

## KAZAKHSTAN'S FUEL AND ENERGY COMPLEX: REFORMS, PROBLEMS, AND PROSPECTS

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Kazakhstan's current energy policy is aimed at ensuring the state's energy independence and raising the efficiency of energy production and consumption. These strategic tasks are being carried out under conditions of sectoral diversification, which is easing the transition from the economy's raw material to service-technological orientation within the framework of state pro-

grams and industrial-innovative development strategies. However, the growing threats to the environment directly related to the development of Kazakhstan's fuel and energy complex are currently acquiring truly global dimensions and require reconsideration of long-term energy programs from the viewpoint of the state's environmental security.

### The Fuel and Energy Complex

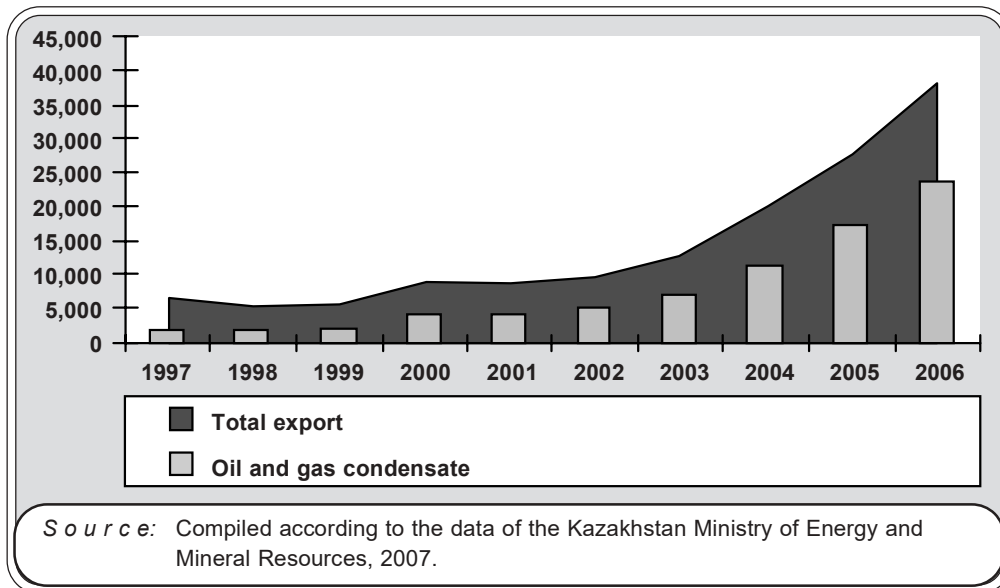
The past few years have been characterized by high rates of the republic's economic development. In 2005-2006, the increase in Kazakhstan's GDP in real terms (10.7%)<sup>1</sup> was higher than the forecasts of Standard & Poor's Ratings Services, Fitch Ratings, and the CIS Statistics Board. The average annual increase rate in the GDP amounted to 10.3%, which was much higher than the mean value for the Commonwealth (7.2%). According to the official data, the amount of investments in subsurface management for 1997-2006 rose five-fold and reached 14.8 billion dollars in 2006. The same year 64.8 million tons of oil and gas were produced in Kazakhstan with a forecast of 62 million tons. The cost volumes of Kazakhstan's foreign trade, taking into account the presumed average world price of Brent brand oil of 47 dollars a barrel (the GDP deflator amounted to 117.9%), were much higher than the forecast levels: export increased by 37.3% (with a forecast of 8.6%) and import by 36.4% (with a forecast of 24%).<sup>2</sup> Products of the fuel and energy complex represented primarily by oil and gas condensate (see Fig. 1) accounted for two thirds of the total export volume (67.5%).

<sup>1</sup> See: "Promyshlennost' Kazakhstana i ego regionov za 2003-2006 gg.," in: *Statisticheskiy sbornik Agentstva po statistike RK*, 2007.

<sup>2</sup> See: P. Zolin, *et al.*, "Rossia—podtians'! (natsional'nye ekonomiki stran SNG v 2006 g.)," 3 May, 2007, available at [<http://www.trinitas.ru/rus/doc/0230/002a/02301007.htm>].

Figure 1

**Oil and Gas Condensate in the Commodity Composition of Export**  
(million dollars)



On the whole, for the past ten years, an active increase has been observed in the percentage of the fuel and energy complex in Kazakhstan's export, while there was a slight drop in its import (see Fig. 2).

According to the results of 2007, the industrial production growth rates in Kazakhstan dropped on average to 4.5%, whereby in the mining industry, there was an increase of 2.6%, in the processing industry of 6.7%, and in the production and distribution of electricity, gas, steam, and water of 7.3%.<sup>3</sup> Despite the world liquidity crisis and the overall slowdown in industrial growth, the republic is still demonstrating good economic indices due to the high world prices for exportable fuel and energy resources. Oil and gas condensate production rose in 2007 by 3.7% and amounted to 67.2 million tons.<sup>4</sup>

Sixty point six million tons of oil were exported. Since the increase in commodity export is mainly based on cost and not on real growth, its dependence on price fluctuations becomes all the more obvious.

The fuel and energy complex formed the foundation of Kazakhstan's economic growth and was the main source of environmental pollution both within the republic and on a trans-regional scale. For example, during the past decade, Kazakhstan occupied first place in Central Asia and third among the former Soviet countries in terms of volume of greenhouse gas emissions. In 2005, the total emission in Kazakhstan of gases with a direct greenhouse effect amounted to 240.7 million tons in terms of carbon dioxide.<sup>5</sup> The energy industry is the main culprit with respect to greenhouse gas emissions, while agriculture follows in second place. In 2005, there were more than 15.2 tons of greenhouse gas emissions per capita.

<sup>3</sup> See: "Minidustrii obeshchaet oblegchit' biznes-klimat dlia otechestvennykh predprinimatelei," *Panorama* (Kazakhstan), No. 2, 25 January, 2008.

<sup>4</sup> See: Report of the Energy Minister at a meeting of the Kazakhstan Ministry of Energy and Mineral Resources, 7 February, 2008, available at [[http://www.memr.gov.kz/?mod=news&year=2008&lng=rus&cat\\_id=1&id=254](http://www.memr.gov.kz/?mod=news&year=2008&lng=rus&cat_id=1&id=254)].

<sup>5</sup> See: *Informatsionnyy biulleten'* (Kazakhstan Ministry of Environmental Protection), No. 1 (87), 2007.

