

## Kazakhstan's Energy Outlook

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### Summary

This paper is based on the Asian Development Bank's commissioned study of *Energy Outlook for Asia and the Pacific*. With the updates in some historical data, and additional information, this paper presents the energy outlook for Kazakhstan, and draws policy implications.

Primary energy demand of Kazakhstan is projected to increase from 56.7 MTOE in 2005 to 88.9 MTOE in 2030 growing at 1.8% per year. This represents a slower growth rate compared with the projected GDP growth rate of 3.8% during the same time period – reflecting the energy efficiency improvement across the sector.

By energy source, coal is expected to maintain the dominant share in primary energy demand at 46.1% in 2030 from 49.7% in 2005. However, its growth is likely to be relatively slow, at 1.5% per year through 2030, as coal will be replaced by natural gas for the industry sector, and will be more efficiently utilized for heat production and power. Natural gas demand will increase at an annual rate of 2.2%, reaching 29.7 MTOE in 2030 from 17.4 MTOE in 2005. Increased production in the western deposits and development of domestic supply infrastructure may spur the growth in natural gas across the sector. Oil demand is projected to increase at 2.1% per year. Upgrades and development of the road infrastructure, the transport sector's growth will lead to an overall increase in oil demand, accounting for more than 50% of total incremental growth in oil demand.

Over the outlook period, Kazakhstan's oil production is projected to increase from 1.2 million b/d in 2005 to 4.3 million b/d in 2030. This assumes steady production increases from the five major fields, including Tengiz, Karachaganak, Kashagan, Uzen and Aktobe. Natural gas production will nearly double from 23.3 BCM in 2005 to 48 BCM in 2030. The production will mainly increase from the western deposits, from the Karachaganak field of which proven reserves account for more than 70% of the entire natural gas reserves in Kazakhstan. Coal production is projected to increase from 38 MTOE in 2005 to 47 MTOE in 2030. About 87% of total production will be domestically consumed in 2030, while the remainder will be exported to Russia and Ukraine.

Kazakhstan would have to invest about between \$121 billion (low case) and \$169 billion (high case) for developing energy infrastructure necessary to meet demand growth as well as to meet production increases. These include upstream, middle stream and downstream investments for oil and natural gas, which respective investment requirements represent \$52.9 billion (oil) and \$39.7 billion (natural gas) in high cases. Investment for the power sector – including generation, transmission and distribution - would represent \$50.3 billion (high case), and the coal sector would require \$26.4 billion (high case).

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## 1. Introduction

Kazakhstan is the largest country in Central and West Asia in terms of land area. It has 2,699,700 km<sup>2</sup> of land area (seven times bigger than that of Japan) with a population of 15.67 million in 2008. GDP stood at \$37.27 billion – in 2008, which is roughly more than two times larger than Central and West Asia's average at \$13.66 billion in the same year.

In Kazakhstan's vast land area, energy resources and demand centers are disparately located. The north and middle region of Kazakhstan possesses coal with proven reserves of 31.3 billion tons (3.8% of the world)<sup>1</sup>, and this is the third largest level in the former Soviet republics after Russia and Ukraine. The western region is endowed with oil and natural gas, of which proven reserves respectively stand at 39.8 billion barrels (or 3.0% of the world), and 1.82 trillion cubic meters (TCM) (or 1% of the world). Meanwhile, the population centers are in the southeast region surrounding Almaty – the former capital of Kazakhstan, in the north region surrounding Astana – the current capital, and in the south region surrounding Shymkent.

Kazakhstan's economy has been making positive growth since 1999 after a substantial economic setback caused by the break-down of Former Soviet Union. The increases in oil exports from Tengiz and Karachaganak greatly contributed to the recovery. Particularly, the opening of a new oil export route to the Black Sea through the Caspian Pipeline Consortium (CPC) in 2003 has driven the increases in oil export from the Tengiz field. And these factors along with the rise in international crude oil prices from 2005 have confirmed the resilient economic growth in Kazakhstan. For example, between 1999 and 2007, Kazakhstan's GDP growth rate averaged an annual rate of 10.2%. This marks a contrast to the decline in GDP between 1991 and 1999 at an annual rate of 4.2%. On the back of the global financial crisis; however, Kazakhstan's GDP growth has slowed to an annual growth rate of 3.3% in 2008.<sup>2</sup>

Along with the economic recovery since 1999, energy demand recovered to grow positively. From 1999 and 2007, Kazakhstan's total primary energy demand grew from 35.85 MTOE to 66.46 MTOE at an annual rate of 8.0%. Despite the growth, the primary energy demand in 2007 was about 11% below the 1991 level at 74.5 MTOE.

Kazakhstan's energy supply infrastructure is underdeveloped as the legacy of the former Soviet Union, which had sought to optimize energy supply within member states rather than to achieve self sufficiency in the energy supply of each member state. Heavy government regulation including pricing and universal supply obligations makes domestic market unattractive to suppliers. Therefore, while Kazakhstan is a net energy exporter, some regions would have to rely on imported energy sources – including petroleum products, natural gas, and electricity – from the neighboring countries.

