20 Kazakhstan

20.1 Summary of Coal Industry

20.1.1 Role of Coal in Kazakhstan

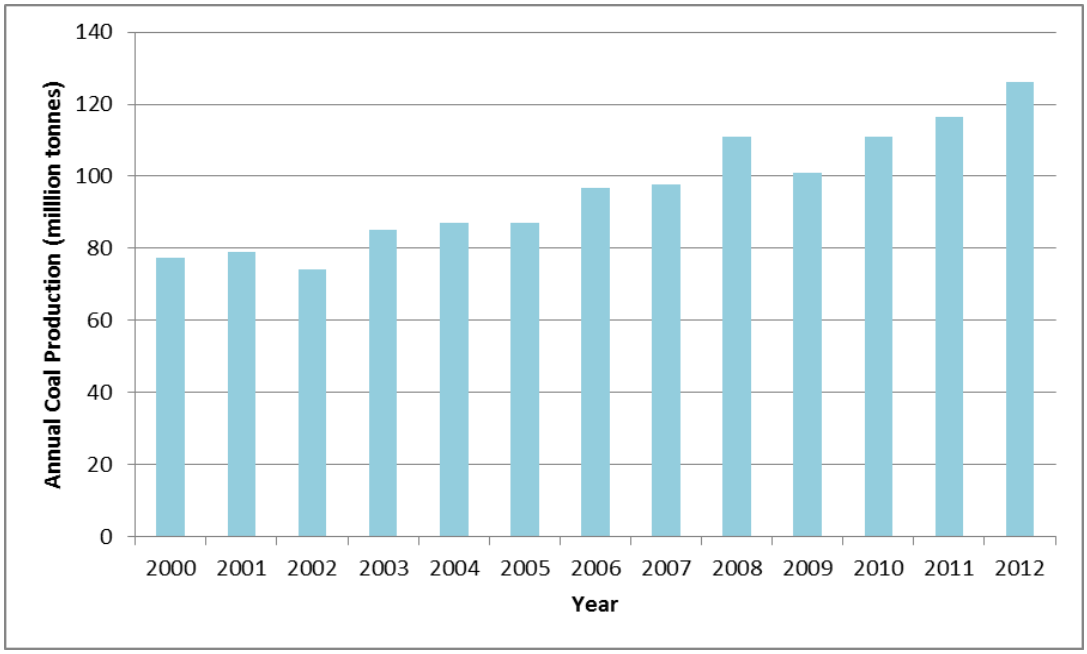
Kazakhstan ranks 10th in the world in coal production, with coal comprising 64 percent of its total energy consumption in 2012 (EIA, 2013). In 2012, it exported 25.3 percent of the coal produced (32 million tonnes [Mmt]), primarily to Russia and Ukraine. In 2011, 85 percent of power generation was coal-fired and net generation totaled approximately 81.2 billion kilowatt-hours (kWh) of electricity (EIA, 2013). Table 20-1 summarizes Kazakhstan's coal resources and recent production, while Figure 20-1 shows historical annual coal production from 2000 to 2012 (EIA, 2013).

Table 20-1. Kazakhstan's Coal Reserves and Production

Indicator	Anthracite & Bituminous (million tonnes)	Sub-bituminous & Lignite (million tonnes)	Total (million tonnes)	Global Rank (# and %)
Estimated Proved Coal Reserves (2011)	21,496	12,097	33,593	8 (3.78%)
Annual Coal Production (2012)	120.5	5.5	126	10 (1.6%)

Source: EIA (2013)

Figure 20-1. Kazakhstan Annual Coal Production



Source: EIA (2013)

Kazakhstan has registered 49 coal deposits in its state reserve balance (USGS, 2010). The main producing regions are located in the central and northern regions of Kazakhstan in the Ekibastuz, Karaganda, Maykuben, Shubarkol and Turgay basins (Table 20-2).

Table 20-2. Kazakhstan's Major Coal Basins Production Capacity in 2012

	Basin				
	Ekibastuz	**Karaganda**	**Maykuben**	**Shubarkul**	**Zhelyn**
Annual Estimated Production Capacity (million tonnes)	67.3	35.4	4.0	8.9	1.0

Source: USGS (2011)

20.1.2 STAKEHOLDERS

Thirty-three companies operate coal mines in Kazakhstan, including 28 of domestic origin, five foreign companies and one joint venture (Energy Charter Secretariat, 2013). The major companies are listed in Table 20-3. The table also lists other potential stakeholders in Kazakhstan's coal mine methane (CMM) industry.