Figure 2

Share of the Fuel and Energy Complex  
in Kazakhstan's Export and Import (%)

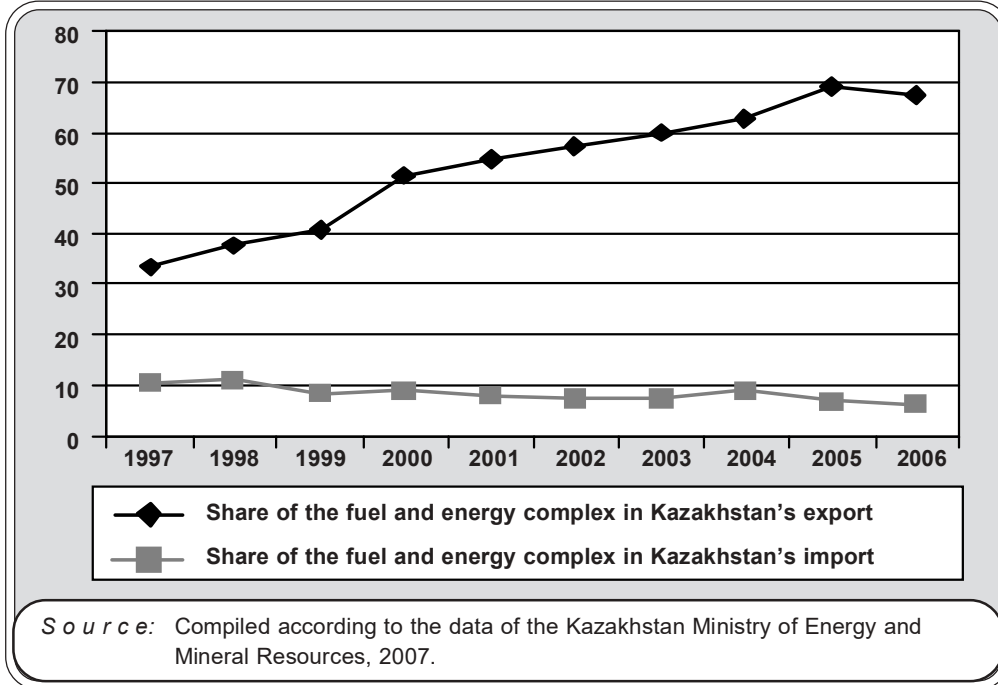
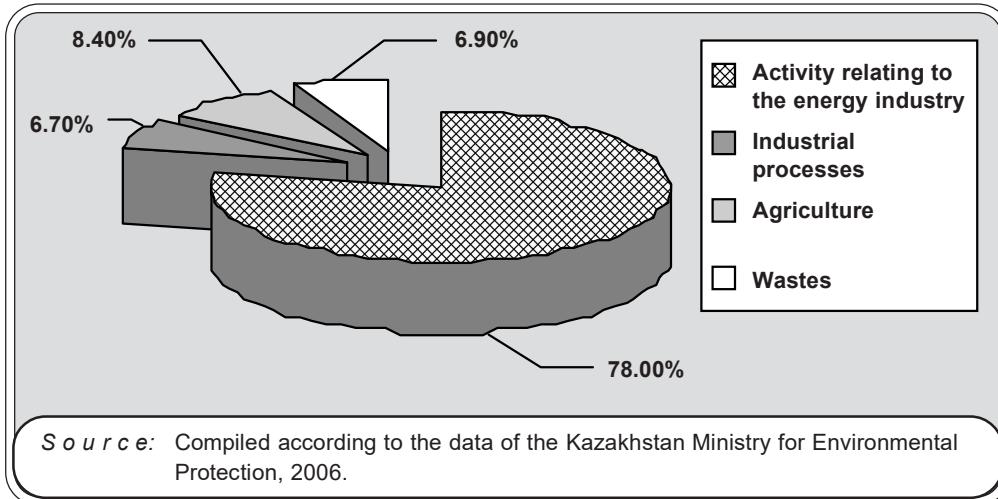


Figure 3

Percentage of Sources of Greenhouse Gas Emissions  
in the Total Emissions in 2005



In this respect, the drawing up of a strategic course for developing the national fuel and energy complex based on the principles of the state's new environmentally oriented energy policy is becoming particularly urgent for ensuring the sustainability of the national economy.

Today, Kazakhstan is one of the largest countries in the world in terms of reserves and production of fuel and energy resources, which defines the republic's high economic potential. The fuel and energy sectors—oil- and gas-producing and coal industries, as well as the power engineering industry—are developing in compliance with the Program of Development of the Fuel and Energy Complex until 2015 and the *Toplivno-energeticheskiy balans RK* (Fuel and Energy Balance of Kazakhstan). The volume of the resource part of the Fuel and Energy Balance increased in 2006 compared with 2005 by more than one quarter, constituting 320.6 million tonnes of oil equivalent (toe). In so doing, 73.4% of the inflow was formed from the production of fuel and energy resources, and 8.5% from their import. A total of 186.4 million toe was consumed on the country's domestic market, 32.9% of which was used for production and technological needs, and 16.7% for transformation into other forms of energy and fuel.<sup>6</sup>

At present, oil, including gas condensate, accounts for 45.3% of the total volume of natural fuel and energy resources consumed, coal for 31.3%, and natural gas for 23.4%. In 2006, energy consumption per capita amounted to 8.7 toe in the Republic of Kazakhstan.

## Market Reforms in the Economy

The impressive results of Kazakhstan's economic growth during the years of independence were largely engendered by successful measures aimed at reforming and restructuring the sectors of the fuel and energy complex. The market reforms in the republic's economy and reform of the energy sector within their framework began during the crisis of 1991; expert opinion is that it is possible to divide the period of reforms into several stages.

The reforms of the first stage (1992-1994) were aimed at liberalizing the economy and creating a legislative and institutional basis for market relations. This period was marked by a significant drop in the volumes of production, work, and services in all branches. Inflation devaluated all savings and circulating funds in a short time; the products of domestic enterprises could not be sold on the domestic and foreign markets. In 1994, the volume of industrial production dropped by 47.7% compared with 1990. Production capacities in the light, chemical, and machine-building industries, as well as in the manufacture of building materials, decreased at a rapid rate.

With the arrival of large foreign companies in Kazakhstan's industry, a steady trend appeared in 1993 toward an increase in investments and an accompanying structural shift in the national economy. For example, the share of capital investments in the oil and gas industry rose from 31% in 1991 to 51% in 1994. In so doing, financing of the metallurgical industry remained at a level of 17%, while it decreased in all other branches.

The second stage of reforms (1995-1999) consisted of carrying out measures promoting an increase in the production of export products and stabilization of industries that met the demands of the domestic market. The real sector of the economy underwent economic reforms: reconstruction of production units was carried out and measures were adopted for the rehabilitation and bankruptcy of financially unprofitable enterprises. Conditions are being created for an inflow of foreign investments

<sup>6</sup> See: *Toplivno-energeticheskiy balans RK*, Statistical Bulletin, Kazakhstan Statistics Agency, 2006.

