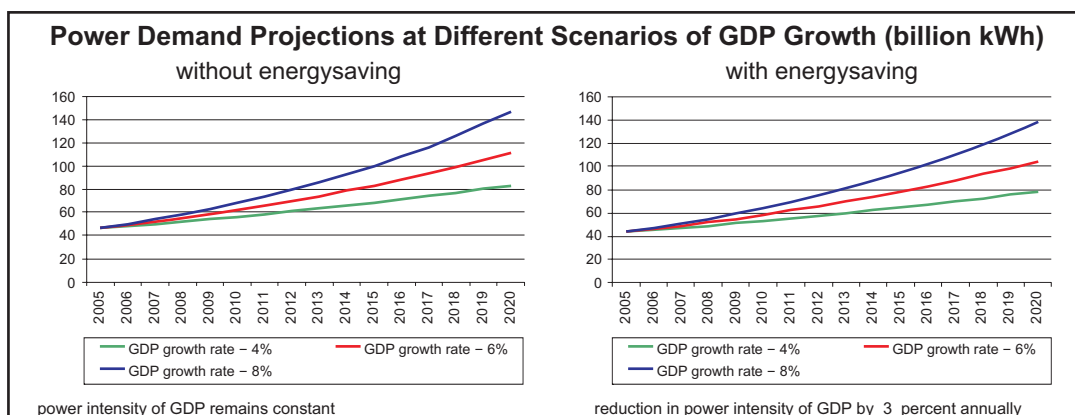
The implications are clear from the data. Electricity demand is significantly correlated with economic growth. Using scenarios, the potential impact can be estimated. For example, assuming that the present energy intensity will continue in the future:

- An annual growth in GDP of 4 percent a year will require an electricity demand of 53 billion kWh per annum in 2010 and around 64 billion kWh in 2015
- An annual growth in GDP of 6 percent a year will require an electricity demand of 58 billion kWh in 2010 and 78 billion kWh by 2015
- An annual growth in GDP of 8 percent a year will require an electricity demand of 64 billion kWh in 2010 and 94 billion kWh by 2015

In effect, under a business-as-usual scenario, power demand will almost double in eight years, given existing GDP growth rates, unless energy intensity is reduced. If an improvement in energy efficiency of 3 percent per annum could be achieved, these figures would be substantially reduced:



- An annual growth in GDP of 4 percent a year would require an electricity demand of 45 billion kWh in 2010 and around 47 billion kWh in 2015;
- An annual growth in GDP of 6 percent a year would require an electricity demand of 50 billion kWh in 2010 and 57 billion kWh by 2015;
- An annual growth in GDP of 8 percent a year would require an electricity demand of 55 billion kWh in 2010 and 69 billion kWh by 2015.



The lesson here is an obvious one. Unless the electricity industry curbs its losses and the country achieves greater energy efficiency, it will need to build a considerably higher electric power generating capacity. This, in turn, will probably require a reduction in gas exports or an increase in power imports from the United Energy System of Central Asia.

Moreover, we have to note that the industrialization of Uzbekistan to ensure sustained growth rates will tend to increase the energy intensity of the economy. Also, as time goes on, more of the rural population (currently, 64 percent of the total population) will be urbanized, which also would tend to raise the energy intensity. Therefore, it is very important to modernize the power systems, minimizing the inefficiencies and the various losses. Otherwise, the country will have to invest very large amounts to generate high power loads, perhaps eventually becoming dependent on imported fuel.

Supply. Total installed capacity in Uzbekistan is currently 12,300 MW. Of this capacity 10,620 MW is from thermal plants: 77 percent gas, 7 percent oil and 3.5 percent coal. The rest is hydropower, producing around 12 percent. The thermal units are rather large, with Syrdarya at 3,000 MW, Novo-Angren at 2,100 MW and Tashkent at 1,860 MW. In effect, 56 percent of capacity is accounted for by these three major thermal units. The two coal-fired units are close to the Angren coal mine. The largest hydropower station is Charvak at 620 MW.

The grid is extensive, with a total of 234,000 km of power lines, reaching nearly all consumers and interconnecting with the country's neighbors through the Central Asian grid. At present, there are problems meeting both winter and summer peak demand. The winter deficit in capacity is, for example, 800-900 MW.³⁵ While this winter deficit is made up by the Central Asian grid, a built-in deficit of 6.5 percent capacity is dangerous for system stability. It makes the assumption that the Central Asian Grid will continue to provide the necessary peaking capacity in the future.

Supply-Demand Matching. Uzbekenergo SJSC is currently working on a program to expand output up to 61-62 billion kWh per annum, which is clearly needed. However, increasing power output puts a strain on Uzbekistan's remaining hydrocarbons.

Around 75 percent of electricity is generated by burning natural gas. To produce 62 billion kWh of electricity – rather less than the 8 percent GDP business-as-usual scenario will require an additional amount of 8 bcm of gas a year or 6.5 million toe a year. Indeed, forecasts for the economy as a whole suggest that demand in the whole economy for primary energy may reach 68 million tons of oil equivalent by 2010 at a GDP growth rate of 8 percent.

³⁵ Technical Assistance To The Republic Of Uzbekistan For Off-Grid Renewable Energy Development, September 2003 (Financed by the Government of Denmark) Asian Development Bank TAR: UZB 37107.