Table 20-3. Key Stakeholders in Kazakhstan's CMM Industry

Stakeholder Category	Stakeholder	Role
Coal Producing Enterprise	▪ JSC ArcelorMittal Termirtau ▪ Bogatyr-Access-Komir, Ltd. ▪ OJSC "Eurasian Natural Resources Corporation" ▪ OJSC "Borly" ▪ "Maykuben-West" joint venture ▪ KomirInvest, Ltd. ▪ Transenergo, Ltd. ▪ "Gefest" Association ▪ Shubarkol Komir	Project hosts
Developer	▪ ZhumysStroiService LLP ▪ KazTransGas JSC ▪ Social enterprise company Saryarka ▪ See http://www.epa.gov/coalbed/networkcontacts.html	Project opportunity (CBM from virgin seams) identification and planning
Engineering or Consultancy Services	▪ Azimut Energy Services, Ltd. ▪ Promelektronika-K LL C. ▪ Kar-Metan LL C. ▪ See http://www.epa.gov/coalbed/networkcontacts.html	Technical assistance
Universities and Research Centers	▪ Methane Center, Kazakhstan ▪ Karaganda State Technical University ▪ Karaganda Institute for Scientific Research on Industrial Safety	Technical assistance
Other	▪ National Agency for Technological Development ▪ Zhasyl Damu state company (emissions trade system) ▪ National Geological Exploration Company "Kazgeologiya" (assessment of CMM/CBM resources)	

Table 20-3. Key Stakeholders in Kazakhstan's CMM Industry

Stakeholder Category	Stakeholder	Role
Government Groups	▪ Ministry of Energy (absorbed functions of former Ministry of Industry and New Technologies, Ministry of Oil and Gas, Ministry of Environment and Water Resources) ▪ Ministry of National Economy ▪ Ministry of Investment and Development (geology and energy efficiency) ▪ Kazakh Scientific Research Institute for Ecology and Climate (KazNIIEC)	Drafting of legislation, implementation of laws, government oversight

Source: KazNIIMOSK (2002); Energy Charter Secretariat (2013); Alekseev (2010)

20.1.3 Status of Coal and the Coal Mining Industry

Kazakhstan's coal mining industry was restructured and largely privatized between 1995 and 1997 (State, 2005). The Karaganda and Ekibastuz mining associations were dissolved and the mines put up for sale or lease. Many of the coal mining enterprises were closed or reorganized (USGS, 2010; KazNIIMOSK, 2002).

Coal production in Kazakhstan declined by more than 50 percent in the years following independence from the Soviet Union in 1991 through 1999 (BP, 2013). Since then Kazakhstan's coal production has continued to increase with 2012 yielding production comparable to the Soviet times (EIA, 2013). During the Soviet era, coal production was subsidized and mines were not structured to maximize profits. When subsidies were removed and mines had to operate competitively, it became extremely difficult to obtain foreign investment to maintain their economic viability. This fundamental lack of profitability was compounded by other problems, such as restructuring, mine problems, and accidents. Government efforts to significantly improve production by 2015, by encouraging foreign interest in the coal mining industry, appear to have been successful. Since the low point in 1999, annual production has steadily increased to rates above 100 million tonnes, although the world-wide economic downturn in 2009 also affected Kazakhstan coal production with a resultant 8.6 percent decline in production from 2008, but rebounded to a 13.4 percent increase from 2008 to 2012. Consumption has risen steadily since 2000 with exports remaining relatively steady since 1999 (EIA, 2013).

Underground mining only occurs in the Karaganda basin, which produces the coking coals essential to the steel and iron sectors and coke plants in Kazakhstan, Russia, Ukraine, and Georgia, and also to the phosphoric and ferroalloy industries. The share of production from underground mines decreased from about 27 percent in 1990 to just 11 percent in 2000 (KazNIIMOSK, 2002), and back up to 30 percent in 2010 (Alekseev, 2010), following new investment from companies such as the ArcelorMittal Group (USGS, 2010). The ArcelorMittal Coal Division operates eight underground mines in the Karaganda Basin producing 12 Mmt annually (Baimukhametov, 2009). Twenty-six underground mines were reportedly in operation in 1990 (KazNIIMOSK, 2002) with fifteen now currently producing (Energy Charter Secretariat, 2013). Four mines operated by KomirInvest and Transenergo have nearly stopped production. ArcelorMittal's eight underground mines (originally operated by Ispat-Karmet) were expanded in 1986 to stabilize production levels. The Gefest Association also operates in the Karaganda Basin as the association of small mines. By 2007, the Association represented about 30 mines with approximately 1 Mmt per year of combined coal production (UNECE, 2008). For example, the Association represents Mine Batyr, an underground mine in the Karaganda Basin.