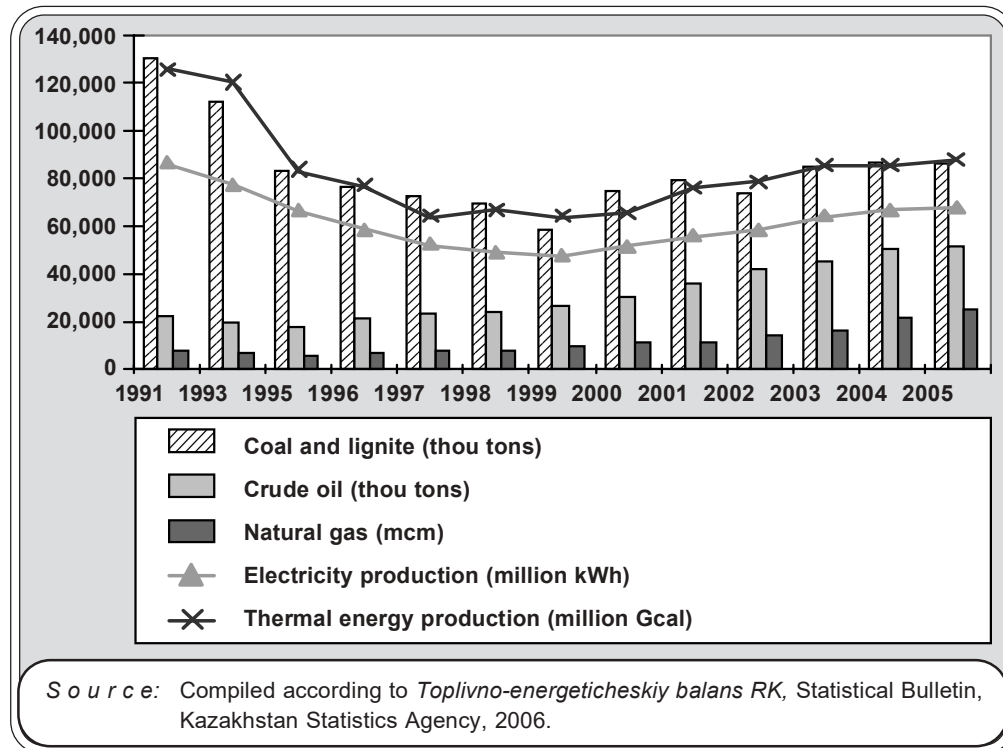
into the strategic branches of the economy. The efforts made have yielded positive results: in 1997, for the first time since independence, a 4%-increment in industrial production was ensured, and in 2000 it reached 14.6%. An increase in domestic consumption was noted: in 1999-2000, the total volume of state purchases almost doubled.

At the current stage, Kazakhstan's industrial policy is aimed at supporting domestic goods producers by implementing measures aimed at import substitution and protection of the domestic market from unfair competition. It aims to achieve sustainable economic growth based on the balanced development of industry, as well as gradual substitution of the raw material component in the gross national product for high-tech production. The fuel and energy sector is playing the main role in ensuring Kazakhstan's economic, political, and social progress, and so the achievement of national strategic goals largely depends on drawing up a new energy policy that meets the criteria of the state's sustainable development. The tasks set should be resolved on the basis of a comprehensive and objective analysis of the processes occurring in the fuel and energy sectors during reform of the Kazakhstan economy.

The overall economic slump that began in 1991 had a negative impact on the state of the entire fuel and energy complex: production volumes in the electric and thermal power industry and in the oil- and gas-producing and coal industries has dropped in the past seven years by 10-50%. 1996-1999 were turning points. As a result of the inflow of investments and the effect of the market reforms, the state of the fuel and energy sectors stabilized (see Fig. 4).

Figure 4

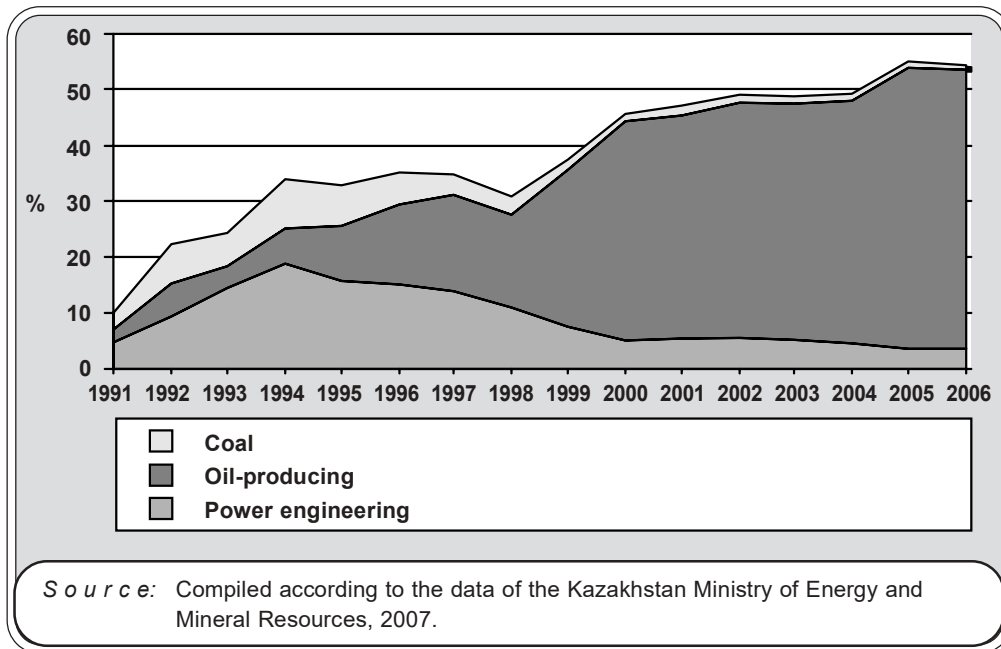
Production Volume of Kazakhstan's Fuel and Energy Sectors in Kind



Due to the rise in world prices for hydrocarbons, characteristic trends were designated in the change in industrial production volumes in current prices in certain sectors of Kazakhstan's fuel and energy complex: active growth dynamics in the oil-producing industry and a drop (after a slight increase) in similar indices of electricity manufacture and coal production (see Fig. 5). We will look at the domestic and foreign prerequisites, reasons, and consequences of the changes that occurred.