During the transition period toward market economy, it is inevitable for Kazakhstan to rely on energy exports for further development. However, heavy dependence on exports from the energy

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<sup>1</sup> BP. 2009. *BP Statistical Review of World Energy*. London.

<sup>2</sup> Limited access to international capital markets resulting from global financial crisis hampered domestic lending, and led to slow economic growth in 2008.

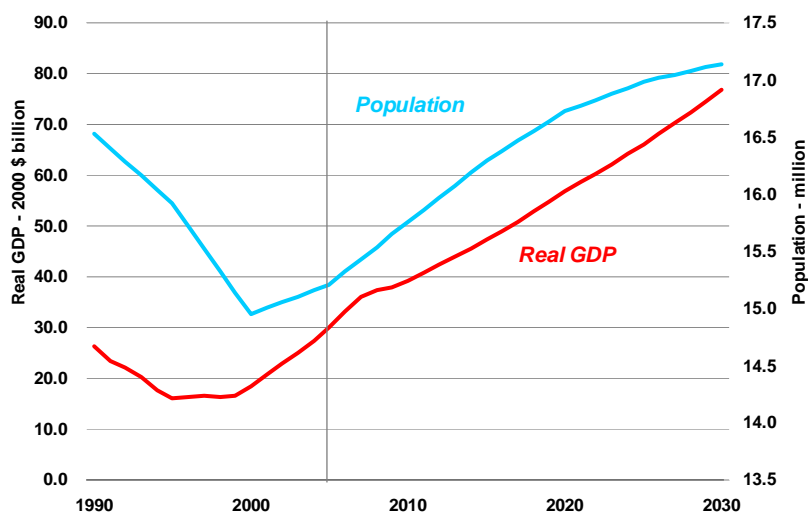
sector has created social disparities such as a widening income gap between rich and poor and a development gap between regions. To strengthen the overall economy, in 2003 the Kazakhstan government promulgated the Innovative Industrial Development Strategy for 2003-2015, which tries to diversify the economic structure. At the same time, Kazakhstan is strengthening government ownership in the oil and gas sector.

## 2. Energy Demand Drivers

Kazakhstan’s GDP is projected to grow at an annual rate of 3.8% between 2005 and 2030. Assisted by pipeline infrastructure development, oil and gas exports will continue to drive steady economic development. Following the current practice, surplus revenues from oil and gas sales will be channeled to the National Fund, which will support the country’s efforts to diversify the economic structure through development of the agriculture and manufacturing industries.

The economic downturn in the early 1990s resulted in increased emigration, causing the population to decline at an annual rate of 1% between 1990 and 1999. In contrast, as the economy started recovery in 1999, immigration increased and the country’s population grew at a moderate rate of 0.1% per year from 1999 to 2005. During the outlook period, the overall population is expected to continue growing at 0.5% per year through 2030, while the urban population will grow at a faster rate, 1.1% annually through 2030, with its share of the total population reaching 66.8% in 2030 from 57.1% in 2005.

**Fig. 2-1 GDP and Population (1990-2030)**

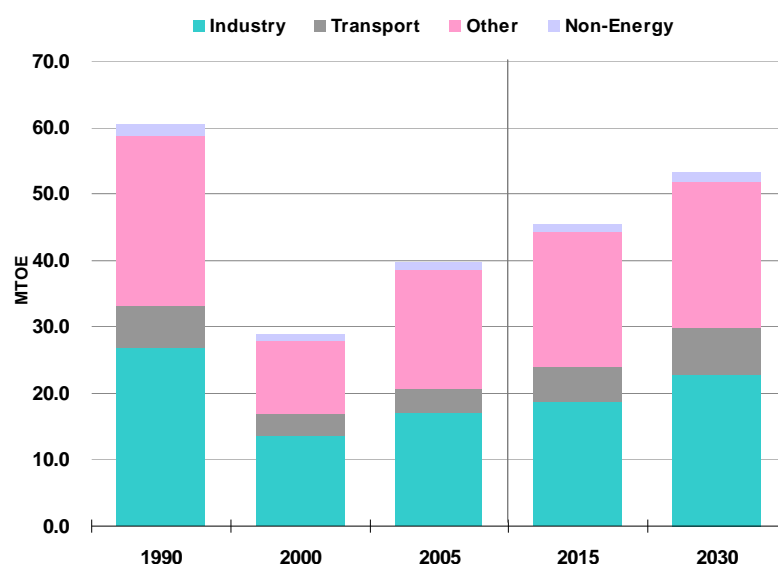


Source : ADB. 2009. *Energy Outlook for Asia and the Pacific*. Manila.

### 3. Final Energy Demand Outlook

Final energy demand is projected to grow at 1.2% per year in contrast to the 2.8% per year decline observed between 1990 and 2005. The transport sector is expected to increase at the fastest rate of 2.7%, followed by industry at 1.2% and the other sectors at 0.8%.

**Fig. 3-1 Final Energy Demand (1990-2030)**



Source : ADB. 2009. *Energy Outlook for Asia and the Pacific*. Manila.

