



Independent Statistics & Analysis

U.S. Energy Information  
Administration

# Country Analysis Brief: Kazakhstan

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## Overview

*Kazakhstan, an oil producer since 1911, has the second-largest oil reserves and the second-largest oil production among the former Soviet republics after Russia.*

Kazakhstan is a major oil producer. The country's estimated total petroleum and other liquids production was 1.698 million barrels per day (b/d) in 2016. The key to its continued growth in liquids production from this level is the development of its giant Tengiz, Karachaganak, and Kashagan fields. Development of additional export capacity will also be necessary for production growth.

Although Kazakhstan became an oil producer in 1911, its production did not increase to a meaningful level until the 1960s and 1970s, when production plateaued at nearly 500,000 b/d, a pre-Soviet independence record production level. Since the mid-1990s, and with the help of major international oil companies, Kazakhstan's production first exceeded 1 million b/d in 2003.

Oil field development in Kazakhstan reached two milestones in 2016. In October 2016, the giant Kashagan field resumed production after years of delays. Kashagan is expected to produce 370,000 b/d of liquids at full capacity. Additionally, in July 2016, The Tengizchevroil consortium decided to proceed with expansion plans that should increase liquids production at the Tengiz project by about 260,000 b/d beginning in 2022.

Kazakhstan is landlocked and is far from international oil markets. The lack of access to the open ocean makes the country dependent mainly on pipelines to transport its hydrocarbons to world markets. Kazakhstan is also a transit country for oil and natural gas pipeline exports to China.

Kazakhstan consumed 2.66 quadrillion British thermal units (Btu) of energy in 2014, with coal accounting for the largest share of energy consumed (63%), followed by petroleum and natural gas (18% and 16%, respectively) (Figure 2).

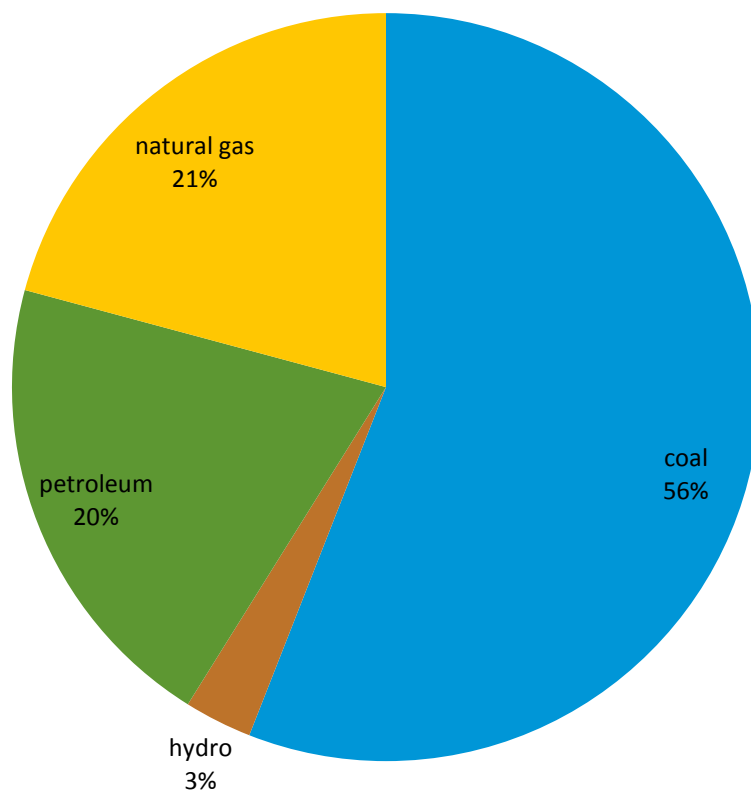
Kazakhstan is a Caspian Sea littoral state. The legal status of the Caspian area remains unresolved, mainly driven by a lack of agreement on whether the Caspian is a sea or a lake. Until all states agree on a definition, the legal status of the area will remain unresolved.