Table 20-4 provides mine statistics for Kazakhstan.

Table 20-4. Kazakhstan Mine and Production Statistics

Type of mine	Production (million metric tonnes)	Number of major mines*
Underground (active)	31.5 (2009)	15 in Karaganda Basin
Surface (active)	69.9 (2009)	6 total: 3 mines in the Ekibastuz Basin - Bogatyr, Severny, Vostochny (80% of surface production) 3 others - Borlinskoe deposit, Maykuben Basin, Karaganda Basin (15-20% of surface production)

*Note these figures represent the largest mines. The total number of mines operating in Kazakhstan is 35 (24 underground mines and 11 open pit mines (Energy Charter Secretariat, 2013)

Sources: Alekseev (2010); EOK (2010)

20.2 Overview of CMM Emissions and Development Potential

The Global Methane Initiative (GMI) International CMM Projects Database currently identifies two CMM projects. One is operating at the Kazakhstanskaya underground mine in the Karaganda basin. The methane currently drained from the mine is being used for boiler fuel in five neighboring mines (GMI Projects, 2014). The mine is planning an expansion of its degasification systems by 8.5 kilometers (km) along with the installation of three KVTS-10 boilers utilizing 13 million m^3 methane per year. Current coal production is 1 million tonnes per year (Mmt/y) with plans to increase production to 1.8 Mmt/y by 2012. The second project is power generation from CMM at the Lenina mine (1.4 MW CHP). In 2013, the CHP unit produced 5 million kWh, operating at 40 percent availability (Baimukhametov, 2014).

20.2.1 CMM Emissions from Operating Mines

The Kazakh coal mines are particularly gassy and prone to violent gas outbursts, and must be degasified and ventilated to prevent explosions and promote worker safety. The underground mines in the Karaganda basin use a variety of pre-mining and post-mining methane drainage techniques. Most of the mines are operated at a depth of more than 500 m and gas contents in these mines average between 18-24 m^3/tonne (Baimukhametov et al, 2009) with specific emissions averaging 33 m^3/tonne (KazNIIMOSK, 2002). Pre-drainage has historically been carried out using in-seam boreholes. Advance degassing from the surface has been trialed with limited success because of the low permeability of the coal seams. The ArcelorMittal Temirtau Coal Division has had recent success in increasing degasification rates, and hence coal production rates, by drilling cross-measure boreholes from a roadway driven 8-12 m below the coal seam. Gob gas is drained with vertical wells from the surface or via galleries driven 20-30 m above the seam (Baimukhametov et al, 2009).

Current drained methane emissions are estimated to be approximately 130 million m^3 resulting from increased underground coal production rates (Alekseev, 2010), However, the level of methane utilization is very low, only about 25 million m^3 annually, which is recovered and combusted in the boiler houses of five mines for mine heating. Surface mines are heavily ventilated and ventilation

air with methane concentrations of about 1 percent is vented to the atmosphere (KazNIIMOSK, 2002).

CO_2 emissions from coal mining related activities in 2010 were 1,507 million m^3 (USEPA, 2012). Coal mining related activities were 12.5 percent of the total 12,075 million m^3 of CO_2 emissions released from the consumption of energy in 2010 (EIA, 2013).

Table 20-5 details Kazakhstan's measured and estimated CMM emissions. The data in this table may vary from the USEPA data presented in the Executive Summary due to differences in inventory methodology and rounding.