**Table 3-1 Final Energy Demand (1990-2030)**

	Final Energy Demand (MTOE)					Annual Growth Rates			
	1990	2000	2005	2015	2030	1990-2005	2005-2015	2015-2030	2005-2030
<b>Total</b>	<b>60.5</b>	<b>28.9</b>	<b>39.7</b>	<b>45.5</b>	<b>53.3</b>	<b>-2.8%</b>	<b>1.4%</b>	<b>1.1%</b>	<b>1.2%</b>
Industry	26.9	13.7	17.1	18.8	22.7	-3.0%	1.0%	1.3%	1.2%
Transport	6.4	3.4	3.6	5.1	7.0	-3.6%	3.4%	2.2%	2.7%
Others	25.5	10.9	17.9	20.4	22.0	-2.3%	1.3%	0.5%	0.8%
Non-Energy	1.8	0.9	1.2	1.3	1.5	-2.8%	0.8%	1.0%	0.9%

Source : ADB. 2009. *Energy Outlook for Asia and the Pacific*. Manila.

#### 3-1 Industry Sector

Industry energy demand is projected to increase at an annual rate of 1.2% between 2005 and 2030, a slower rate compared with the 4.5% annual growth registered between 2000 and 2005. Presently, coal is the main energy source in Kazakhstan’s industry sector, accounting for 41.7% of total industry energy demand. Coal is mainly used in the steel and manufacturing subsector, which is located close to the coal mines in the northern part of Kazakhstan. Over the outlook period, although iron and steel production will continue to drive the steady growth in coal demand, other manufacturing subsectors will shift from coal to other energy types—mainly electricity and natural

gas due to the development of expanded transmission networks. As a result, industry's coal demand is projected to decline at an annual rate of 0.8% through 2030, compared with the annual growth rate of 1.4% between 2000 and 2005.

Natural gas is projected to increase the fastest, at an annual rate of 5.1% over the outlook period. The development of a natural gas pipeline that connects the production deposits in the western region to the eastern demand center for the light and food industries may increase natural gas demand. At the same time, following the government's strategy to diversify economic structure, the manufacturing industry is expected to increase its investment in the western region and utilize natural gas for on-site generation. The rapid growth in demand for natural gas will increase its share of industry energy demand from 4.8% in 2005 to 12.2% in 2030.

Electricity demand is projected to grow at an annual rate of 2.5% between 2005 and 2030 – more than double the projected growth of industry's total energy demand (1.2%) during the same time period. Electricity will increasingly substitute for coal, and as a result, electricity's share of total industry energy demand will increase from 14% in 2005 to 18.9% in 2030.

Demand for petroleum products is projected to increase at an annual rate of 3.5% through 2030. In Kazakhstan, the mining subsector is currently the main consumer of petroleum products (diesel), and with steady growth in mining, this sector is expected to continue driving the increase in diesel demand.

### **3-2 Transport Sector**

Given Kazakhstan's distinctive geographical characteristics—vast land area, landlocked location, and long distance between the mineral resource deposits and demand center—the country's economic activities inevitably rely on efficient transport operations.

Over the outlook period, transport energy demand will nearly double from 3.6 MTOE in 2005 to 7.0 MTOE in 2030, at an annual growth rate of 2.7%. As a result of income growth, demand for gasoline for both passenger and freight vehicles will grow 2.1% per year through 2030 and maintain the largest share of total transport energy demand at 60.7% in 2030—although this still represents a decline from 69% in 2005. Diesel for buses and freight trucks will grow at an annual rate of 3.1% through 2030, faster than the projected total growth in transport energy demand. The Kazakhstan government plans to modernize the road infrastructure and expand the road network to facilitate connectivity within the country and to allow smooth transit to other countries. Investment in road infrastructure and economic development both within and outside the country may increase the freight transport needs, which will translate into the relatively fast growth of diesel demand through 2030.

Jet kerosene demand for international air transport will grow at an annual rate of 4.4% over the projected period. Integration into the subregional economy as well as increased tourism may attract international passengers to drive this growth. In anticipation of increased air transport demand, the Kazakhstan government plans a two-stage upgrade to the service in 2010 and 2015.

The railway system is likely to continue its importance as a mode of transport for passenger traffic and mineral and steel products for export. By energy source, currently diesel represents more

than 75% of total rail transport energy demand, while the remainder is taken up by electricity.

### **3-3 Other Sectors**

The other sectors' energy demand is projected to increase at an annual rate of 0.8% through 2030, slower than the growth of final energy demand (1.2%) during the same time period.

By energy, natural gas for heating and cooking is the dominant energy source, accounting for 61.7% of total energy demand in this sector in 2005. Over the outlook period, natural gas will continue to have the dominant share in this sector, while its demand is projected to grow relatively slowly at an annual rate of 1.0% through 2030. This reflects both the efficiency improvements in gas supply and an expected price increase to offset the cost of those improvements.

In contrast, heat — which currently accounts for the second-largest share at 22.7% of the sector's energy demand — is projected to decline at an annual rate of 0.2% over the outlook period. Heat for space and hot water heating may increasingly be replaced by natural gas, and heat supply efficiency may improve in newly installed residential and commercial buildings. These factors will result in a decline in heat demand over the outlook period, with the share of heat decreasing to 17.7% in 2030.