Figure 1. Map of Kazakhstan



Source: Central Intelligence Agency, *The World Factbook*

Figure 2. Kazakhstan energy consumption by fuel, 2014



Source: U.S. Energy Information Administration

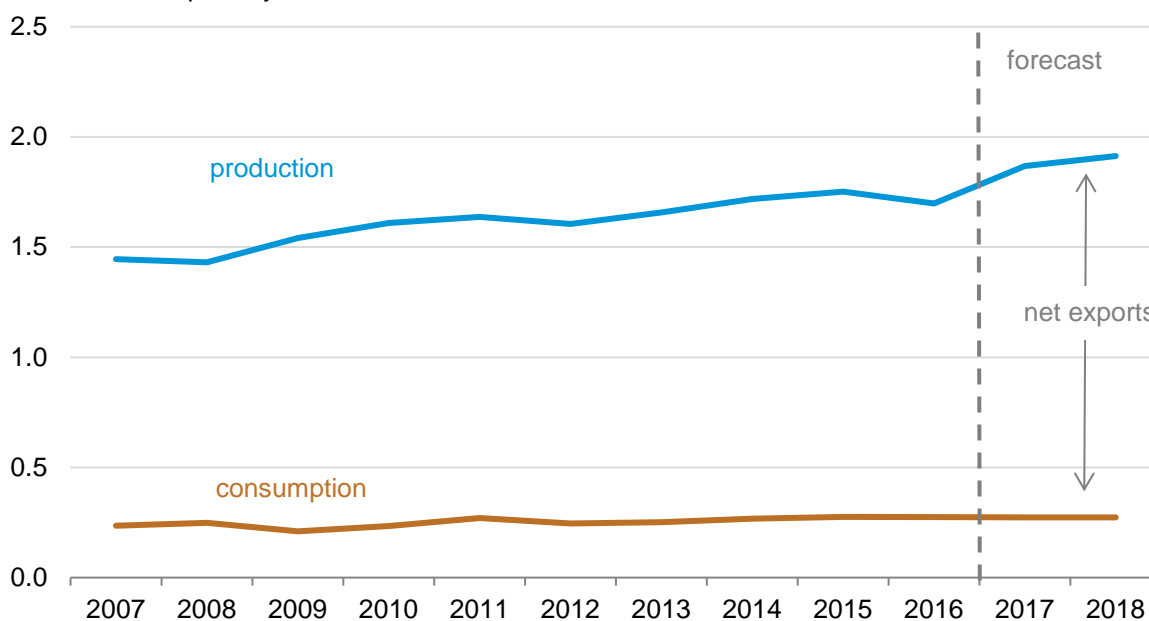
## Petroleum and other liquids

*Oil field development in Kazakhstan reached two milestones in 2016. In October 2016, Kashagan field resumed production after years of delays. In July 2016, the Tengizchevroil consortium made a final investment decision on a project to increase liquids production by about 260,000 b/d.*

According to the *Oil & Gas Journal* (OGJ), Kazakhstan had proved crude oil reserves of 30 billion barrels as of January 2017—the second-largest endowment in Eurasia after Russia, and the twelfth largest in the world, just behind the United States.<sup>1</sup> Kazakhstan's current oil production (Figure 3) has been dominated by two giant onshore fields in the northwest of the country: Tengiz and Karachaganak, which together produced about half of Kazakhstan's total petroleum liquids output in 2016. The offshore Kashagan field, in Kazakhstan's part of the Caspian Sea, started production in October 2016. At full capacity, Kashagan will join Tengiz and Karachaganak as the three largest producing fields in Kazakhstan. Additionally, in July 2016, The Tengizchevroil consortium decided to proceed with expansion plans that should increase liquids production at the Tengiz project by about 260,000 b/d beginning in 2022.