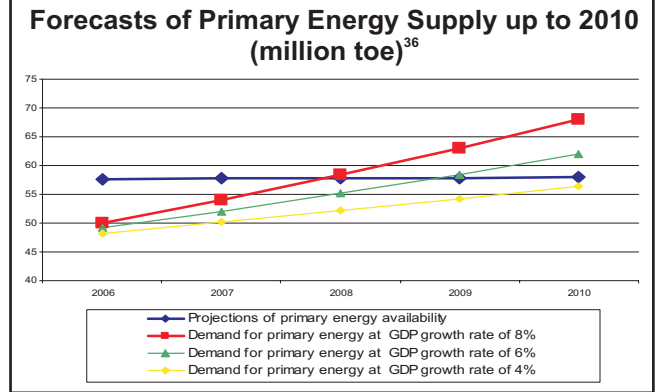
Local experts suggest that the primary energy supply is likely to be of the order of 58-60 million toe by 2010. Even with the energy efficiency program in place, this would imply a deficit of 3-4 million toe by 2009-2010. Hence, the provision of electricity supply cannot be considered independently of Uzbekistan's overall hydrocarbon resources.

Technological Issues.

Most of the existing generating capacity was built in the 1960s and 1970s. Today, around one-third of the installed capacity is over 30 years old. By 2010, two-thirds of the generating capacity will be 30 years old or older. A rough estimate indicates that \$3 billion is needed for the development of the power industry up to 2020-2025.

Uzbekenergo SJSC is implementing a Program for the Development of the Power Industry until 2010. The main focus of this program is the rehabilitation and upgrading of existing generating capacity by introducing modern technologies to create greater capacity and increase output.

Currently, the construction of additional large generating plants on new sites is not envisaged. The program envisages adding 1,700 MW of generation capacity and the construction of 220-500 kV transmission lines plus new substations, amounting to 800 km of new lines and new transforming capacity of more than 2,400 MVA (Megavolt-Amperes). However, given difficulties in obtaining investment funds, the deadlines for implementing this program are likely to be delayed until 2015. Consequently, economic growth may be threatened because existing generating capacity may be inadequate to meet growing demand.



Box 3. Activities of Uzbekenergo SJSC for Modernization of Generating Capacity up to 2010

Total expenditures for implementing the Program are assessed at \$1.2 billion. These include:

- \$200 million: rehabilitation and modernization of generating capacity
- \$600 million: modernization of four generating stations (Tashkent and Navoi TPP, Mubarek and Tashkent CHPP) by implementing modern gas turbine and combined-cycle plant technologies
- \$400 million: rehabilitation and development of power networks.

The program financing will be 40% by the companies themselves and 60% in foreign loans and investments. Modernization works at Tashkent TPP were started by preferential loans (\$196 million) from Japan. The project envisions implementation of a highly efficient 370MW combined cycle plant.

Modernization of Navoi TPP by implementing a 340MW combined cycle plant is in the pipeline. Project implementation is planned for 2007-2010. Preliminary cost is estimated at \$270 million, to be met by Uzbekenergo SJSC and funds borrowed from international financial institutions.

In 2001, there was a feasibility study of rehabilitating Mubarek CHPP (combined heat and power plant) by implementing modern 100MW gas turbine devices. The estimated cost is \$103 million, with implementation during 2007-2010.

A draft feasibility study for upgrading Tashkent CAPP with an 80 MW gas turbine for combined generation of electricity and heat energy is underway. The project will be implemented over 2006-2009 with a \$98.5 million loan from the Japan Bank for International Cooperation (JBIC).

Projects for Modernization of Tashkent and Navoi CAPP envision construction of a separate additional source of generating capacity, which significantly enhances the reliability of supplying power to consumers, reducing pollution, and saving over 800 million cubic meters of natural gas annually after 2010.

The Program for Development of Small Scale Hydro Power Generation envisages 15 small-scale hydropower stations with total installed capacity of 420MW and annual electricity output of 1.3 billion Mwh.

Economic Issues. The key issue in economics of the power industry, as well as in the oil and gas business, is the enduring cross subsidies that keep the prices low. This flawed tariff policy led to huge losses in the electricity sector in the early 2000s, effectively making the industry incapable of financing maintenance, modernization or new capacity.

However, electricity tariffs to all consumer groups are being increased lately. Average tariffs grew by more than 150 percent in 2004 alone. Current tariffs,

³⁶ Estimates based on the presentation of U. Nazarov, Director General of UzLITneftgaz. "Strategy for Development of Oil and Gas Sector of Uzbekistan and Transition of the Sector towards an Energy – Efficient Course of Development", International Conference "Energy Markets of Central Asia: Trends and Prospects", Tashkent, December 6-7, 2005.



amounting to \$0.03 per kWh, now cover the costs of generation, transmission and distribution, and there are no loss-making companies. Nonetheless, current prices do not cover the long-run marginal costs in the sector, rendering it incapable of meeting its investment needs in the long run. According to estimates by the World Bank, long-run marginal costs vary from \$0.035 to \$0.0403 per kWh.³⁷

Furthermore, the positive impact of rising electricity tariffs is limited because of accumulated and increasing arrears. These outstanding amounts for consumed electricity, natural gas and oil seriously undermine the financial health of energy producers.

Structural Issues. Since 2001, the power industry has been under the umbrella of Uzbekenergo SJSC, a joint stock company which includes Uzbekugol OSJC, a coal company. The generating companies have been transformed into joint-stock companies and partially privatized. Ownership of six of the ten thermal power plants has been changed by making them OJSCs. The remaining four will also be made OJSCs by 2008.³⁸ The corporate structure of power transmission and distribution functions has also been revised. Uzelektroset has been in charge of transmission. All the regional distribution and sales companies have been turned into OJSCs.

The Government owns 100 percent of Uzbekenergo's shares as well as holding 51 to 60 percent of the shares in the thermal power plants, distribution/sales companies, construction/ manufacturing companies and Ugol OJSC. There are no foreign or private capital holdings in any of the energy companies. Consequently, the Government still controls the entire power sector throughout generation, transmission and distribution. This monopolistic structure prevents the development of healthy competition in power generation and sales.

The centralized system of both collecting payments and distributing investment funds has been retained since independence. To an extent, that may be justified to concentrate financial resources needed for investment. However, it does not provide any incentive for the individual companies to improve their technical or managerial performance, without which the country cannot get due return for its investments in the power sector.