Figure 5

Change in the Share of Sectors of the Fuel and Energy Complex  
in Kazakhstan's Industry in Current Prices



## The Oil Industry

The oil and gas industry which ensures one third of the budget tax revenues is the moving force behind Kazakhstan's economy. Kazakhstan's hydrocarbon potential is very high in the total volume of world mineral resources. In terms of confirmed oil and gas reserves, the republic is among the ten leading countries of the world and occupies second place among the CIS states. At present, extractable oil reserves, including in the Kazakhstan Sector of the Caspian Sea, amount to 4.8 billion tons in the republic, or 35 billion barrels, while gas amounts to 3.3 tcm. The total forecast resources of hydrocarbons in Kazakhstan are estimated within a range of 12 to 17 billion tons, more than 60% of which is accounted for by the Kazakhstan Sector of the Caspian Sea.

Privatization of the oil industry was carried out in 1994-1997. For most enterprises, it envisaged the initial stage in share-holding and privatization on a competitive level. After signing the Production Sharing Agreement between the Kazakhstan Government and the International Consortium for

the Northern Caspian (1997), measures were carried out to restructure the oil industry. This promoted a perceptible improvement in the production and financial indices of the extractive enterprises.

For example, the production of energy resources in Kazakhstan in 2001 was more than two-fold higher than the total domestic consumption of primary fuel and energy resources, amounting to 83.8 million tons of oil equivalent (toe). As a result, the export volume of energy resources reached 51.3 million toe. But the level of their import also remained sufficiently high and amounted to 20% of domestic consumption due to the already developed electricity network and special features of the existing gas-pipeline system, as well as to the market situation. At present, the south of Kazakhstan is also importing energy and natural gas from the Central Asian republics, and a significant amount of electric power is delivered to the west of Kazakhstan from Russia. Electric energy manufactured at enterprises in the north and center of Kazakhstan is exported to Russia, the PRC, and other states.

The National KazMunaiGaz Company (KMG) created in 2002 has made a significant contribution to the production and economic development of the republic's oil- and gas-producing industry, including by attracting investments and protecting state interests in agreements on the prospecting, production, and refining of hydrocarbons. A State Program for the Development of the Kazakhstan Sector of the Caspian Sea was adopted in 2003 to ensure the rational and safe assimilation of hydrocarbon resources and the development of the country's accompanying industries. At present, the second stage of the Program (2006-2010) is being implemented. One of the most important oil projects in this region is the North Caspian project aimed at industrial development of the Kashagan field.

During the past five years, the share of oil production in Kazakhstan's industry increased by 50%. The current development strategy for the republic's oil and gas complex is based on three main vectors: augmenting the production of raw hydrocarbons; creating a corresponding transportation network for delivering energy resources to world consumers, and raising the capacity of the oil-refining and petrochemical industries. The state's low level of participation (about 15%) in this strategic branch is a factor of instability in the oil and gas sector, which is generating certain risks in the development of the entire national economy.

In 2007, the state production structure Prospecting Production "KazMunaiGaz" (PP KMG) increased its oil production volume to 11.6% compared with 2006. This growth was prompted by PP KMG acquiring a 50% share in the Kazgermunai and CCEL companies. The increase in the national company's share in the oil and gas projects in Kazakhstan in order to raise the state's energy security has become a characteristic trend of the past few years. For example, in January 2008, the economic and operational model for developing Kashagan was reconsidered and an agreement was reached with the foreign investors of the North Caspian project (Eni, Total, ExxonMobil, Shell, ConocoPhillips, and Inpex) on increasing Kazakhstan's share from 8.33% to 16.81%. Moreover, KMG was entrusted with exercising control over the outlays and work quality at the field in light of the complaints that tax and environmental state agencies were making on the operator.<sup>7</sup>

## The Coal Industry

The Republic of Kazakhstan occupies seventh place in the world in terms of coal reserves,<sup>8</sup> most of which are represented by anthracites and bituminous coal. The country's proven reserves

<sup>7</sup> See: "Peregovory po Kashaganu zavershilis' v pol'zu Kazakhstana," *Panorama* (Kazakhstan), No. 1, 18 January, 2008.

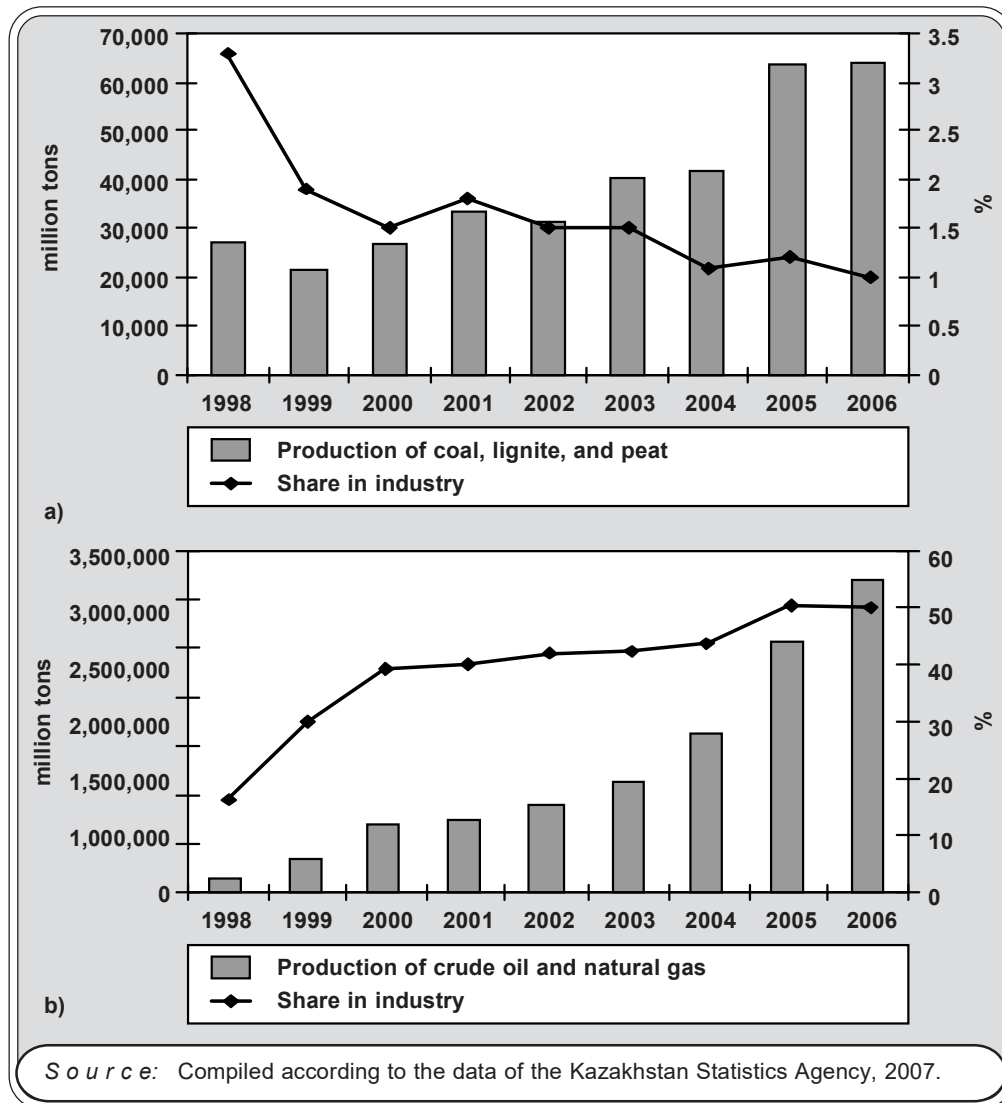
<sup>8</sup> See: *BP Statistical Review of World Energy*, 2005.