**Figure 3. Kazakhstan's petroleum and other liquids production and consumption**

million barrels per day



U.S. Energy Information Administration, *Short-Term Energy Outlook*, April 2017

## Sector organization

The Ministry of Energy oversees the oil and natural gas industry in Kazakhstan. In August 2014, Kazakhstan's president, Nursultan Nazarbayev, announced an extensive government reorganization with the intention of creating a more compact and effective government. The number of ministries in the government was reduced from 17 to 12, and the Ministry of Energy was created to absorb the functions of the Ministry of Oil and Gas and parts of the functions of the Ministry for Industry and New Technologies and the Ministry for Environment and Water Resources.<sup>2</sup>

The national oil and natural gas company, KazMunaiGaz (KMG), represents the state's interests in Kazakhstan's oil and gas industry. KMG was created in 2002 and holds equity interests in Karachaganak (10%), Kashagan (16.88%), and Tengiz (20%), as well as interests ranging between 33% and 100% in many other production projects.<sup>3</sup>

Kazakhstan's Law on Subsoil and Subsoil Use (Subsoil Use Law) governs investments in the oil and natural gas industries. The Subsoil Use Law has been amended several times, most notably in 2005, 2007, 2010, and 2014. Among other provisions, the Subsoil Use Law along with the December 2009 Local Content Law established strict local content requirements for oil and gas contracts. The Subsoil Use Law also established the government's right to preempt any sale of oil and gas assets. In 2013 Kazakhstan preempted ConocoPhillips sale of its 8.4% stake in the Kashagan project to India's ONGC.

The preemption did not affect Conoco's proceeds from the sale, but rather than going to ONGC, the stake was purchased by KMG before being resold to China's CNPC.<sup>4</sup>

The government announced the re-introduction of oil export duties in August 2010, increasing the duty in subsequent years as oil prices climbed, and reducing the oil duty several times since 2014 when oil prices declined sharply. Export duties were first introduced in 2008 and then were suspended in January 2009. Export duties affect all oil exporters operating in Kazakhstan, with the exceptions of those that include a tax stabilization clause in their contracts.

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## Production

In the 1970s, several large discoveries were made in presalt reservoirs, including Karachaganak and Tengiz. However, the development of these fields was not possible at the time because of the technical challenges of developing the deep, high-pressure reservoirs. Since international oil companies began to participate in Kazakhstan's petroleum sector and as presalt deposits became technically and commercially viable, these fields have become the foundation of the country's petroleum liquids production.

Although Kazakhstan is the second-largest liquid fuels producer among Former Soviet Union republics, its future as a producer of petroleum liquids depends on the development and expansion of its three largest projects: Karachaganak, Kashagan, and Tengiz (Table 1).<sup>5</sup> Kazakhstan's two largest projects, Tengiz and Karachaganak, accounted for 50% (Tengiz 35%, Karachaganak 15%) of the country's production in 2016, according to data published by Energy Intelligence.<sup>6</sup> When production at Kashagan (which started in October 2016) reaches full capacity, the combined output of all three projects is likely to account for at least 60% of Kazakhstan's total production.

In July 2016, the Tengiz partners made a final investment decision to proceed with the Future Growth Project. This expansion project is expected to be completed by 2022, bringing about 260,000 b/d of additional liquids production from Tengiz. An expansion project has also been proposed for the Karachaganak field, but it is at a less-advanced stage of planning.

The Kashagan field, the largest known oil field outside the Middle East and the fifth largest in the world in terms of reserves, is located off the northern shore of the Caspian Sea near the city of Atyrau, Kazakhstan. Kashagan's recoverable reserves are estimated at 7 to 13 billion barrels of crude oil. On September 11, 2013, production from the super-giant field commenced, eight years after the originally scheduled startup date. In October 2013, just a few weeks after production began, production had to be halted because of leaks in the pipeline that transports natural gas from the field to shore. Production restarted in October 2016, and by January 2017, the field was producing more than 100,000 b/d of liquids. Full capacity for the first phase of development is production of 370,000 b/d.