Electricity is projected to increase at an annual rate of 2.3%, representing the fastest growth among all types of energy in the other sectors. With the economic development of Kazakhstan, the service sector's share is likely to increase and this will drive the growth in electricity demand.

## **4. Primary Energy Demand**

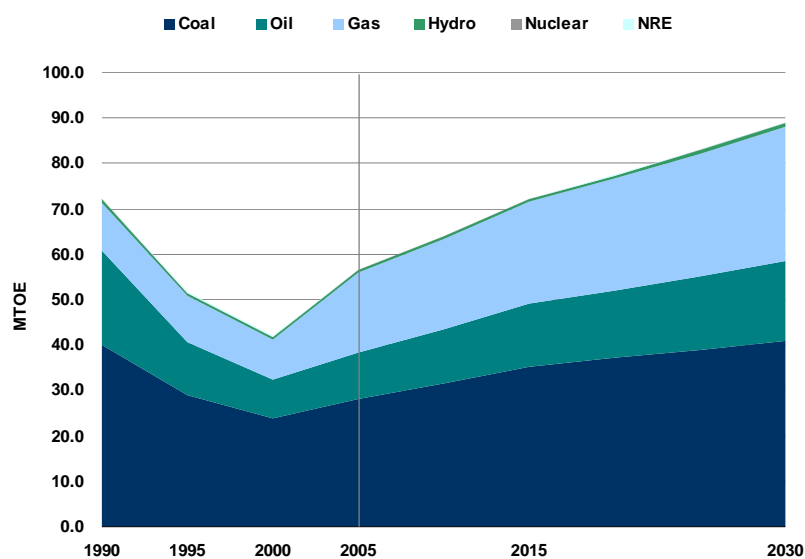
Kazakhstan's primary energy demand is projected to increase at 1.8% per year between 2005 and 2030. Although the country's primary energy demand registered a 1.7% annual decline between 1990 and 2005, a positive increase is projected over the outlook period. Primary energy demand is projected to increase faster in the near term (2005–2015) at 2.5% annually, driven by the economic growth, in contrast to a slower growth rate of 1.4% per year for the longer term (2015–2030).

By energy type, coal is expected to maintain its dominant share over the outlook period (46.1% in 2030 from 49.7% in 2005). However, its growth is likely to be relatively slow, at 1.5% annually through 2030, as coal may be replaced by natural gas in the industry and power sectors, and will be more efficiently utilized for heat production and power.

Natural gas demand will increase 2.2% per year, reaching 29.7 MTOE in 2030 from 17.4 MTOE in 2005. Increased production in the western part of Kazakhstan – assisted by the improved domestic natural gas supply infrastructure – may spur growth in demand in the power, industry, and other sectors.

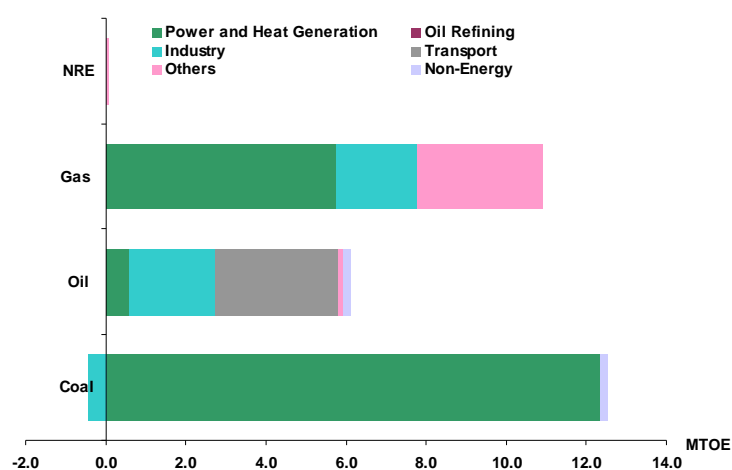
Oil demand is projected to increase 2.1% annually, in contrast to the 4.6% annual decline observed between 1990 and 2005. As a result of upgrades and development of the road infrastructure, the transport sector's growth will lead to an overall increase in oil demand, accounting for more than 50% of total incremental growth in oil demand.

**Fig. 4-1 Primary Energy Demand by Source (1990-2030)**



Source : ADB. 2009. *Energy Outlook for Asia and the Pacific*. Manila.

**Fig. 4-2 Incremental Growth by Energy Type (2005-2030)**



Source : ADB. 2009. *Energy Outlook for Asia and the Pacific*. Manila.