5. District Heating and Hot Water Sector

Hot water supplies and heating for businesses and households are provided from power stations, district heating plants and independent sources. The latter include heat and power plants of industrial companies and local boiler houses, which service individual residential blocks.

The main suppliers of heating are local boiler houses, which account for two-thirds of the total output.³⁹ There are more than 7,500 of these, with differing capacities, holding some 25,000 individual boiler units of various types and designs. As of the end of 2000, there were 1,186 boiler houses with capacities ranging from 3 to 1,000 Gcal/hr.⁴⁰ Around 25 percent of the heating and hot water supply is provided by Uzbekenergo SJSC. 30 percent comes from district heating and power plants owned by oblast khokimyats and 45 percent from boiler houses owned by rayon khokimyats.⁴¹

Approximately 5 million toe is used for heating in Uzbekistan annually, accounting for 10 percent of the total fuel consumption in the country. Natural gas is the main fuel, although there are a small number of coal-fueled boiler houses. Timber is used for heating in the more remote, rural areas.

District heating is well developed in all the major cities. The system is simple though inefficient. According to official data, the design efficiency for the major

³⁷ Martin Raiser. "Issues of Enhancing Energy Efficiency in Uzbekistan." Conference on Sustainable Development and Environmentally Safe Operation of the Energy Sector of Uzbekistan prospects and problems, September 20-22, 2005. Tashkent, Uzbekistan.

³⁸ Earlier all generating companies were part of the Ministry of Energy and Electrification, which was dismantled in 2001.

³⁹ Industrial sector of the Republic of Uzbekistan, 2003. Goskomstat, Tashkent, 2004. Booklet of Uzbekneftegaz National Holding Company for 2003-2004.

⁴⁰ Ibid.

⁴¹ Technical Assistance To The Republic Of Uzbekistan For Energy Needs Assessment, December 2002, Asian Development Bank, TAR:UZB 36382.



boilers should be 90-92 percent, but in practice it is closer to 50-70 percent, while the smaller boiler houses have a design efficiency of only 60-75 percent.

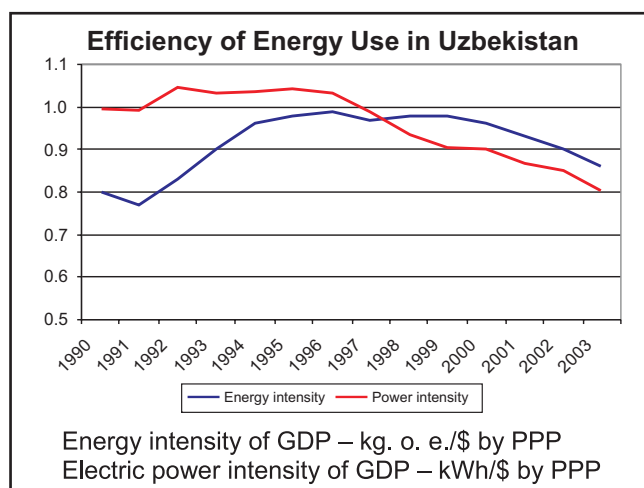
The situation is made worse by the fact that household components of the heating system in nearly 30 percent of homes are at the end of their design life - a figure that is likely to grow in the coming years. As a consequence of all the above, decentralizing the heating systems with independent and smaller heating devices is under discussion. That should reduce the risk of breakdowns in the heating supply across wide areas and enhance overall efficiency with the use of modern boilers – and equally important, reduce heating losses in transportation.⁴²

However, the heating companies are not able to finance the required maintenance or modernization. Tariffs for hot water and heating are subsidized at rates of 40-50 percent. Regulated prices for heating services and the limited ability of many consumers to pay for the full cost of these services necessitate the central government's investment support.

6. Energy Conservation and Efficiency

Uzbekistan is one of the least energy-efficient countries in the world. Unreasonably low prices for gas, oil, coal and electricity fail to motivate corporate and household consumers to conserve or improve energy efficiency. As a result, the power intensity of the economy in 1991-2000 increased by 12 percent, from 0.87 to 0.98 kg of oil equivalent/\$. This exceeds the power intensity of many developing countries by 200 to 250 percent.

The gradual price liberalization in the energy sector, which started in 2001, fostered an overall energy efficiency increase of the economy. The impact of price increases has been complemented by administrative legislation on energy use in natural gas, electricity and heating and a more determined follow-up for payments from consumers. A campaign has begun to install meters for consumers of natural gas and hot water, contributing to greater efficiency. Total energy intensity of GDP decreased from 0.96 in 2000 to 0.86 kg of oil equivalent/\$ in 2004. The electric power intensity of GDP fell from 0.9 in 2000 to 0.8 kWh/\$ in 2004.



Yet price increases and administrative measures can only have a limited effect. The sector is plagued by larger issues:

1. The corporate structure of the energy sector is not conducive to conservation or higher efficiency;
2. The legal framework for energy efficiency is inadequate, while the law "On Rational Energy Use" is not enforced directly and requires either revision or the development of additional by-laws;
3. The infrastructure is already old and aging fast, without the necessary maintenance or modernization;
4. The lack of indigenous modern technology and funding sources leads to an attention deficit for energy efficiency projects in both the energy sector and the country as a whole; and
5. The energy market is far from being competitive, and true private sector involvement is negligible. This over-centralization deprives energy producers of any incentive to cut costs.

⁴² UNDP. Report on Component 1 of the Project "Review Study to draft National Strategy for Renewable Energy Development in Uzbekistan". Ramboll Company, 2005.



The impact of the above prevents the sustainability of sporadic initiatives in energy efficiency.