Many of the repeated delays at Kashagan were the result of the field's adverse operating environment and complexity, resulting in significant cost overruns. The Kashagan reservoir is located more than 13,000 feet below the seabed and is under very high pressure (770 pounds per square inch). The reservoir contains high levels of hydrogen sulfide. Hydrogen sulfide is both highly toxic and highly corrosive and has been blamed for the pipeline leaks. In addition, conventional drilling and production

technologies such as fixed or floating platforms cannot be used because of the shallow water and cold climate. Instead, offshore facilities are installed on artificial islands (drilling and hub islands) that house drilling and processing equipment. The processing facilities separate recovered liquids from the gas, reinject a portion of the gas, and send the liquids and the remainder of the gas to shore for further processing. Before production could restart, the pipelines connecting the field with the onshore processing facilities had to be replaced using higher-grade materials that are more resistant to corrosion.

**Table 1. Kazakhstan's major oil and gas fields**

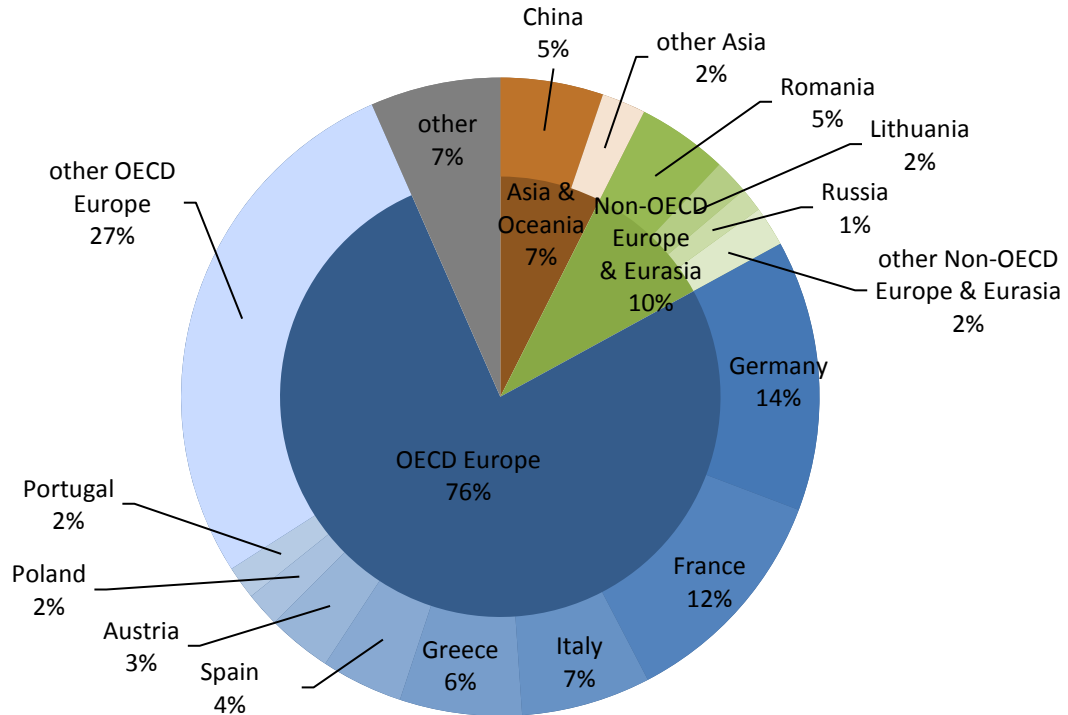
Field Name	Companies	Start year	Liquids production	Natural gas production
Tengiz (& Korolev)	Chevron, ExxonMobil, KazMunaiGaz, and Lukoil	1991	570,000 b/d petroleum and other liquids production in 2016 Expansion project to add 260,000 b/d of crude production beginning in 2022	274 Bcf dry marketed gas production in 2016
Karachaganak	BG, Eni, Chevron, Lukoil, KazMunaiGaz	1984	206,000 b/d total liquids production in 2016 An expansion project is under consideration, but potential production volumes are uncertain	About 300 Bcf wet marketed gas production in 2016
Kashagan	KazMunaiGaz, Eni, ExxonMobil, Shell, Total, China National Petroleum Corporation, Inpex	2016	370,000 b/d liquids processing capacity with current development	Over 100 Bcf gas production capacity