Table 20-5. Kazakhstan's CMM Emissions (million cubic meters)

Emission Category	2000	2005* (estimated assuming breakdown from 2000)	2010* (estimated assuming breakdown from 2000)	2015 (projected)
Underground coal mines – ventilation emissions	286.23	472.3	601.8	
Underground coal mines – drained emissions	41	67.7	86.2	
Post-underground emissions	8.0	13.2	16.8	
Surface mine emission	381	628.7	801	
Total liberated (= sum of all above)	716.23	1,182	1,506	1,629.4*
Recovered & Used	12.2		25**	
Total emitted (= Total liberated – recovered & used)	704.03	467	955**	

Sources: KazNIIMOSK (2002); *USEPA (2012); **Shultz & Alekseev (2010)

20.2.2 CMM Emissions from Abandoned Coal Mines

At least 16 underground coal mines in Kazakhstan have been abandoned since 1995. All are considered gassy and every abandoned mine is classified as a high hazard for coal and gas outbreaks. Starting in May 2001, measurement and data processing for gas drain pipes at abandoned shafts, pit-holes, and boreholes have been implemented at 12 abandoned mines in the Karaganda and Abay-Shakhtinsk districts, some abandoned before 1995. In total, approximately 3,000 measurements of methane flow rate and concentration are taken each year and have proven useful in understanding methane released during and after coal mining.

After abandonment some mines have been sealed better than others, thus resulting in varying methane release rates. For example, the "50 Years of October Revolution" mine, which was abandoned in 1998, has the highest methane content of any of the abandoned mines due to being well-sealed both at the surface and between old connections in the underground mine area. No specific information about methane recovery projects at abandoned mines is available but analysis is being conducted to evaluate utilization options for an AMM project at the "50 Years of October Revolution" mine (EU, 2009).

20.2.3 CBM FROM VIRGIN COAL SEAMS

According to the Ministry of Energy and Mineral Resources, Kazakhstan's CBM resources are some of the highest among the coal basins of the world, as illustrated in Table 20-6.

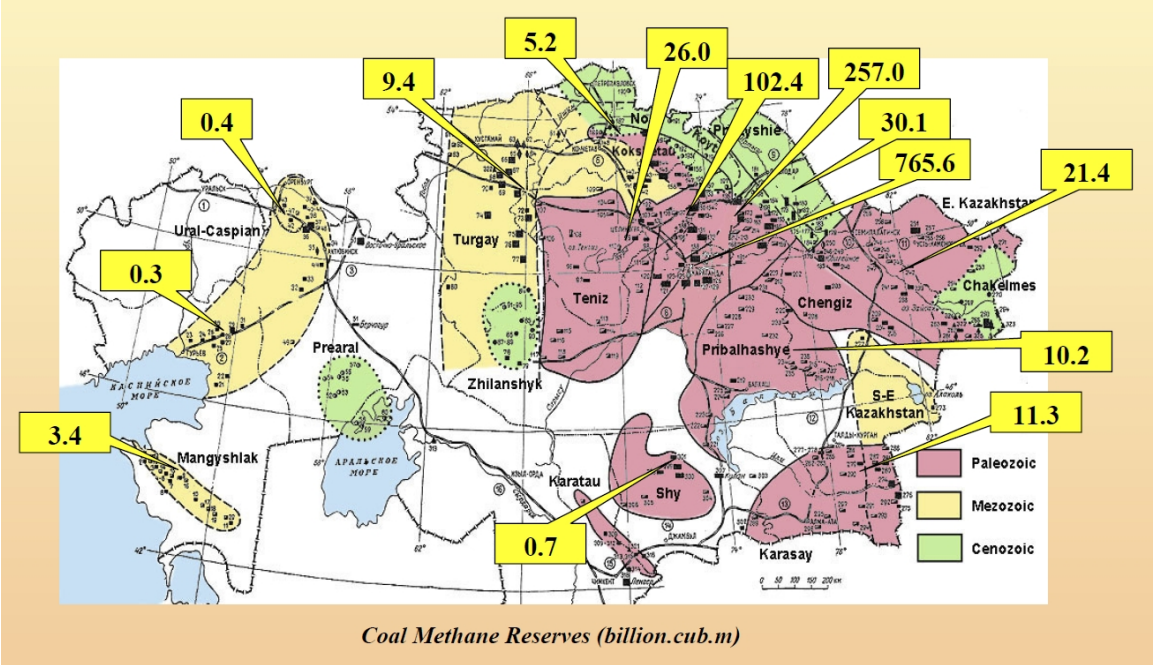
Table 20-6. Summary of Kazakhstan's Selected CBM Resources

Basin or Field	CBM Resources (est.) (billion cubic meters)
Karaganda Basin	550 – 750
Ekibastuz Basin	75 – 100
Zavialov Field	14.6 – 16.8
Samarskiy Field	11.0 – 14.2

Source: Stoupak and Zhukovskiy (2001)

Kazakhstan is one of the few countries actively pursuing to initiate commercial CBM production. Figure 20-2 shows Kazakhstan's coal regions with estimated methane reserves for each region.