There are various estimates of the potential energy savings in Uzbekistan. Some experts estimate that energy use could be reduced by as much as 40-50 percent without slowing economic growth or reducing public comfort. In fact, the energy sector itself can account for more than one-third of the potential savings. Another third could be in industry, 20 percent in agriculture and the utilities, and 10 percent in the transportation sector.⁴³

According to the Energy Efficiency Program up to 2010, over 50 percent of potential energy savings is in the household and utilities sectors. The Program was not adopted by the Cabinet of Ministers, but its main provisions were accepted for implementation.

The majority of experts agree that substantial financial resources and the adoption of new technologies will be required for increasing energy efficiency in industry and other sectors of the economy. Not the least of these will be in the metering of energy consumption.

In general, energy efficiency should become one of the key issues for Uzbekistan and a focal point of national interest. Achieving improved efficiency reinforces energy supply security and improves the nation's economic and political independence. While one of the key measures in promoting energy efficiency is raising prices for electricity, natural gas and oil, the authorities should also bear in mind the low disposable income of a large percentage of the population and also focus on:

1. Improving energy tariffs and the measurement of consumption;
2. Changing the corporate structure of the energy sector to make it more market-oriented;
3. Supporting wider dissemination of information about new energy-efficient technologies; and
4. Moving to modern standards in the production and consumption of energy.

7. Policy-Making, Regulatory and Operational Aspects

A major success in Uzbek energy policy is the achievement of self-sufficiency through sharply increasing primary energy production. While Uzbekistan imported 20 percent of domestic consumption from abroad in 1991, by 1995 the country had become a net exporter. The stable supply of domestic primary energy has enabled it to sustain highly energy-intensive industries such as ferrous and non-ferrous metal processing, chemicals, and agriculture.

It has also had a favorable social impact through quite low prices. Official statistics put access to natural gas by the population at 81 percent in 2005, with 95 percent of urban residents and 74 percent of rural dwellers having access.

Tax collection in the energy sector has contributed around 40 percent of Government revenues, thereby financing many social goods and services. The energy sector has also played a major role in providing hard currency revenues, as its share in export revenues grew from below 5 percent in 1991 to 15 percent in 2004.

For many years, energy companies have acted as quasi-fiscal institutions. They provide a wide spectrum of direct and cross-subsidies to industry and households, mostly by maintaining average prices lower than international tariffs and allowing long grace periods on payments.

However, the focus on energy self-sufficiency and the increasing production of fuels has prevented Uzbekistan from implementing some important priorities. For example, diverting resources to expanding the production of gas and oil resulted in dwindling reserves due to greatly reduced exploration and development of new fields. As explained above, today the companies lack the financial resources to embark on further exploration and development.

⁴³ H. Abdullaev, T. Nasyrov. "Energy Conservation and the Energy Strategy of Uzbekistan." http://www.unescap.org/esd/energy/publications/finance/part4_uzbekistan.html.



Box 4. Main Directions of Uzbekistan's Energy Policy

Current energy policy is primarily based on the "Main Directions of Energy Strategy of Uzbekistan in the period up to 2010," approved in 1995. The "Program for Energy Sector Development in the period up to 2010" was developed in 1999 as a framework document of the energy sector and oil and gas development subprograms. Long-term Development Programs of the Power and Coal Industry for the period up to 2010 were adjusted and approved in 2000-2001.

Government policy priorities in the energy sector according to the "Main Directions of Energy Strategy of Uzbekistan in the period up to 2010" are:

- Provide a sustainable supply of fuel and energy resources with prioritized focus on social needs, by creation of a reliable raw materials base and support to strategically important industries, quite well-developed mining, production, recycling, transportation and distribution systems;
- Enhance efficiency of energy resource use and create essential conditions for the implementation of energy conservation measures enabling energy self-sufficiency of the country and enhancing export potential;
- Promote economically sound diversification of energy supply sources to increase the share of coal, the use of renewable and non-traditional energy sources and development of small-scale hydropower systems;
- Maintain the financial stability of energy sector and bring in additional investments to the sector;
- Develop a regulatory framework and improve the financial and tax system considering the specifics of price formation and relationship of the energy sector with relevant sectors;
- Gradually nurture a competitive environment through a combination of methods of direct and indirect government regulation of the energy sector and form a government-controlled energy market;
- Establish full-fledged participants in the energy market and market infrastructure.

Another downside has been the absence of diversification. The whole economy came to be dependent on natural gas, which has been produced at maximum capacity for the past dozen years. The share of renewables and coal in the energy balance remains very low.

Also, the objective of reducing the power intensity of the economy has not been achieved. This indicator has virtually leveled off at the pre-reform rate and is double the world average. The energy companies are plagued by high technical and commercial losses. For sustained and significant economic growth, Uzbekistan will have to expand its power generation capacity and increase its fuel production measures which will raise the burden on the energy sector and may lead to an eventual dependence on energy imports.

The energy infrastructure is aging rapidly, particularly in the power sector. Funds mobilized by the energy sector in recent years and under government guarantees did not prove sufficient to create the necessary investments.

A major underlying problem is that the energy sector remains fully in state ownership and is regulated by administrative methods which are totally unresponsive to market conditions. The Government continues to hold a monopoly on regulating energy prices, producing energy, selling it to the consumer, ownership of the transmission pipelines/grid, and responsibility for investment/maintenance/modernization. Consequently, not only are the profits of the sector limited, but the capacity for self-financing, and indeed for implementing a forward-looking investment policy, is hindered.

The Government still controls the entire process of power generation, transmission and distribution, via Uzbekneftegas NHC and Uzbekenergo SJSC. This retains the monopoly in the sector, which creates a lack of competition and does not stimulate the energy companies to improve the productivity of their operations.