Source: U.S. Energy Information Administration based on TengizChevroil, Chevron, Karachaganak Petroleum Operating (KPO), and Eni

## Oil exports

Kazakhstan is an exporter of light, sweet crude oil. In 2016, Kazakhstan exported about 1.3 million b/d of crude oil and condensate, according to EIA estimates based on data from Global Trade Tracker and Lloyd's List Intelligence (APEX) (Figure 4).<sup>7</sup> Most of Kazakhstan's crude exports travel around or across the Caspian Sea to European markets. An additional 5% of Kazakhstan's crude oil exports flowed east via a pipeline to China. A significant portion of Kazakhstan's exports transit Italy and the Netherlands, making it difficult to determine where this crude oil ends up because Kazakhstan reports these volumes as having been delivered to the transit countries.

Figure 4. Kazakhstan's crude oil exports by destination, 2016



 Source: U.S. Energy Information Administration based on APEX tanker data and on Kazakh export statistics and partner-country import statistics from Global Trade Tracker

## Export routes

Kazakhstan's pipeline system is operated by the state-run KazTransOil, a subsidiary of KazMunaiGas, which runs approximately 3,400 miles of pipelines. Because of Kazakhstan's landlocked location and the continued use of Soviet-era infrastructure, much of Kazakhstan's oil and gas export infrastructure is integrated with [major Caspian oil and natural gas export routes](#) that interlink the region. Since independence, Kazakhstan has successfully expanded and diversified its export capabilities. Major crude oil export pipelines include the Caspian Pipeline Consortium pipeline to the Black Sea port of Novorossiysk, the Kazakhstan-China pipeline, and the Uzen-Atyrau-Samara pipeline to Russia (Figure 5).

Figure 5. Kazakhstan map of major crude oil pipelines





Kazakhstan also exports crude oil via the Caspian Sea and via rail. Oil is loaded onto tankers or barges at Kazakhstan's port of Aktau or the smaller Atyrau port and then shipped across the Caspian Sea, where it is loaded onto the Baku-Tbilisi-Ceyhan pipeline or the Northern Route pipeline (Baku-Novorossiysk) for onward transport, mainly to Europe. Additionally, Kazakhstan has an extensive rail network, which it uses to transport liquid fuels both for domestic consumption and for exports. Continued expansion and diversification of Kazakhstan's petroleum liquids transport capacity, particularly export capacity, is key to its future ability to increase production.

Another potential export route for Caspian crude oil is via swaps with Iran. For years, Kazakhstan and other Central Asian countries delivered their crude oil to Iran's Caspian Sea port of Neka. From there the crude oil was delivered to refineries in Tehran and Tabriz, with the refined products distributed and consumed in northern Iran. In exchange, Iran exported equal volumes of crude out of its Persian Gulf ports on behalf of Kazakhstan. Swap volumes have varied over the years, with little to no crude swapped since 2011. Sanctions against Iran reportedly complicated swap arrangements, especially the marketing of the crude oil exported in the Persian Gulf, which had been done by the Iranians. Also complicating the swap arrangements was Iran's desire to raise the fee it charged Kazakhstan for each barrel of crude swapped. Since at least late 2013, Iran and Kazakhstan have been discussing resumption of the swap arrangement and have periodically announced their intentions to resume swaps, but no swaps had occurred as of the end of 2016.