**Table 4-1 Primary Energy Demand by Source (1990-2030)**

	Primary Energy Demand (MTOE)					Annual Growth Rates			
	1990	2000	2005	2015	2030	1990-2005	2005-2015	2015-2030	2005-2030
<b>Total</b>	<b>73.6</b>	<b>42.2</b>	<b>56.7</b>	<b>72.3</b>	<b>88.9</b>	<b>-1.7%</b>	<b>2.5%</b>	<b>1.4%</b>	<b>1.8%</b>
Coal	40.0	23.7	28.2	35.3	41.0	-2.3%	2.3%	1.0%	1.5%
Oil	20.8	8.6	10.3	13.8	17.5	-4.6%	3.0%	1.6%	2.1%
Natural gas	10.7	8.8	17.4	22.5	29.7	3.3%	2.6%	1.9%	2.2%
Hydro	0.6	0.6	0.7	0.7	0.7	0.4%	0.2%	0.2%	0.2%
Nuclear	-	-	-	-	-	-	-	-	-
Others	1.6	0.3	0.1	0.1	0.1	-15.8%	-5.0%	0.0%	-2.0%

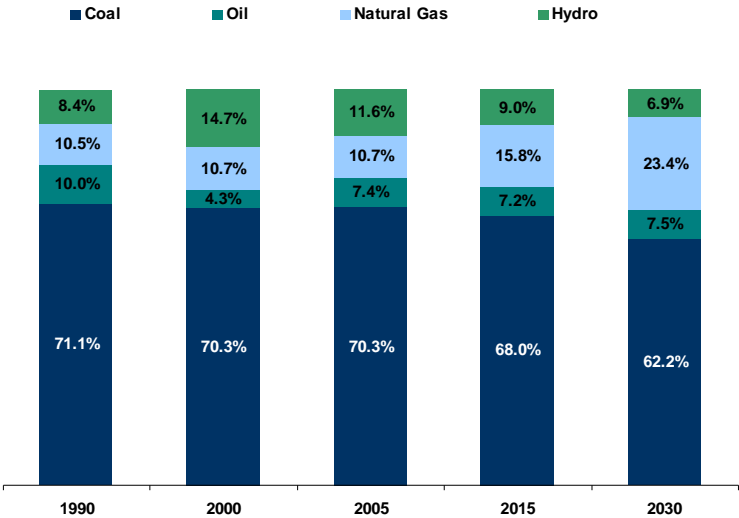
Source : ADB. 2009. *Energy Outlook for Asia and the Pacific*. Manila.

### 5. Electricity

Electricity demand is projected to increase at 2.5% per year between 2005 and 2030. The increase in overall electricity demand may be driven largely by the industry sector, which accounts for 60% of incremental demand growth between 2005 and 2030, followed by the other sectors at 31% and the transport sector at 9% during the same time period.

Similar to other countries in Central and West Asia, most of Kazakhstan’s power generation facilities are obsolete as they were mostly built during the Soviet era. Currently, the country’s total installed capacity is 18,602 MW, of which only 14,410 MW of generation capacity is operational. To meet the expected 2.5% annual growth in demand, replacement of the old generation units and introduction of additional units will be necessary. Kazakhstan’s power generation mix is dominated by coal, accounting for 70.3% in 2005. Along with the additional capacity increase in coal-fired generation close to the northern part of the country, construction of natural gas-fired generation facilities is being undertaken near the western deposits and hydrogeneration capacity is being expanded in the south. As a result, coal’s share will drop to 62.2% in 2030, while natural gas-fired generation will double from the current 10.7% to 23.4% in the same time period.

**Fig. 5-1 Electricity Generation Mix**



Source : ADB. 2009. *Energy Outlook for Asia and the Pacific*. Manila.

### 6. Energy Production

#### 6-1 History of Oil and Natural Gas Production

After the break-down of the former Soviet Union, the Kazakhstan government considered that the increased earnings from oil and natural gas export could assist the country’s economic recovery, and launched the exploration and development of the untapped oil and natural gas reserves in the western region. To explore new oil and natural gas fields, the government opted for inviting foreign



investors because of the substantial capital requirements and technological needs. The concerted efforts between Kazakhstan’s state owned oil/natural gas company and foreign ones to develop the major oil and natural gas fields were successfully translated into positive growth in oil and natural gas production respectively from 1995 and 1996. The main fields that supported the growth in oil and natural gas production are Tengiz and Karachaganak.

**Table 6-1 Main Oil and Natural Gas Fields**

Field	Project Participants	Proven Reserves	Production
<b>Tengiz</b>	TengizChevrOil (Chevron 50%, Kazmunaigaz 20%, ExxonMobil 25%, LUKArco 5%)	6-9 billion barrels of recoverable reserves of oil (The 6th largest oil field in the world)	492,000 b/d of crude oil and 38,000 b/d of liquids; 6.9 bcm of natural gas in 2009. The oil production can increase to as much as 750,000 b/d or 1 million b/d.
<b>Karachaganak</b>	Karachaganak Petroleum Operating (BG 32.5%, Eni 32.5%, Chevron 20.0%, LUKoil 15.0%)	9 billion barrels of condensate, and 1.34 tcm of gas	237,721 b/d of liquids; 15.2 bcm of natural gas in 2009. The Phase I and II are focused on the production of condensate, and the Phase III will boost natural gas production.
<b>Kashagan</b>	Agip Kazakhstan North Caspian Operating Company (Agip KCO) (Eni 16.81%, Kazmunaigaz 16.81%, ExxonMobil 16.81%, Shell 16.81%, Total 16.81%, ConocoPhillips 8.4%, INPEX 7.55%)	9 billion barrels of recoverable oil	Oil production is expected to start by the end of 2012. The peak production can reach 1.5 million b/d.
<b>Uzen</b>	Uzenmunaigaz (Kazmunaigaz Exploration & Production 100%)	1.5 billion barrels of oil	132,000 b/d of crude oil in 2008
<b>Aktobe</b>	CNPC Aktobemunaigaz (88%), (within Block ADA partners include Korean National Oil Corp (KNOC), LG International Corp, Vertom)	1.17 billion barrels of oil	JV Producing 116,660 b/d of oil in 2008, 101 Bcf/y of natural gas in 2007. Oil production more than doubled between 1997 and 2006. New field Umit discovered in 2005.
<b>Amangeldy</b>	Kazmunaigaz (100%)	Natural gas reserves up to 50.4 bcm	Initial production of 0.98 bcm is expected to serve for the demand in the South region.