The policy of privatization in the sector has not worked. The system of regulated tariffs does not provide a sufficient rate of return on capital to make the sector attractive to investors, given the level of political and other risks. Moreover, the whole privatization effort has failed to generate sufficient interest on the part of the private sector due to the retention of the controlling interest by the Government, the lack of domestic private savings for any significant purchases of the entities being privatized, and the lack of long-term confidence among the foreign investors who alone could have provided the funds, technology and management expertise to truly modernize the energy sector.

Tariff Policy and its Impact on the Energy Sector. The policies of cross subsidies and regulated prices for electricity and other energy carriers were key elements in the previous stage of economic reforms. However, today it is the tariff policy, the lack of payment discipline by consumers and the inadequate attention to energy conservation which have led to an unfavorable situation for the energy sector that could undermine desired rates of economic growth.

Reforms, based on a price-setting system, proved inadequate to generate a dynamic energy sector that would be profitable, competitive, financially healthy,



comprehensive and forward-looking in its vision. The price-setting system accounts for cost of production, refining, transportation and sales plus taxation. It does not provide for the future long-term investment needs of the companies concerned.

The administrative mechanism for setting the tariffs deprives the energy sector of the ability to respond to market signals, such as global price fluctuations. Inadvertently, this price-setting mechanism, at times, ends up subsidizing the economies of neighboring countries as fuel and lubricants are smuggled out of the country.⁴⁴

The issue of non-payment for consumed energy remains unresolved. The problem of arrears is particularly pressing where consumers are government-owned companies. The energy companies are effectively forced to supply them without any advance payment or, in some cases, without any payment arrangements at all. The major debtors of Uzbekenergo are Uzkimyosanoat SJSC, the Ministry of Agriculture, the Almalkyk Mining and Metallurgy Combine and the Tashkent Aviation Factory.

Box 5. Tariff Ratio for Primary Energy

According to the International Energy Agency, the optimal tariff ratio for coal, gas and oil should be 1.0/1.6/1.8. In Uzbekistan, the situation is significantly different: 1.0/0.8/0.7. According to expert estimates, competition between gas and coal at the power stations, the largest consumer of fuel, will be feasible only when the price for coal is at least 25-35% lower than the gas price.

According to official data, arrears in the household sector are not yet a problem, probably because some consumers are able to bypass metering devices (theft), which appears in the accounts as technical losses.

The current composition of prices for major energy resources in the domestic market does not correspond to the ease of use of the fuel. For example, prices for oil and gas were significantly lower than coal prices in 2001-2005, which is completely contrary to the situation in market economies. Consequently, industrial consumers and the utilities in Uzbekistan prefer to use the cheaper and much more convenient natural gas. This results in the domestic consumption of over 50 percent of natural gas production.

The periodical price increases in recent years have not improved the financial health of the energy companies to ensure their long-term sustainability. The increase in prices for energy in 2000-2004 did increase the profitability of the power industry from -12.2 percent in 2000 to 8 percent in 2004. However, the projected indicators of new investment in the industry have not been met systematically in recent years. According to the Program of Development of the Power Industry in the period from 2000 to 2010, it was planned to invest approximately \$1.2 billion. Around \$500 million was supposed to be covered from the industry's own resources but only \$80-85 million was actually invested in the first four years.

Similar trends can be observed in the oil and gas sector. Profit margins here remain at 12-14 percent and investments were more intensive as compared to the power sector, amounting to over \$8 billion during the past decade, 25 percent of which has been in foreign loans and foreign direct investments.⁴⁵ However, the low rate of resource mobilization in the sector continues to challenge the Government in realizing its investment plans. According to expert estimates, Uzbekistan will require an additional \$1.5 billion for exploration and development of new oil and gas deposits.

Structural Reforms. The entire energy sector remains fully in government ownership. The Government, through Uzbekneftegaz NHC and Uzbekenergo SJSC, controls the entire process of production, transmission and distribution as well as the financial management of the sector. Hence the sector is characterized by an enduring monopoly, a lack of competition and an absence of incentives for higher efficiency in the companies' operations. Although energy companies have been transformed into joint stock companies and the basic prerequisites for

⁴⁴ Gasoline and other petroleum products are easier to smuggle abroad than natural gas and electricity which require some investment in the transport arrangements.

⁴⁵ S. Abdurakhmanov, head of the Main Department for the Prospective Development of the Oil and Gas Industry and Foreign Economic Relations of Uzbekneftegas NHC. "Promoting Foreign Investments is a Priority in Development of the Oil and Gas Sector in Uzbekistan". International Conference "Energy Markets of Central Asia: Trends and Prospects", Tashkent, December 6-7, 2005.



reform put in place, the oil and gas sector as well as the power industry effectively remain integrated monopolies under government ownership and control.

On the one hand, the situation is understandable. Uzbekistan does not yet have the developed market, judicial and regulatory institutional framework that would facilitate proper competitive mechanisms for energy operations, arbitrate in contractual forms of collaboration and provide overall impartial guidance to the sector. Hence, the Government continues to play an overly centralized role.

But the reform measures have not been ambitious enough to change the situation and lead to a significant shift towards a sector that is competently operated by entities that are competitive, financially sound, free of excessive interference and forward-looking in their vision. The present situation arising from the reforms thus far is characterized by:

- A conflict of interest between the commercial goals of the companies and the national interest in socio-economic development, due to the retention of both the business functions and governance functions in a government monopoly.
- Excessively centralized financial management, as a result of which companies cannot control their income from the energy supplied, regulate tariffs and thus recover all costs and administrative expenditures, or react to market fluctuations. The significant arrears owed to the energy companies has become an additional factor in perpetuating the excessively centralized structure of the sector. In the meantime, the monopoly in generation, transmission and distribution of energy, the lack of competition, and strictly regulated tariffs deprive the producers of incentives to reduce production costs or raise the quality of products and services.
- High losses, due not only to outdated equipment, but also to theft. Energy companies, particularly in the oil and gas sector, lack real incentives to upgrade metering systems both at the final consumption end as well as throughout the supply chain. Consequently, the sector lacks the ability to accurately measure commercial losses and prefers to write off theft as technical losses.