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## Oil grades

Kazakhstan's main export oil grade is the CPC Blend. CPC Blend is a very light (45.3° API), sweet crude (0.56% sulfur)<sup>8</sup> that is valued for its high yield of gasoline and light distillates. Production from the Tengiz field accounts for about 60% of the CPC blend. Other components include production from Karachaganak, Kashagan, and Kumkol fields, some Russian grades such as Siberian Light, along with a variety of other Russian and Kazakh grades.

Smaller volumes of many of the components of CPC Blend are also marketed separately as distinct crude oil grades. However, with the recent expansion of the CPC pipeline, the volumes of crude oil marketed separately have declined.

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## Refining

Kazakhstan had three major crude oil refineries with crude oil distillation capacity of 340,000 b/d as of January 1, 2017, according to OGI.<sup>9</sup> The three major oil refineries in Kazakhstan are: Pavlodar, Atyrau, and Shymkent. The Pavlodar refinery is in north-central Kazakhstan and is supplied mainly by a crude oil pipeline from western Siberia, because Russian supplies are well-placed geographically to serve that refinery. The Atyrau refinery uses only domestic crude oil from northwest Kazakhstan, and the Shymkent refinery currently uses crude from the oil fields at Kumkol and the nearby area in central Kazakhstan. There is also a smaller refinery at Aktau that processes heavy crude oil produced at a nearby field to make bitumen for road construction.<sup>10</sup>

The three main refineries meet approximately 70% of Kazakhstan's gasoline and diesel demand, with most of the remaining demand met by imports from Russia. Upgrading projects were underway in early 2017 at all three refineries and are expected to be completed in late 2017 or early 2018. The upgrades will allow the three plants to produce fewer heavy products and more high-quality transportation fuels. With these upgrades, Kazakhstan aims to meet all domestic demand for gasoline and diesel production by 2019.<sup>11</sup>

## Natural gas

*Kazakhstan's largest petroleum liquids fields also contain substantial volumes of natural gas, most of which is reinjected into oil wells to improve oil recovery rates.*

OGJ estimated Kazakhstan's proven natural gas reserves at 85 trillion cubic feet (Tcf) as of January 1, 2017.<sup>12</sup> Most of Kazakhstan's natural gas reserves are in crude oil or condensate-rich fields. The two largest petroleum liquids fields, Karachaganak and Tengiz, are also the two largest natural gas fields.

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## Production

Over the past decade, annual gross natural gas production almost doubled, from 0.8 Tcf in 2005 to 1.5 Tcf in 2015. Much of Kazakhstan's gross natural gas production is reinjected (more than 30% in 2015) to increase oil production. Much of the natural gas produced at Tengiz and Kashagan is high in sulfur, and therefore requires special handling and is more costly to process.

In 2016, the Karachaganak and Tengiz fields combined accounted for about 70% of Kazakhstan's natural gas production.<sup>13</sup> The Tengiz project includes a natural gas processing plant, which according to Chevron produced 274 billion cubic feet (Bcf) of dry marketed natural gas in 2016 that was sold to local consumers.<sup>14</sup> The Karachaganak project has insufficient gas processing capacity. Most of the raw marketed production from the Karachaganak field must be exported to Russia to be processed at a gas processing plant in Orenberg.

Production restarted at the Kashagan field in October 2016. When the project reaches full capacity, it is expected to produce about 100 Bcf of natural gas per year for domestic consumption, with additional produced gas reinjected into the reservoir to boost liquids recovery.

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## Consumption, imports, and exports

Kazakhstan has two major export pipelines for natural gas (Figure 6). The Central Asia Centre pipeline (CAC), which traverses the western edge of Kazakhstan on its way to Russia and points further west, and the Turkmenistan-China pipeline, which traverses the southern edge of the country on its way to China. Both pipelines are part of the regional [Caspian export infrastructure](#) and mainly carry natural gas exports from Turkmenistan, along with smaller but still significant volumes of exports from Kazakhstan and Uzbekistan. The CAC pipeline also serves local natural gas demand in western Kazakhstan, including northwestern Kazakhstan where most of the country's production is located.