Source : AGIPKCO, EIA, Global Insight, and KPO.

As a landlocked country, finding routes of transporting resources has been critical to spur the growth in oil and natural gas exports. At the time when Kazakhstan gained independence from the Soviet Union in 1991, the Atyrau (in Kazakhstan) – Samara (in Russia) was the only westward oil export pipeline route. Meanwhile, Kazakhstan’s export volume was controlled by Russia in the early part of the 1990s, and this has promoted Kazakhstan to find alternative routes that can become outlets for direct export. On natural gas, the Central Asia Center Pipeline has been the major international pipeline, to which Kazakhstan serves as the transit from Turkmenistan and Uzbekistan to Russia. In addition, domestic infrastructure to deliver natural gas in the western deposit to the demand center in the industrial belt around Almaty and Shymkent was underdeveloped; therefore, oil producers in Kazakhstan chose to flare their associated gas – rather

than to use it – until the government passed a law requiring suboil users to include natural gas utilization in the project.

A few major developments have been made so far in terms of diversifying oil export routes. In 2003, an oil pipeline linking Tengiz field (the largest oil/natural gas field in Kazakhstan) with the Black Sea port of Novorossiysk in Russia, was commissioned by the Caspian Pipeline Consortium (CPC). And in 2005, Kazakhstan and Azerbaijan reached an agreement that allows re-export of Kazakh oil through the BTC pipeline from Baku in Azerbaijan to Ceyhan - a sea port in Turkey. More recently, the construction of a Kazakhstan - China oil pipeline was completed in 2009, of which the maximum capacity could expand to 400,000 b/d from the initial capacity of 200,000 b/d.

## **6-2 Oil Production and Export**

Over the outlook period, Kazakhstan's oil production is projected to increase from 1.2 million b/d in 2005 to 4.3 million b/d in 2030. This assumes steady production increases from the five major fields, including Tengiz, Karachaganak, Kashagan, Uzen and Aktobe. Out of these fields, Tengiz, Karachaganak and Kashagan are expected to drive the growth in oil production, as they may account for about 80% of the Kazakhstan's entire increments in oil production. In particular, the production from Kashagan field may add an additional 1.5 million b/d by 2030 – the largest contributions to the total increase in Kazakhstan's oil production. Out of this total production, about 83.7% will be dedicated to export, and the remainder will be consumed domestically.

Nevertheless, there are risks revolving around the future growth in oil production from these fields. The future of Kazakhstan's oil production is contingent on the government policy toward foreign investment, and on the development of export routes alternative to the existing ones.

Kazakhstan's Law on Suboil and Suboil Use was amended in 2005 to provide the basis for pre-emption rights on any oil assets that are sold in Kazakhstan. Further amendment of the Law was made in 2007, in order to give rights for the state to retrospectively change existing oil contracts, or break contracts if any projects are considered as a threat to Kazakhstan's economy.<sup>3</sup> In addition, the Law on Production Sharing Agreement was amended in 2005 to require more than 51% ownership of the state owned Kazmunaigaz in a project. The timing of oil production increases from the major fields may be delayed if the amendments in these laws stall negotiations between Kazakhstan and foreign investors.

In addition, there is a mismatch between the projected export volume and pipeline/tanker capacity for export. Reflecting the current capacity and plan for pipeline expansion on CPC, Atyrau-Samara, BTC, and Kazakhstan-China, Kazakhstan would have about 2.76 million b/d of export capacity, which is about 20% below the projected export amount in 2030. Additional routes as well as market are needed to be secured to realize Kazakhstan's full potential in oil production growth.

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<sup>3</sup> EIA. 2009. *Country Analysis Brief: Kazakhstan*. Washington, D.C.