top 31 billion tons, which amounts to 4% of the total volume of the world reserves. In terms of coal production per capita, the republic occupies first place among the CIS countries and is one of the ten largest producers and exporters on the world market. Power-generating and coking coal, which are the most valuable for industry, are concentrated in 16 fields in the Karaganda, Ekibastuz, and Turgai basins.

Privatization of the producing enterprises and elimination of unprofitable production units in 1996-2000 helped the coal industry to withdraw from its crisis. The efficiency of sectoral manage-

Figure 6

Growth Rates in the Production of  
a) Coal and b) Oil and the Share of These Branches in Kazakhstan's Industry





ment was largely raised thanks to the activity of foreign investors; in particular, systems for monitoring and forecasting the market situation were introduced. Subsequent optimization of the mine and pit-run funds yielded positive results: the main funds were used more efficiently and the net cost of oil production was reduced. Vertically integrated structures that included coal, electricity, and metal production (AO Ispat-Karmet, the Kazakhmys Corporation, the Eurasian Energy Corporation, TOO Bogatyr Akse Komir, and others) were created, which ensured a stable sales market and high production profit.

In 2006, the total coal export volume amounted to 479.9 million dollars in monetary terms. The Russian Federation was and still is the main importer. Since 2001, Kazakh coal has been delivered to Finland, the Netherlands, Rumania, and Poland, and since 2003 to the Czech Republic and Turkey. There is reason to presume that in the near future, Kazakhstan will acquire another large coal importer—the People's Republic of China.

At present, 70% of coal production is consumed domestically. The coal industry is one of the key industries in Kazakhstan, supplying the energy industry, metallurgy, and other industries, including public services, with fuel and raw materials. All the same, the annual increase in coal production volumes is accompanied by a drop in the cost share of the coal sector in industry, which is due to the record growth rates in the price of oil and the increase in oil production (see Fig. 6).

Until recently, the state owned no share of Kazakhstan's coal industry. Eighty-seven point seven percent of the total oil production was carried out by five large private companies: Bogatyr Akse Komir, the Eurasian Energy Corporation, Maikuben Vest, Mittal Stil Temirtau, and Kazakhmys. Today, 50% of the shares of Bogatyr's open-pit coal mine, at which 42.8% of the country's entire coal resources is produced, have been returned to the Samruk State Holding Company. The Kazakhstan government is also planning to purchase other strategic facilities of industrial infrastructure in the near future (including of energy-generating enterprises), which is vitally important for strengthening national energy security. Almost 80% of the electricity in the country is manufactured at coal stations, and so coal is still the main type of fuel ensuring the development of the energy industry in the foreseeable future. In compliance with the coal industry development strategy, there are plans to bring coal production up to 95-97 million tons in 2015.

Efficient and waste-free use of solid fuel, as well as expansion of the sales markets of power-generating coal are long-term priorities of the coal industry. A joint fuel and energy balance for the Republic of Kazakhstan and the Russian Federation until 2020 has been drawn up. The coal industry is switching to international standards of management quality, environment, health protection, and safe work conditions. The mines of the largest basin in the republic, Karaganda, have been reconstructed, which made it possible to increase the volumes of high-quality coke production. Projects are being implemented on the utilization of methane from coal beds, mining allotments, and liquidated mines. The introduction of new sustainable technology is helping to improve the environmental and economic state of the coal industry.

## The Gas Industry

In terms of natural gas resources, Kazakhstan occupies eleventh place in the world. Its potential reserves, counting the fields of the Caspian Shelf, amount to 6-8 tcm. It should be noted that 98% of the total industrial gas reserves are located in the four western regions of the country. The annual increase in gas production amounts on average to 17%. The slump in the gas industry observed since 1991 was overcome by 2000 after structural reorganization of the industry was carried out. When the KazTrans-Gaz state company went into operation, there was a subsequent rise in the consumption of natural gas and stabilization of its delivery volumes.

The gas industry is functioning in compliance with the Development Program for the Industry in 2004-2010. In 2007, production increased more than three-fold compared with 1997 and amounted to 29.6 bcm. In so doing, the main increase (8.7%) compared with the previous year, 2006, was provided by the Karachaganak Petroleum Operating b.v. Company, TOO Tengizshevroil, and TOO Kazgermunai Joint Venture. Taking into account the potential of the Caspian Shelf, there are plans to bring the total production volume up to 70 bcm by 2015.

Assimilation of the Karachaganak oil and gas-condensate field was an important stage in the development of Kazakhstan's gas industry. The innovated technique of pumping unrefined gas back into the bed at a depth of up to 5 km was applied for the first time in the world at this field. In 2007, 14.2 bcm of gas were produced at the Karachaganak field, whereby 6.3 bcm of this amount was pumped back into the bed.<sup>9</sup> The refining and sale of Karachaganak gas is being carried out in cooperation with Russia. In 2007, an Agreement on the Creation of a Joint Enterprise Based on the Orenburg Gas-Refining Plant and long-term agreements on the buy-sell of unrefined and refined gas from the Karachaganak field were signed with the Russian Federation.

The republic's dependence on the import of natural gas is still causing gas supply problems. In the 1990s, about half of the gas required was imported from Uzbekistan, Turkmenistan, and Russia. Until now, the southern regions of Kazakhstan have been supplied with Uzbek gas, which entails certain risks. In 2006, the ratio of export to import of natural gas corresponded to 540.4 and 470.3 million dollars in monetary terms. Last year, the KazTransGaz Company, Russia's Gazprom, and the Uzbekneftegaz National Company signed a treaty in Tashkent on deliveries in 2008 to Kazakhstan of 3.5 bcm of natural gas (30% more than in 2007).<sup>10</sup> Under a swap agreement with Gazprom, the Kazakh side, in exchange for Uzbek gas purchased by the Russian company, will deliver gas from the Karachaganak field to Russia on mutually advantageous terms. Agreements were also reached earlier on supplying two of Kazakhstan's western regions with Russian gas.