8. Energy Sector and Future of Uzbekistan

There is no doubt that the energy sector is a critical one in Uzbekistan's economy. On its own, it is a significant exporter (the estimated 2006 revenues for natural gas alone are \$650-700 million), bringing in large revenues and thus helping finance socially significant projects. It is also a key input provider to almost all the other sectors, thus affecting the overall economic growth potential of the country.

Hydrocarbons are becoming increasingly important in international political and economic relations. In the next 10-15 years, the energy resources of Central Asia are expected to play an important, if not a decisive, role in the development of regional energy markets, notably those of Asia and Europe. Significance of Uzbekistan in the regional energy market will depend on the export capacity of the country.

On the other hand, as sustainable energy supply is a prime requirement for sustainable economic growth and socio-economic development. In this context, the energy sector should be seen as an instrument of industrial policy to spur economic growth with affordable energy and facilitate the development of the other sectors. This is particularly critical due to Uzbekistan's limited hydrocarbon reserves.

In addition, hydrocarbons are the building blocks of the petrochemical industry, providing the economy a large variety of products ranging from plastics to fertilizers. Hence, any reduction in the burning of hydrocarbons will support new businesses and jobs. Petrochemicals and other products could be exported, resulting in greater revenues than exports of fuels alone.



Indeed, throughout the entire period of reforms, the Government of Uzbekistan has actively used the energy sector to support its new industrial policies. The production of hydrocarbons has been increased by all means possible and consumers provided with subsidies through low energy tariffs. However, the energy sector itself has not received sufficient priority. This should change and, in the next five to ten years, the primary objective of industrial policy should be to enhance the efficiency and competitiveness of the energy sector in order to guarantee sustainable energy supply to a fast-growing economy.

The economic growth underway will, in itself, lead shortly to greater demand for energy, possibly creating an energy deficit. This is made more likely by the modest hydrocarbon reserves, the high power-intensity of the economy and the over-emphasis on natural gas.

In this regard, a number of changes in the corporate structure of the sector and a major change in the philosophy of energy-price determination are essential. Modernization of the energy sector is crucial in order to replace aged systems, put in new capacity, and upgrade management methods.

Diversification of the energy mix, by reducing the share of natural gas and increasing that of renewables and coal, remains an important long-term objective. To that end, policies should be put in force to encourage favorable changes in the behaviors of both the producers and the consumers. A prerequisite to a sustainable energy sector is the gradual formation of a sustainable market for conventional and alternative energy. Also, as a country with sizeable uranium deposits, Uzbekistan should explore nuclear energy options, although the high capital costs would pose a significant problem.

9. Conclusions and Recommendations

There is no universal model that would guarantee success in developing the energy sector. Nevertheless, international experience does offer a set of tools which may be considered for easing the challenges facing Uzbekistan.

9.1. Choices for Economic Reforms

The main economic objective for the transformation of Uzbekistan's energy sector is to enhance financial sustainability. Investment in developing the infrastructure and raw materials base of the energy sector, including renewable sources of energy, needs to be encouraged. The achievement of this primarily requires the right energy tariffs and finely tuned taxation policies. Also, new energy efficient technologies must be emphasized in both the energy and non-energy sectors.

Raising tariffs is a key prerequisite in improving the financial sustainability of the energy companies and promoting private investment. Tariff policy also remains a key element in conserving energy. To this end, it will be essential:

- To maintain fuel and electricity prices at levels that will cover long-run marginal costs; and
- To remove price distortions in the primary energy markets and bring prices closer to their optimal level, reflecting the calorific value of the fuels, their ease of use and international supply-demand.

Achieving the above may be possible by implementation of a price-setting mechanism for oil and natural gas, based on trends in world markets and not on cost-based and regulated profit margins and taxes. This should enable greater flexibility in responding to changes in economic and geological conditions, while investing in exploration, development and production. Furthermore, market mechanisms for price-setting are important components of policy, to foster the development of a competitive environment. Meanwhile, windfall profits may be absorbed into the wider economy through tax instruments, such as excises, which may be exercised in a flexible manner.

Initially, the government should be able to develop a plan to remove price distortions in energy markets through the cost-plus system and to continue subsidizing non-energy sectors via tariffs for energy carriers and electricity, while



reducing them gradually. Subsidies could be retained for companies in certain strategic industries until they achieve viability. Although developed countries frequently advocate removing all subsidies of energy prices, developing countries actively utilize this instrument to guide energy use and industrial development. An example is Malaysia, where selected industries get electricity at subsidized rates. However, any exceptions to market principles tend to cause unexpected distortions and unintended economic consequences. Hence, it is best to gradually move to market principles with as few exceptions as possible, and in any case, industrial policy should be managed through a broad range of economic and institutional measures rather than simply with favorable input/output prices.

Removing price distortions in energy markets should facilitate the optimization of the demand mix for electricity and fuels, including reducing the use of gas and increasing the use of coal and renewables. Rising prices will encourage energy conservation. However, balancing the current distortions seems to call for steep price rises for gas, oil and petroleum products as well as efficiency improvements.