A third major international pipeline, the Bukhara-Tashkent-Bishkek-Almaty pipeline, serves local demand in southern Kazakhstan. Two of Kazakhstan's three underground natural gas storage facilities are located along this pipeline.

Natural gas production in Kazakhstan is concentrated in the northwest and, until recently, has not been connected to population centers in the south, north, center, and east. Prior to 2016, consumers in southern Kazakhstan were supplied with imported natural gas from Turkmenistan or Uzbekistan. However, in November 2015, KazTransGas, the state-owned natural gas pipeline operator, completed the final link in the new Beinu-Bozoi-Shymkent pipeline. This pipeline has allowed Kazakhstan to gasify communities along the route of the pipeline that previously had no access to gas. It has also connected the natural gas fields and infrastructure in the northwest of the country to the population centers in the south of the country, replacing imported natural gas in those markets with domestically produced gas. Completing this link has also connected Kazakhstan's producing regions with the natural gas pipeline to China, allowing production from northwestern Kazakhstan to be exported to China. Kazakhstan has also discussed the possibility of using this infrastructure to transit Russian natural gas to China.

Plans for gasifying other parts of the country and connecting them to the existing infrastructure in the West and South are more uncertain. The vast distances and relatively low population density in the north, center, and east make the economics challenging for any potential gas pipeline projects to serve those regions. Kazakhstan contracted to import 5,000 metric tons of liquefied natural gas (LNG) in 2017 (about 0.2 Bcf of gaseous natural gas) from Russia by road to Astana, Kazakhstan's capital, and other cities in the north of the country. Kazakhstan's coal basins, which lie in the north and center of the country, could also be a source of natural gas supplies for areas of the country that are far from existing natural gas production and infrastructure. Kazakhstan has been exploring the potential to produce and market methane from coal mines and coal beds.

Figure 6. Kazakhstan map of major natural gas pipelines



## Coal

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*In 2014, coal accounted for 56% of Kazakhstan's total energy consumption.*

With 28,225 million short tons (MMst) of total recoverable coal reserves as of 2014, Kazakhstan is in the top ten countries in the world in terms of coal reserves, coal production, and coal exports. It is also in the top fifteen countries in the world in terms of coal consumption. Despite being among the top coal countries, Kazakhstan is a relatively small contributor to global coal volumes. The top four countries globally account for disproportionate shares of total global coal reserves, production, consumption, and exports (between 65% and 75% combined), while Kazakhstan accounts for between 1% and 4%.

About a quarter of Kazakhstan's coal production is exported, with most going to Russia. Virtually all of Kazakhstan's coal production and exports consist of steam coal, which is suitable for burning in electric power plants or in other applications to generate steam and heat. Kazakhstan also produces smaller quantities of metallurgical coal that are consumed domestically. Kazakhstan is rich in a variety of minerals, with mineral and coal deposits concentrated in the north and center of the country. Coal is a major energy source for the mining and smelting industries and for the electricity sector in Kazakhstan.

## Electricity

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*Most of Kazakhstan's power generation comes from coal-fired power plants, concentrated in the north of the country near the coal-producing regions.*

Kazakhstan's total installed generating capacity was 22.1 gigawatts (GW) as of 2017.<sup>15</sup> Kazakhstan's total generation in 2016 was 94.1 billion kilowatthours (BkWh) of electricity—of which 87% came from fossil fuel-fired plants, 12% came from hydropower plants, and less than 1% came from solar and wind installations.<sup>16</sup>

Kazakhstan's only nuclear power plant, a BN-350 nuclear reactor at Aktau, was shut down in 1999. Kazakhstan has some of the largest uranium deposits in the world and is the world's largest uranium producer.<sup>17</sup> Although plans have long existed to build additional nuclear power plants, there has been little progress on constructing these units.