## The Transportation of Hydrocarbons

At the current stage, one of the main strategic tasks in the development of the fuel and energy complex is augmenting the republic's transit potential with respect to oil and gas export. In 2000, reconstruction of the Atyrau-Samara oil pipeline was completed, via which a large amount of Kazakh oil is being transported today. The Tengiz-Novorossiisk export oil pipeline was put into operation in 2001 in order to reach the Black Sea ports. There are plans to implement large-scale projects to expand the Caspian Pipeline Consortium, create a Kazakhstan Caspian Oil Transportation System along the Aktau-Baku-Tbilisi-Ceyhan route, and carry out joint research of the Kazakhstan-Turkmenistan-Iran oil pipeline.

In 1998, an agreement was entered with the PRC on the stage-by-stage construction of the Atyrau-Kenkiiak-Kumkol-Atasu-Alashankou pipeline with a throughput capacity of 25 million tons of oil a year. In 2004, the Atyrau-Kenkiiak section was put into operation, and in 2006, laying of the Atasu-Alashankou oil pipeline was completed. The Chinese side will finish building the Kenkiiak-Kumkol-Atasu section in October 2009.<sup>11</sup>

<sup>9</sup> See: "Results of the Socioeconomic Development of the Fuel and Energy Complex Sectors for 2007," 6 February, 2008, available at [[http://www.memr.gov.kz/?mod=news&year=2008&lng=rus&cat\\_id=26&id=255](http://www.memr.gov.kz/?mod=news&year=2008&lng=rus&cat_id=26&id=255)].

<sup>10</sup> See: "Kazakhstan sokhranil v 2008 godu stoimost' postavok uzbekskogo gaza na prezhnem urovne blagodarja swap-dogovoru s 'Gazpromom'," *Panorama* (Kazakhstan), No. 2, 25 January, 2008.

<sup>11</sup> Reuters (Beijing), 2007.

Kazakhstan's internal and external gas transportation systems include the main Central Asia-Center, Soiuz, Orenburg-Novopskov, and Gazli-Shymkent-Bishkek-Almaty pipelines, as well as the two-branch Bukhara-Ural gas pipeline. Their total length, taking into account the discharge and supply pipelines in Kazakhstan, amounts to almost 10,000 km. The already developed system of mainline and distributing gas pipelines makes it possible to deliver natural gas to 9 of Kazakhstan's 14 regions.

In order to reduce the dependence of the republic's southern regions on deliveries of Uzbek gas, in 2003 the Amangeldy-Taraz main gas pipeline was put into operation. In the medium term there are plans to increase the throughput capacity of the CAC main pipeline to 60 bcm a year in order to transport the growing volumes of natural gas from Turkmenistan and Uzbekistan. In 2007, an Agreement on Cooperation in Laying and Operating the Kazakhstan-China Gas Pipeline was signed between the governments of Kazakhstan and the PRC, the first section of which is to be completed by the end of 2009.

## The Electric Power Industry

Reform of Kazakhstan's national electric power industry was the main prerequisite for the republic's successful integration into the world economy. Until the mid-1990s, Kazakhstan's electric power industry was a state vertical-integrated monopoly, which did not provide the industry with sufficient financing and rejuvenation. The sector was characterized by low indices of economic and technological efficiency, while the wear-and-tear of the main production funds reached 50%. Between 1991 and 1999, the country experienced a drop in electric power production and consumption.

Radical reform of the industry's structure and property relations began in 1995 in compliance with the Kazakhstan presidential decree On Electric Power Industry and the resolutions of the Kazakhstan Government On Reorganizing Kazakhstan's Energy Industry, as well as On the Program of Privatization and Restructuring in the Electric Power Industry.

Reform of the electric power industry was carried out in stages. In 1995-1996, power stations were transformed into joint-stock companies with the corresponding management and juridical independence. Regional distributing electricity network companies and an integrated electricity network management company, the KEGOC Joint-Stock Company, were created. Electricity transmission and customer supply functions were distributed in regional electric network companies. Organizations that were independent legal entities supplying electricity to local consumers were created in every region.

The second stage of the reforms (1997-2003) was carried out within the framework of the Kazakhstan Government Resolution on Additional Measures for Implementing the Privatization and Restructuring Program in the Energy Industry and Further Reform of the Electricity Market. Principles for organizing the market, rights and obligations of consumers, and structure of contractual relations were legislatively enforced for the first time. The electric power sector was divided into two parts: competitive (electric power manufacture and rendering services to specialized enterprises) and monopoly (the transmission and distribution of electric power). As a result of the reforms, most power stations were privatized and a model for a competitive wholesale electric power market was adopted on the basis of direct buy-sell contracts and ensuring open access to power transmission services via the electricity networks of the KEGOC Joint-Stock Company.

On the basis of the Kazakhstan Operator of the Electric Power and Capacity Market Joint-Stock Company, a spot exchange, centralized trading in electric power under "day in advance" conditions, began operating for the first time in the CIS countries. Over time, trading was included in the range of services for market participants on the delivery of electric power in the medium and long term, as well

as on the delivery of electric power during operation hours. The system of electronic trading introduced raised the objectivity and transparency of this market.

At present, in compliance with the Kazakhstan Law on Electric Power Industry, the third development stage in market relations is underway. Legal documents regulating questions relating to the organization and functioning of a wholesale electric power market, systemic and auxiliary service market, centralized trading of electric power, and a retail electric power market have been adopted. In order to regulate imbalances in electric power production and consumption, the market entities approved the Regulations for the Functioning of a Balanced Electric Power Market, which came into effect on 1 January, 2008.

According to Russian experts, Kazakhstan's competitive wholesale electric power market stands out in terms of its size among the post-socialist states, but its structure, with its small exchange market percentage, is typical of developing markets.<sup>12</sup> Kazakhstan's electric power industry is not yet ready for large-scale free trade of its products due to the undeveloped infrastructure of the industry and market.<sup>13</sup>

It can be ascertained that as a result of the reforms carried out, Kazakhstan's energy industry has overcome the crisis phenomena observed in the republic during the years of stagnation. Today, the generating capacities in Kazakhstan are capable of producing up to 80 billion kWh of electricity. The production, transmission, and distribution of electric power and capacities are carried out within the framework of the Joint Electricity System (JES), which includes power stations, electricity networks with general operating conditions, centralized operative-dispatcher and anti-emergency management, and others. Kazakhstan's JES serves as a link in Russia's, Central Asian and the CIS united energy systems.

The current electricity network of 500-1,150 kV makes it possible to carry out transit of capacities between the Urals and Siberia, as well as between the Central Asian states and Russia via Kazakhstan.