**Table 6-2 International Oil Pipelines**

Project	Project Partners	Route and Distance	Project Status
<b>Caspian Pipeline Consortium</b>	Russia 24%; Kazakhstan 19%; Chevron (U.S.) 15%; Luk Arco (Russia/U.S.) 12.5%; Rosneft-Shell (Russia-U.K./Netherlands) 7.5%; ExxonMobil (U.S.) 7.5%; Oman 7%; Agip/Eni (Italy) 2%; BG (U.K.) 2%; Kazakhstan Pipeline Ventures LLC 1.75%; Oryx 1.75%	Tengiz to Novorossiysk (Russia), 1,510km	CPC started crude oil export in 2001 to the terminal near Novorossiysk on the Black Sea on the test base. In 2003, the first phase of the CPC system started regular operation. Ultimately, CPC will be able to transport 1.34 million b/d of oil per year by 2014.
<b>Ayrau - Samara</b>	Russian Transneft and Kazakh KazTransOil	691 km	Prior to the commissioning of the CPC pipeline, the Ayrau-Samara pipeline was the main export pipeline. Current pipeline capacity stands at 321,000 b/d. Project operators plan to expand the capacity to 522,600 b/d by 2015.
<b>Kazakhstan - China</b>	CNPC (China) and Kazmunaigaz	Ayrau (Kazakhstan) to Alashankou-Dashanzi (China), 3,000 km	The construction of Kazakhstan-China crude oil pipeline was made in three phases with the first phase (Ayrau-Kenkyak) completed in 2003, the second phase (Atasu-Alashankou in China) completed in 2005, and the third phase linking the two pipelines (Kenkyak-Kumkol) completed in 2009. The crude oil is sourced from CNPC's Aktobe field and from CNPC and Kazmunaigaz's Kumkol fields. The initial capacity at 200,000 b/d is expected to double to 400,000 b/d once supply sources in the Caspian region is secured.

Source : EIA, CNPC, and Global Insight.

### 6-3 Natural Gas Production and Export

Over the outlook period, natural gas production will nearly double from 23.3 BCM in 2005 to 48 BCM in 2030. The production will mainly increase from the Karachaganak field of which proven reserves account for more than 70% of the entire natural gas reserves in Kazakhstan. Production from Amangeldy will meet demand in the country's south region, which currently relies on imports from Uzbekistan.

Out of the total natural gas production, Kazakhstan will be able to export about 15 BCM in 2030. Export to China may account for 5 BCM, and export to Russia through CAC 3 may account for 10 BCM in 2030.

Similar to oil, however, Kazakhstan's natural gas production is subject to the development of additional natural gas pipelines for both export and domestic supply, and government regulation over foreign investment.

**Table 6-3 International Natural Gas Pipelines**

Project	Type	Route and Distance	Project Status
<b>Central Asia Center (CAC) Pipeline</b>	Transit	Turkmenistan, Uzbekistan, Kazakhstan and Russia (3,730 km)	Main natural gas export pipeline in Central Asia, transporting gas from Turkmenistan, Uzbekistan, Kazakhstan, and Russia. Two branches have a combined total capacity of 100 bcm. The Kazakhstan part serves as a transit. CAC 3 pipeline - connecting Turkmenistan and Kazakhstan with 10-30 bcm of capacity is planned to be built.
<b>Turkmenistan-Kazakhstan-China Pipeline</b>	Transit/Export	Turkmenistan, Uzbekistan, Kazakhstan, China (1,818 km)	The construction of the first part of two parallel lines was completed in November 2009, and the second line is scheduled to be completed in 2014. Out of the total capacity at 30-40 bcm, Kazakhstan will export about 5-10 bcm to China.

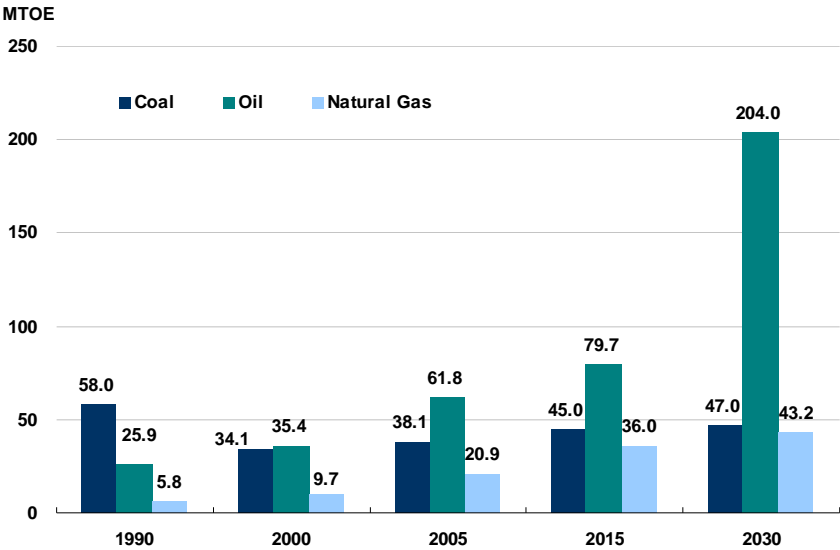
Source : EIA, CNPC, and Global Insight.