In turn, tax policy should be geared to achieve a number of objectives:

- It must encourage investments in the exploration and production of energy resources. This will require the implementation of a special tax on energy companies, related directly to global market prices, particularly regarding the development of certain deposits to encourage investment. A more flexible taxation system will be essential in the liberalization of the price-setting mechanisms in order to regulate windfall profits as energy prices rise. Today, there is a single tax system for all sectors of the economy. This does not take into account the specific features of extractive industries, and damages the financial health of the oil and gas companies.
- It must support energy-intensive industries, while moving towards higher tariffs, and removing cross-subsidies. It is essential that the process of raising domestic prices for fuels should be done in a flexible manner, taking into account competitiveness and the need for technological shifts in non-energy sectors. In this regard, energy-intensive sectors, where energy costs make up more than 10-12 percent of total costs, can be compensated by a reduced value added tax over a certain period as prices rise.
- It must encourage investment into energy-efficient technologies and equipment. As world experience has shown, in order to implement an effective energy conservation policy, additional economic incentives and sanctions are essential, to motivate both producers and consumers alike. The measures and incentives may include: corporation tax exemption for investments in energy efficiency and conservation technologies; options to more rapidly depreciate energy-efficient equipment to reduce the tax burden for companies; and the creation of preferential crediting funds for energy-conservation activities.

9.2. Choices for Institutional Reforms

Further institutional transformation should ensure greater effectiveness of the energy sector for the whole economy. The possible approaches of the reforms are determined in many respects by the level of economic development and the socio-economic objectives of the government. The model of economic governance in general and the relationship between government and big business are equally important.

The classic liberal recipe, promoted by international organizations and welcomed by Western investors, consists of reforms geared towards:

- The development of corporate management systems;
- The breaking up of the monopolies and promotion of competition in domestic energy markets; and
- Privatization plus nurturing of the private sector.

On the one hand, this approach facilitates the West's access to the markets and energy resources of developing countries, as well as ensuring a guaranteed supply of primary energy in the long run. In certain circumstances, international corporations may recommend these measures exclusively in their own interests.



On the other hand, liberalization is an essential prerequisite for a nation to gain broader access to foreign investment and loans and to facilitate access of national companies to international capital markets, not to mention involvement of foreign partners and new technologies in the national market. Furthermore, liberalization and expanding the involvement of the private sector is a key factor in enhancing efficiency in the energy sector.

As a counterweight to the liberal approach, there is the view that it is essential to retain full public sector control over natural resources and energy, maintaining the monopoly of national companies – or at least according them priority – in the development of national resources. Consolidation of the national oil and gas companies provides economies of scale and improves their competitiveness in international markets.

However, the power industry is a distinct sector, where various models for institutional arrangements exist today. In many countries, energy sector reforms are geared to improving competition and introducing market mechanisms. There is a lingering question as to which development model is the best for the sector. Undoubtedly, there are opportunities for the involvement of the private sector in energy distribution and each country has a best fit along the spectrum from full public ownership to full private sector engagement.

Meanwhile, the large-scale investment needs in infrastructure and generating capacity impose a limit on the flexibility of choosing the best model for reform in the power industry. If state control and monopoly are retained, investments can only be made by the government through domestic savings or foreign/domestic loans under government guarantees. Of course, liberalization or privatization programs do not automatically generate private sector or foreign investor interest through investment commitments. However, liberalization will reduce the pressure on the government to be the sole provider of funds for maintaining the power sector that provides the economy with electricity for targeted growth rates.

Since the energy sector is so critical for the entire economy, an essential element of its institutional structure is the capacity to plan for both the sector and the economy as a whole. However, in a “normal” energy sector, this cannot be left to the public sector alone, since the sector will consist of a healthy mixture of public and private sector enterprises. It is important that an enlightened coalition of public, private, academic and civil society develop the regulatory environment that will guide the birth of a national energy sector that is both profit-seeking as

Box 6. Power Industry Development Models

Structural transformation to enhance competition and introduce market relations in the power industry was started in different countries in the 1990s. Four distinct models of restructuring emerged:

Model 1. Monopoly at all levels. Electricity producers do not compete among themselves and none is entitled to choose its generating company. One company has the monopoly to generate electricity and supply it via transmission network to distribution companies or end users depending on the existence or absence of distribution companies. Consumers are supplied by the energy company given this responsibility. This form of vertically integrated organization enables the creation of large-scale transmission systems and large power stations over many years. This model enables the government to deliver subsidized public goods/services to poor territories, implement rural electrification, develop new technologies, etc. This model has been used in Uzbekistan.

Model 2. The only buyer. There is one buyer (government agency) who has a choice among generating companies and maintains competition among them. The only buyer has the monopoly over transmission networks and the sale of electricity to distribution companies or end users depending on the existence or absence of distribution companies. This model also enables the government to deliver public goods and avoid a number of costs typical in more deregulated systems, such as the costs of introducing an electricity market, channeling investments into infrastructure, etc. The model requires long-term contracts between the buyer and independent producers of energy, whereby independent producers are guaranteed against market risk as the contract is based on the costs of power generation. Market and technological risks are borne by consumers through the single buyer. Isolating the owners of power stations from the influence of market forces to a certain extent, this model leaves many opportunities for choice (for instance, when, where and what to build) in the hands of central planning authorities. This model has been widely used in the world over many years.

Model 3. Competition in a wholesale market. Distribution companies purchase energy directly from generators and deliver it through transmission networks to the consumers. Distribution companies have monopoly rights for energy supply to end users. However, there is open access to the transmission networks of power generators and distribution companies. In this model, competition may be expanded so that all producers can sell power to many consumers. A greater number of buyers makes the market more competitive and dynamic. Owners of power stations approach new investments more carefully than in the above two models since they face the risks. Wholesale competition raises transaction costs, requiring market and network agreements. This model very much limits the role of government in the choices made for power generation.

Model 4. All consumers have the right to choose their supplier of energy. The government merely ensures equal access of producers and consumers to transmission and distribution networks and regulates the market through market instruments.



well as careful of national development in general. Qualified specialists are needed in energy think-tanks to develop policy and long-term strategy.

In moving from the present system of public monopoly over the energy sector to the afore-mentioned "healthy mixture of public and private enterprises", there will be a need for a national regulatory body in the energy sector for accomplishing such objectives as:

- Developing energy sector management and regulation of markets, by transforming the institutions, liberalizing the sector and liquidating monopolies;
- Ensuring public interest in large-scale investments and international energy projects; and
- Coordinating private energy companies so that they can bring their common concerns to the government's attention – particularly, in relation to tariff policy and taxation.