In 2006, 71.6 billion kWh of electricity were produced; 89.1% of which was generated at thermal power stations and 10.9% at hydropower stations. According to the 2007 results, electricity production increased by 6.7% (76.36 billion kWh) and consumption by 6.5% (76.42 billion kWh) compared to the previous year's index.

Thus, as a result of the market reforms, restructuring of the national sectors of the fuel and energy complex, and reform of the state's energy policy:

- (1) the steady trends toward an increase in production volumes in the oil-producing industry were strengthened;
- (2) the high level of export of energy resources was stabilized;
- (3) the transition to market relations in the oil and gas, coal, and electric power industries was largely completed;
- (4) elimination of the price disproportion of the internal and external export markets helped to integrate Kazakhstan's economy into the world economy.

## The Problems of the Fuel and Energy Complex

At present, the republic's fuel and energy complex fully meets the current demands of the economy and population for electric and thermal power. Nevertheless, many problems of Kazakhstan's

<sup>12</sup> See: *Mezhdunarodny opyt reformirovaniia elektroenergetiki. Kazakhstan*, RAO UES Russia Press, Moscow, 2005.

<sup>13</sup> See: I. Shulga, "Reformirovanie elektroenergetiki Kazakhstana," *EnergoRynok* (Russia), No. 7, 2004, available at [www.e-m.ru/archive/printer.asp?aid=4261].

fuel and energy complex have still not been resolved, which is making it difficult to carry out a targeted energy-efficient and energy-saving policy. The latter is a vital prerequisite for ensuring sustainable development of the country's energy industry and economy as a whole.

For example, there is essentially no production of large energy-machine-building products in the republic. Most of the current machine-building enterprises provide only technical servicing and repair of equipment of energy facilities, which have a high degree of wear-and-tear. The technical refurbishing of thermal power plant boilers and modernization of the existing energy-supply systems is required.

The significant wear-and-tear of production equipment and outmoded technology, the absence of comprehensive energy-saving systems, and the weak investment and financial mechanisms for stimulating energy-efficient production are the reasons for the high specific energy-output ratio in Kazakhstan's GDP, which is 2.5-4-fold higher than the indices in developed countries. Due to the republic's large territory, energy losses on lengthy power transmission lines reach 14%. There is no adequate system of control, accounting, and regulation of energy resource expenditure. Specialists believe that organizational and technical optimization of the energy-use system will save up to 10% of energy resources in Kazakhstan. In 2009, there are plans to adopt a new law on energy saving that envisages introducing fines for exceeding the energy-consumption limits, as well as measures for stimulating energy saving.

The Program for Developing Kazakhstan's Power Engineering Industry until 2030 plans to increase the share of electricity consumption in the social sphere by 25% with an insignificant drop in this index in industry by 2015. Recently, the trend toward an increase in production volumes in energy-intensive branches has been gaining momentum in practice. The enterprises of the oil and gas, coal, and metallurgical industries are investing funds to develop the electricity network infrastructure. In the near future, analysts are forecasting an abrupt rise in energy consumption in the republic's north due to the introduction of new production capacities of the heavy industry.

At present, average annual energy consumption growth amounts to 5-6% in Kazakhstan. Real prerequisites are developing for the emergence of an energy deficit in the country, the first signs of which were observed in 2006. The Kazakhstan government is taking effective measures to strengthen the national energy sector. In compliance with the Action Plan for Developing Kazakhstan's Energy Industry in 2007-2015 adopted in 2007, existing generating capacities will be modernized and new ones created totaling 8,100 MW, as well as facilities of the National Energy Network and regional electricity network companies. Investments in implementing the Plan will amount to no less than 21 billion dollars.<sup>14</sup>

Since coal will continue to play a leading role in the production of electric and thermal power in the republic, this augmentation in energy capacities will lead to a significant increase in development pressure on the environment and population. At the current stage, the efficiency of the domestic power industry depends on solving a set of tasks to diversify energy sources, obtain more competitive fuel, and make use of the latest "clean" practices in boiler technology.

Specialists are concerned about the adoption of decisions on the construction of a large thermal power station in Ekibastuz with export of 90% of the electricity manufactured to the PRC. The implementation of this project will have a serious impact on the environment of the northern region. It will demand the combustion of 25 million tons of domestic coal a year, whereby the emission of greenhouse gases and the ash and slag waste will constitute 40 and 10 million tons a year, respectively.<sup>15</sup>

<sup>14</sup> See: *Sistemnye voprosy razvitiia elektroenergeticheskoi otrasli*, Report of the KEGOC Joint-Stock Company. Second KazEnergy Eurasian Energy Forum, Astana, 6 September, 2007.

<sup>15</sup> See: E. Akhmetov, "Energetika RK: sostoianie i perspektivy," 11 December, 2006, available at [[www.gazeta.kz/art.asp?aid=84485](http://www.gazeta.kz/art.asp?aid=84485)]

As a result, degradation of the soil cover over large areas and extreme gasification of the air are inevitable.

## The Prospects for Renewable Energy

One of the promising areas in an efficacious environmental energy policy is the use of renewable energy sources (RES). The Program for Developing the Power Engineering Industry until 2030 envisages introducing RES technology into Kazakhstan's energy balance: the potential of small rivers, solar and wind energy, as well as biomass energy, which are essentially not tapped at present. But the planned introduction of small hydropower stations with a capacity of 1 GW and wind stations with a capacity of 2 GW into operation by 2024 is clearly insufficient for transferring to a sustainable power industry and will not compare in any way to the large-scale projects of the European countries in the field of renewable energy.

Kazakhstan has significant renewable energy resources: its hydro potential reaches 170 billion kWh/year (only 8 billion kWh/year are currently being used), its wind energy potential, which is technically available for use, is estimated at 3 billion kWh, and the total reserves of solar energy amount to 340 billion tons of oil equivalent. The drawing up of a new environmental energy policy based on the extensive introduction of RES into the production of thermal and electric energy will make it possible to solve the tasks of efficient energy supply and help to restore a favorable environmental situation in Kazakhstan.

Biomass is a very promising energy resource in Kazakhstan both for producing high-quality liquid and gaseous fuel and for manufacturing thermal energy. The republic possesses a large amount of land resources required for cultivating vegetable biomass. Enterprises producing bioethanol belong to the grain-product cluster being formed. In order to develop this production in Kazakhstan, a law must be adopted on the mandatory use of bioethanol as an additive to motor oils.