Figure 20-2. Kazakhstan Coal Regions and Coal Methane Reserves



Source: Alekseev, et al. (2003)

Zhumys-Stroyservice LLP was awarded a CBM license in 2008 and proceeded with a pre-feasibility assessment (by Schlumberger) and drilled a few pilot wells with a minor gas yield reached so far. Zhumys-Stroyservice, announced (May, 2010) an agreement with the Australian company Arrow Energy Ltd., to perform a feasibility study on the commercial production of CBM in the Karaganda coal basin. Funding would be provided by Arrow Energy with plans for a pilot project to be launched in 2014 (SteelGuru, 2010).

In April 2003, the former Ministry of Energy and Mineral Resources recommended that BogatyrAccess Komyr, Ltd. and Azimut Energy Services, Ltd. pursue a CBM development effort in the Ekibastuz basin. However, the project was ultimately suspended.

20.3 Opportunities and Challenges to Greater CMM Recovery and Use

Kazakhstan is a signatory to both the UNFCCC and the Kyoto Protocol (see Table 20-7). Kazakhstan applied for Annex I status in June 1999, withdrew its application in June 2000, but finally ratified the Protocol in March 2009. With Annex I status obtained, new CMM projects in Kazakhstan are eligible to earn and sell emission reduction credits through the Clean Development Mechanism. Until Kazakhstan is a member of Annex B, their domestic emissions trading system can only affect their domestic market (EDF, 2014). Kazakhstan is currently awaiting status as an Annex B country. Investment for CMM projects could also come from the National Innovation Fund, mine operators, and foreign investors (Zhasyl Damu 2014).

Table 20-7. Kazakhstan's Climate Change Mitigation Commitment

Agreement	Signature	Ratification
UNFCCC	June 8. 1992	May 17, 1995
Kyoto Protocol	March 12, 1999	March 26, 2009

Source: UNFCCC (2014)

The Kazakh Emissions Trading Scheme (ETS) was enacted into law on December 3, 2011, through an amendment to the country's "Ecological Code" (IETA, 2013). In January 2013, the ETS was launched for a one year pilot phase. The program entered its second, two-year phase in January 2014. According to reports, the first allowance transaction took place on 28 March 2014, trading at the price of 455 Tenge (about $2.60) (ICAP, 2014). The Government of Kazakhstan expects about 180 large GHG emitters (mainly industrial enterprises) to be covered under the new environment code starting in 2015. The first official trading session in early 2014 generated a carbon price of USD2.50/tCO2e (Zhasyl Damu 2014). Kazakhstan is also working on a domestic offset system for specific sectors and gases (e.g. CH4) not covered by the scheme.

Reports are that international credits may be allowed in the future, subject to approval of the KAZ CP2 (ICAP, 2014).

20.3.1 Market and Infrastructure Factors

Opportunities to develop the country's coal bed methane (CBM) and CMM resources are a potentially significant source of investment, and Kazakhstan is working to establish an attractive investment climate. The Kazakhstan government prioritizes CMM projects as a means of achieving measurable and verifiable greenhouse gas emission reductions. Recently the government approved proposals for establishing criteria and procedures for screening, review, and approval of GHG emission reduction projects. It also approved similar proposals relating to baseline assessment and validation; emission reduction calculation; monitoring, verification, and registering emission reduction projects; and allocating 5 million metric tons of CO_2 equivalent ($MMTCO_2e$) for transfer to

investors in GHG reduction projects. As a next step, the government will promulgate regulations (USEPA, 2005).

Kazakhstan will require significant infrastructure investments to commercialize CBM and CMM development. Gas gathering systems will be required as well as interconnects with distribution pipelines. Some synergies may be available with rapidly developing gas production associated with expanding oil production. Kazakhstan produced 1.4 Tcf of natural gas in 2011. Between 2008 and 2010 Kazakhstan produced sufficient volume of dry gas to satisfy its domestic demand, although increased domestic consumption resulted in Kazakhstan becoming a net gas importer again in 2011 (EIA, 2013). Production has been growing at 22 percent annually over the last decade, compared to consumption growth of 9 percent annually, and Kazakhstan is, therefore, expected to become a net exporter of gas within the next few years. Current and proposed major gas distribution pipelines are routed mainly in the west and south of the country and so opportunities for local CMM/CBM projects in the central and northern coal-fields may arise as a result of proximity to underserved markets in these areas. Regional gas demands are increasing, especially from neighboring China, suggesting adequate markets for all methane that can be produced. Possible end uses for recovered methane include industrial boilers, power generation, heating, and transportation fuel (for fleets and private vehicle conversions).