9.3. Recommended Policy Measures

In the foreseeable future, the energy sector in Uzbekistan will continue to bear a substantial socio-economic burden. Any sharp changes, such as increasing the price of energy and electricity without a substantial increase in the income of the population, will rapidly lead to social dissent, anti-market sentiments and even political instability. Moreover, Uzbekistan has not only to maintain, modernize and expand its energy sector, but also its agriculture and industry, all of which requires huge financial resources.

Short-Term Priorities. The opportunities for reform in the short-run are quite limited, due to the entrenched socio-economic factors and the lack of suitable institutions to catalyze the reforms with sufficient vision or vigor. That makes it all the more important to lay foundations without further delay and to start the path of reforms in the energy sector towards its liberalization in the next two-three years.

The main focus of government policy in the shortrun should be on the following:

1. It will be essential to increase energy prices, primarily in electricity and natural gas, so that they reach a level that covers the long-run marginal costs of the energy companies. It is essential to support tariffs at a rate that maintains positive returns and investment ratings in the energy sectors earmarked for privatization. Furthermore, it is essential to start removing the price distortions that make coal more expensive than natural gas. A major factor in any new mechanism for price-setting is its transparency, so that it is predictable. To this end, it is crucial to introduce the practice of publishing short-and medium-term projections of energy prices in, for example, the preparation and approval of the government budget.
2. Tax policy should aim to reduce the tax burden on energy companies. This may reduce government revenues, but it will reduce the impact of rising energy prices on the non-energy sector. It is essential to focus on creating incentives for energy conservation in both the energy sector and industry in general.
3. The discipline of payment from major users of energy must be improved. The regulatory acts that permit some users to postpone payments should be abolished. These policies should be introduced gradually, perhaps over a year and a half, to enable the companies to adapt to the new operating environment.
4. The introduction of energy conservation technologies in the energy sector and the rest of the economy, including agriculture, will require substantial public and private financial resources. In this regard it is essential to develop a special investment program to modernize manufacturing in all major energy-intensive industries, potentially with public-private partnerships. The key objective is to reduce energy use in all domestic companies considered of strategic importance and government owned. This will require substantial investment. This problem could be solved by

the privatization of some of these companies, with the condition that investors implement conservation programs in partnership with the government. Public financing of energy efficiency measures could be implemented via the Foundation for Reconstruction and Development as well as the Fund for Conservation.

5. In the institutional arena, efforts must be focused on separating the natural monopolies from those parts of the energy industry with the potential to be competitive. Focusing on further liberalization of these potentially competitive segments will enhance their investment appeal for domestic and foreign capital. Distribution is the most potentially competitive segment in both the oil-and-gas and electricity sectors. Bringing in private firms to provide natural gas and electricity sales and services to households and industrial companies – in a competitive framework – would help reduce both commercial and technical losses. Sales companies should operate in open competition, under equal conditions for all participants. Since operating revenues would depend upon volume of sales, this would help create more rapid payments for power supplied.

Medium and Long-term Priorities. In the medium and long-term, the issues of tariff policy and institutional reform should remain government priorities. These will require a profound transformation of the energy sector and the economy as a whole.

1. In order to promote sustainable development in the energy sector, Uzbekistan should regulate electricity, gas, coal and oil, and petroleum products, primarily through market mechanisms. Improving the tariff policy will encourage energy companies to invest in maintenance and development. Moreover, the sector needs to attract new capital and investment, and to raise the financial viability of the companies already working in the sector. A satisfactory tariff policy should also facilitate privatization. The prices set have to ensure adequate profit margins for domestic and foreign investors. In turn, the institutional transformation of the sector should create a more liberal, impartial and forward-looking regulatory environment and foster modern corporate management in the energy sector.
2. For the power industry, structural and institutional transformation should be aimed at separating electricity generation, transmission and distribution. This is now the market model used worldwide. Uzbekistan has started this process. Uzelektroset is the company responsible for generation, while all the power distribution companies and some thermal power plants are now joint-stock companies. At the bottom line, this is about separating some generating companies out of Uzbekenergo and setting up a wholesale market, and subsequently, a retail market in electricity. In turn, Uzbekenergo should become a joint stock company, with the government owning a majority share. Access to the transmission infrastructure should be available to third parties. In order to improve the investment rating of generating companies, the government will have to give up its majority share in these joint stock companies. It will, however, retain its levers of influence on the energy companies in the form of access to the transmission networks, tariff policy and technical regulations.
3. It is also essential to create an environment to promote competition and raise private domestic and foreign capital. Uzbekneftegaz NHC should be transformed into a business entity free of sector supervision functions and should focus on commercial activities such as exploration for oil and gas, production, refining, and sales of the finished product. Moreover, Uzbekneftegaz should compete with foreign companies for exploration in future.

The establishment of a national regulatory body in the energy sector (ministry or agency) should also be a medium-term objective. Such a regulatory body would relieve the current group of national energy companies of their sector governance functions, focusing them on commercial activities for profitability.





However, the regulatory body must not extend itself into the management of the national companies: it should focus on its sector planning and regulatory role, leaving the national companies free to operate as commercial entities in the market. The regulatory body would:

- Identify, adjust and implement the long-term energy strategy, conscious of the development of the power and oil and gas sectors and their impact on the economy as a whole;
 - Ensure equitable use of the energy infrastructure by the relevant companies in the market;
 - Develop long-term investment plans which would encourage the participation of domestic and foreign investors;
 - Prepare and manage the tariff policies of the energy sector;
 - Hold bidding auctions for the development of new deposits; and
 - Encourage the efficient use of energy in all sectors of the economy.
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