Kazakhstan's national grid is operated by the Kazakhstan's Electricity Grid Operating Company, a state-owned company, which is responsible for electric transmission and network management. A number of medium and small regional electricity companies handle distribution, some of which are privately owned. The electricity transmission and distribution sectors are considered to be natural monopolies and are regulated by the government. However, wholesale generation of power is considered to be a competitive market with most generation assets owned by private enterprises.

## Notes

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- Data presented in the text are the most recent available as of May 10, 2017.
- Data are EIA estimates unless otherwise noted.

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- <sup>1</sup> *Oil & Gas Journal*, "Worldwide look at reserves and production," (December 5, 2016).
- <sup>2</sup> Tengrinews, "[Nazarbayev rearranges Kazakh government](#)," (August 6, 2014).
- <sup>3</sup> KazMunaiGas Exploration Production, *Annual Report 2013*, About the Company, Ownership Structure, pp. 4-5.
- <sup>4</sup> U.S. Department of State, [2014 Investment Climate Statement – Kazakhstan](#), accessed December 18, 2014; U.S. Department of State, [2015 Investment Climate Statement – Kazakhstan](#), accessed March 3, 2017; and Office of the U.S. Trade Representative, 2014 National Trade Estimate Report on Foreign Trade Barriers, [Kazakhstan](#), accessed December 18, 2014.
- <sup>5</sup> Chevron, "[2016 Supplement to the Annual Report](#)," p. 23; TengizChevroil "[2016 Year End Facts and Figures](#)," (February 23, 2017); Karachaganak Petroleum Operating (KPO), "[KPO reports 2016 performance results](#)," (February 9, 2017); and Eni, "[Eni's activities in Kazakhstan](#)," accessed April 26, 2017.
- <sup>6</sup> Energy Intelligence, *Nefte Compass*, "Kazakh Crude Oil and Gas Condensate Production, 2016" (January 26, 2017) p. 9.
- <sup>7</sup> EIA estimates based on crude export data reported by Kazakhstan and import data reported by trade partners from [Global Trade Tracker](#), accessed April 5, 2017 (subscription) and crude tanker data from Lloyd'd List Intelligence, [APEX tanker data](#), (subscription) accessed April 5, 2017. Note that other OECD Europe includes the difference in volumes reported by Kazakhstan versus those reported by OECD Europe countries that transit crude or have crude pipeline connections to countries that transit crude (Italy, Netherlands, Austria, Belgium, Czech Republic, and Germany)
- <sup>8</sup> Platts, "[Methodology and Specifications Guide: Crude Oil](#)," updated January 2017, p. 26.
- <sup>9</sup> *Oil & Gas Journal*, "Worldwide Refining," (December 5, 2016).
- <sup>10</sup> Kaz Munay Gas, [Annual Report 2015](#), accessed March 31, 2017.
- <sup>11</sup> Energy Intelligence, *Nefte Compass*, "Kazakhs to End Product Imports by 2019," (March 16, 2017), p. 8.
- <sup>12</sup> *Oil & Gas Journal*, "Worldwide look at reserves and production," (December 5, 2016).
- <sup>13</sup> Energy Intelligence, *Nefte Compass*, "Kashagan to the Rescue," (February 9, 2017), p. 10.
- <sup>14</sup> Chevron, "[2016 Supplement to the Annual Report](#)," p. 23.
- <sup>15</sup> Kazakhstan Electricity Grid Operating Company KEGOC, [Kazakhstan Electric Power Industry Key Factors](#), (accessed March 30, 2017).
- <sup>16</sup> Kazakhstan Electricity Grid Operating Company KEGOC, [National Power System](#), (accessed March 30, 2017)
- <sup>17</sup> World Nuclear Association, [Uranium and Nuclear Power in Kazakhstan](#), (updated July 2016).