In 2005, 14,609 million KZT was invested in the mining industry. A large portion of those investments, 5,998 million KZT, went into coal production and improvement (CMAR, 2006). In 2007, the ArcelorMittal Group pledged to invest 500 million USD to increase coal production in the Karaganda region by around 5 Mmt. These large investments in the nation's coal production could lead to increased CMM development projects.

20.3.2 REGULATORY INFORMATION

The Government owns all subsurface gas and minerals but has allocated coal reserves to private mine operators as part of their contracts and CMM to contracted coal operators. CMM and CBM project developers must enter into agreements with the coal operators for development and sale of the gas resources (KMIC, nd). Upcoming petroleum legislation and provisional rules for exploration and development will provide a comprehensive and consistent legal framework for CBM exploration and exploitation. At this time, no legislation is in place which distinguishes CMM/CBM production from that of natural gas. When CMM is moved offsite of the mine, it is treated by the same rules and taxes that apply to natural gas. A recent law, "In Support of the Use of Renewable Energy Resources" introduced in July 2009, does not include references to CMM (Alekseev, 2010). Kazakhstan is in the process of developing a new mining code in which CBM and CMM are expected to be included.

Mining companies understand the safety issues and are becoming increasingly familiar with the environmental issues associated with CMM. Coal mine safety is a key concern in surface and underground mines - numerous deaths due to mine explosions and methane outbursts underscore the importance of this problem. Environmental legislation exists that require pollution permits and payment of pollution fines for coal mining activities. Environmental and safety standards are improving, but are also driving up development costs.

20.4 Profile of Individual Mines

Kazakhstanskaya Mine			
Mine Status	Active	**Operator/Owner**	ArcelorMittal Temirtau Coal Division
Mine Area	47 km^2	**Coal Basin**	Karaganda
Mining Method	Conventional Longwall	**Location**	Shakhtinsk District, 30 km west of the city of Karaganda
Reserves (coking coal)	103.4 Mt	**2011 VAM volume**	29.3 million m^3 per year
No. of seams mined	2 (D6 & D10)	**2011 Drained volume**	10.4 Mm^3/y
Depth of seams	650-700 m	**2009 Utilized volume**	7.8 Mm^3/y
		Utilization method	Boilers

Lenina Mine			
Mine Status	Active	**Operator/Owner**	ArcelorMittal Temirtau Coal Division
Mine Area	10.7 km^2	**Coal Basin**	Karaganda
Mining Method	Conventional Longwall	**Location**	Shakhtinskiy District, 60 km west of the city of Karaganda
Reserves (coking coal)	65.6 Mt	**2011 VAM volume**	38.1 million m3 per year
No. of seams mined	8 (D1-D11)	**2011 Drained volume**	24.3 Mm3/y
Depth of seams	650 - 700 m	**Utilization method**	Boilers, Power Generation

Abaiskaya Mine			
Mine Status	Active	**Operator/Owner**	ArcelorMittal Temirtau Coal Division
Mine Area	34.45 km^2	**Coal Basin**	Karaganda
Mining Method	Conventional Longwall	**Location**	Abai District, 35 km from the city of Karaganda
Reserves (coking coal)	81.6 Mt	**2011 VAM volume**	25.9 million m^3 per year
No. of seams mined	6 (K18, K13, K12, K10, K11, K7)	**2011 Drained volume**	44.3 Mm^3/y
Depth of seams	549 m	**Utilization method**	Boilers

Tentekskaya Mine			
Mine Status	Active	**Operator/Owner**	ArcelorMittal Temirtau Coal Division
Mine Area	71.47 km^2	**Coal Basin**	Karaganda
Mining Method	Conventional Longwall	**Location**	Shakhtinskiy District, 60 km from the city of Karaganda
Reserves (coking coal)	134.9 Mt	**2011 VAM volume**	12.8 million m^3 per year
No. of seams mined	2 (D6 & T1)	**2011 Drained volume**	10.1 Mm^3/y
Depth of seams	230-350 m	**Utilization method**	Boilers

More information about these mines of the Karaganda Coal Basin can be found at http://www.epa.gov/cmop/docs/Karaganda.pdf.

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