**6-4 History and Outlook of Coal Production**

Kazakhstan is endowed with vast coal reserves representing the third largest level in the former Soviet republics – after Russia and Ukraine – at 31.3 billion tons, and its production represented the second highest level in the former Soviet republics after Russia. Of the total coal reserves in Kazakhstan, hard coal accounts for 64%, and brown coal accounts for 36%.<sup>4</sup> The country’s coal reserves are mainly in the Ekibastuz, the Karaganda, and the Shubarkol deposits and the Turgay coal basin.<sup>5</sup> Coal mining in Kazakhstan was conducted by 33 companies, including 5 foreign companies. Given the vast reserves, in 2007, about 30% of the whole of production was dedicated to export to Russia and Ukraine, and the remainder was consumed domestically.

Over the outlook period, Kazakhstan’s coal production is projected to increase from 38 MTOE in 2005 to 47 MTOE in 2030. In fact, the projected growth trend in coal production at 0.8% per year between 2005 and 2030 represents a much slower pace compared with the growth rate registered between 2000 and 2005 at 2.2%. About 87% of total production will be domestically consumed in 2030, while the remainder will be exported to Russia and Ukraine.

**Fig. 6-1 Energy Production**



Source : ADB. 2009. *Energy Outlook for Asia and the Pacific*. Manila.

**7. Energy Investment**

Kazakhstan would require between about \$121 billion (low case) and \$169 billion (high case) to develop energy infrastructure necessary to meet demand growth, as well as to meet production increases. These include upstream, middle stream and downstream investments for oil and natural gas, the respective investment requirements of which account for \$52.9 billion and \$39.7 billion in

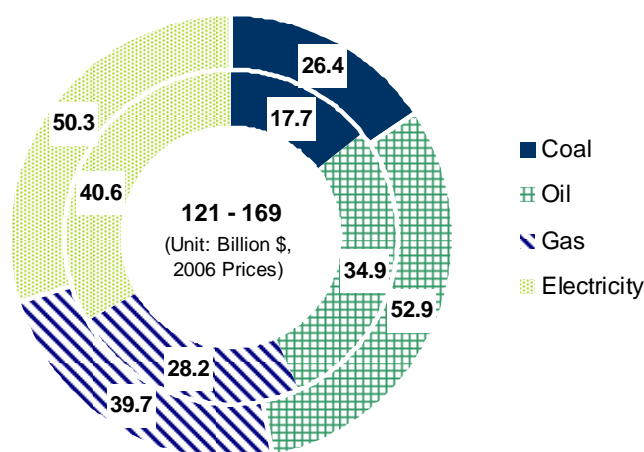
<sup>4</sup> Richard M. Levine, Mark Brininstool, and Glenn. J. Wallace. 2007. *The Mineral Industry of Kazakhstan. U.S. Geological Survey Minerals Yearbook*.

<sup>5</sup> Ibid.

high cases. Investment for the power sector – including generation, transmission and distribution – would represent \$50.3 billion (high case), and the coal sector would require \$26.4 billion (high case).

Because of Kazakhstan’s investment needs to explore/develop energy sources, and to develop energy infrastructure required for export purposes, the size of total investment relative to cumulative GDP over the outlook period accounts for a relatively large 12%.<sup>6</sup>

**Fig. 7-1 Energy Investment Requirements by Sector**



Source : ADB. 2009. *Energy Outlook for Asia and the Pacific*. Manila.

## 8. Implications

The projected primary energy demand growth in Kazakhstan at 1.8% per year represents a slower trend compared with the historical growth trend in primary energy demand at 8.0% between 1999 and 2007. Despite the slow growth, meeting the demand may offer challenges to Kazakhstan.

Kazakhstan is endowed with vast energy reserves of coal, oil, and natural gas, while it does not have a well-developed nationwide energy supply infrastructure, as the legacy of the former Soviet Union which tried to optimize energy resources allocation within the members rather than to achieve self sufficiency of energy supply within a country. Given the vast land, the resource rich area is located far away from the demand centers. Besides, energy suppliers have low incentives to build and modernize facilities due to the regulated electricity tariffs – along with non payment problems of consumers. A clear future direction as well as legislation toward building and modernizing infrastructure is necessary to be developed to promote investment in the energy sector.

On energy resources development and exports, in the early part of 1990s, Kazakhstan encouraged inviting foreign investors to explore and develop resources. However, recently, the

<sup>6</sup> The ratio of cumulative energy investment requirements over the outlook period per cumulative GDP during the same time period in the countries at similar economic development levels to Kazakhstan – excluding energy exporters – will account for 2-4%.

government has shifted its policy to strengthen its involvement in energy resources development. In 2005, Kazakhstan's Law on Suboil and Suboil Use was amended to include pre-emption rights on any oil assets. In addition, the Law on Production Sharing Agreement was amended in 2005 to require more than 51% ownership of the state owned Kazmunaigaz in a project. In the estimated investment outlook, exploration/development, and export facilities represent large-scale capital for both oil and natural gas – respectively accounting for \$52.9 billion and \$39.7 billion. Faced with the financial and technological constraints in Kazakhstan, the country is encouraged to create conditions that can facilitate entry of foreign investors, which can form partnerships with the state owned company, and provide easier access to international capital and technology. And these efforts would ultimately lead to realize Kazakhstan's potential economic gains from energy exports.

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