A development conception for the biofuel market for 2007-2010 has been drawn up in the country and a draft law has been prepared on biofuel which looks at questions relating to the production and consumption of this type of energy resource. Tough state regulation of this market, as well as benefits for the producers of biofuel, are envisaged. There are plans to build two plants for producing biofuel with state and private participation on parity conditions. The excise rate on ethanol fuel has been lowered by a government resolution and there are plans to reconsider the question of reducing the excise rate on gasoline with ethanol additive. During the Second KazEnergy Eurasian Energy Forum (2007), plans were announced to generate 1 billion liters of biofuel a year by 2010.<sup>16</sup>

The introduction of renewable energy technologies in Kazakhstan and an increase in the competitiveness of the products of this sector on the energy markets are being hindered by the high initial investment expenses and non-technical barriers associated with the lack of trust demonstrated by investors, the government, and consumers. The price of the thermal and electric energy produced in Kazakhstan does not reflect its actual cost, taking into account the detriment inflicted on society due to degradation of the environment caused by the use of traditional technology. On the other hand, the steady rise in prices for fuel energy resources and expenses to ensure the efficiency of electric power transmission and distribution systems is promoting an increase in the competitiveness of thermal and

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<sup>16</sup> See: A.K. Kurishbaev, *Perspektivy proizvodstva i primeneniia biotopliva v RK*, Report, Second KazEnergy Eurasian Energy Forum, Astana, 6 September, 2007.

electric power obtained from renewable sources. It is expected that energy production in Kazakhstan based on biomass, wind, and small hydropower stations will be competitive and efficient compared with other decentralized ways of energy supply.

A legal foundation, mechanisms for attracting investments, and state guarantees and benefits are needed to develop an alternative energy industry. Keeping in mind the plans to use Kazakhstan's hydro- and wind-power potential and the high capital-intensive nature of building certain renewable energy facilities, we will note the particular importance of state support—adoption of the Law on Renewable Energy Sources must be speeded up.

An increase in the competitiveness of renewable energy and a rise in its share in the country's energy balance are impossible without bringing RES onto the electricity market and ensuring access to electricity networks at reasonable prices. The creation of favorable financing conditions for integrating the renewable energy industry into Kazakhstan's fuel and energy complex will be justified by the environmental benefits. The task of incorporating renewable sources in the republic's energy balance has been included in the Action Plan for Developing Kazakhstan's Electric Power Industry in 2007-2015.

## The Atomic Energy Industry

According to a recent official statement, the national energy structure will be optimized by putting emphasis on hydrocarbon resources and atomic energy.<sup>17</sup> The country's subsurface holds 25% of the world's uranium reserves. Proven reserves amount to 1 million tons at a world consumption level of 50,000 tons a year. The geological specifications of Kazakhstan's uranium fields make it possible to use low-expense and efficient technology for extracting ores, which ensures the low net cost of the product and minimum environmental risks.

Since 1997, the annual increase in uranium production has remained at the level of 25% in Kazakhstan (in 2007, it was 25.7%). The National Kazatomprom Company is planning to raise the production volume of natural uranium to 15,000 tons a year in 2010. Enterprises are operating to produce and refine uranium ore, up-to-date techniques for producing atomic fuel have been developed, and all the products obtained are currently being exported. The Mangyshlak Atomic Energy Combine that operated in Soviet times is not in use at present.

Nevertheless, during the years of independence, objective prerequisites have been retained in the republic for developing the atomic energy industry. This primarily applies to the high resource potential: the reserves of uranium ore produced amount to 21,024 million tons of oil equivalent, or 46% in the overall structure of natural energy resources. The necessary legal base has been created: a Law on Use of the Atomic Energy Industry, Law on Radiation Safety of the Population, and Law on Export Control have been adopted; a procedure has been determined for licensing activity using atomic energy; a Convention on Nuclear Safety, Joint Convention on the Handling of Radioactive Materials and on the Handling of Processed Nuclear Fuel have been signed, and a Conception for the Development of Kazakhstan's Atomic Energy Industry (2007) has been drawn up.<sup>18</sup>

<sup>17</sup> See: "Atomnaia energetika i promyshlennost'," 9 June, 2007, available at [[www.interfax.kz/?lang=rus&actprint&int\\_id=atom\\_prom&news\\_id=170](http://www.interfax.kz/?lang=rus&actprint&int_id=atom_prom&news_id=170)].

<sup>18</sup> See: T. Zhantikin, *et al.*, *Kontseptsiiia razvitiia atomnoi energetiki RK*, Report of the Atomic Energy Committee, KATEP Joint-Stock Company, National Nuclear Center of Kazakhstan, 2005.

In 2006, a decision was made to build a series of atomic power stations in the country's west, which became necessary due to the shortage of electric energy in this region of the republic and the infrastructure created in Soviet times there. The total capacity of the first atomic power station will amount to 870 MW, which will make it possible to produce a volume of electricity comparable to that generated at present by all the power stations of West Kazakhstan.<sup>19</sup> Russian partners are taking part in implementing this project. According to official data, several more atomic power stations are to be built after 2015 in the west, north, and south of Kazakhstan.<sup>20</sup>

The introduction of complex nuclear energy production technology, which is fraught with the risk of global environmental disasters, is accompanied by several serious problems. They include the burying of radioactive wastes, the absence in Kazakhstan of large sources of running water necessary for the operation of atomic power stations (apart from the Irtysh River which is already under high development pressure), the absence of precise data on the impact of atomic energy-producing reactors under normal working conditions on man and the environment, and others. The resolution of these problems will make it possible for Kazakhstan to fully implement its development plans for the national atomic energy industry.

### *C o n c l u s i o n*

In 2007, the Conception for the Transition of the Republic of Kazakhstan to Sustainable Development in 2007-2014 was adopted by a Kazakhstan presidential decree. The creation of potential for ensuring the republic's sustainable development is associated with the introduction of "sustainable" technology into the national economy, including environmentally pure and economically efficient technology in the energy sphere.

Kazakhstan's fuel and energy sector is the main driving force behind the country's economic growth, as well as the largest source of serious environmental threats. Irreversible destruction of national natural ecosystems is occurring in all regions where facilities are located for extracting and producing energy resources: in the land-based and offshore hydrocarbon fields being developed, on major oil and gas pipeline routes, and at the sites of large hydropower stations and thermal and electric power-supplying enterprises.

In order to ensure the republic's sustainable development, environmental safety should become the fundamental factor in implementation of the national energy strategy. The existence of a powerful fuel and energy base and the positive experience of structural, technological, and legal reform of the fuel and energy complex acquired during the years of Kazakhstan's independence are two more significant factors of success.

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<sup>19</sup> See: S. Gribanova, "Zhiznennaia elektrosila strany," *Expert Kazakhstan*, No. 13, 2 April, 2007, available at [www.expert.ru/printissues/kazakhstan/2007/13/energetika\_kazakhstana/print].

<sup>20</sup> See: A. Satkaliev, "Energetika—novye proekty i perspektivy otrasli," 1 August, 2007, available at [www.zakon.kz/our/news/print.asp?id=30114241].