

26 RUSSIAN FEDERATION



26.1 Summary of Coal Industry

With the world's largest natural gas reserves and second-largest coal reserves (see Table 26-1), Russia plays an important role in coal mine methane (CMM) research and project development. Russian coal and gas exports have continued to grow and are focused on the rapidly growing East Asian energy market. With the Russian government's 2009 decree on increased power generation, CMM development was highlighted as a way for Russian companies to increase earnings while decreasing pollution. On September 23, 2019, Russia, the fourth-largest contributor of greenhouse gases globally, ratified the Paris Agreement on Climate Change. Although the geographic isolation of Russia's coalfields is a barrier to CMM production, pre-existing pipelines and strong natural gas markets in Europe and Asia, coupled with rising domestic natural gas prices, may help incentivize CMM capture and utilization projects in Russia.

26.1.1 ROLE OF COAL IN RUSSIA

- Coal accounts for 13.2 percent of Russia's total primary energy consumption.
- Coal production increased by 43.7 percent between 2007 and 2017 (Figure 26-1).
- Russia's electricity generation in 2017 was split between natural gas (52.3 percent), oil (21.9 percent), coal (13.2 percent), nuclear (6.5 percent), and hydroelectric (5.9 percent) (BP, 2018).

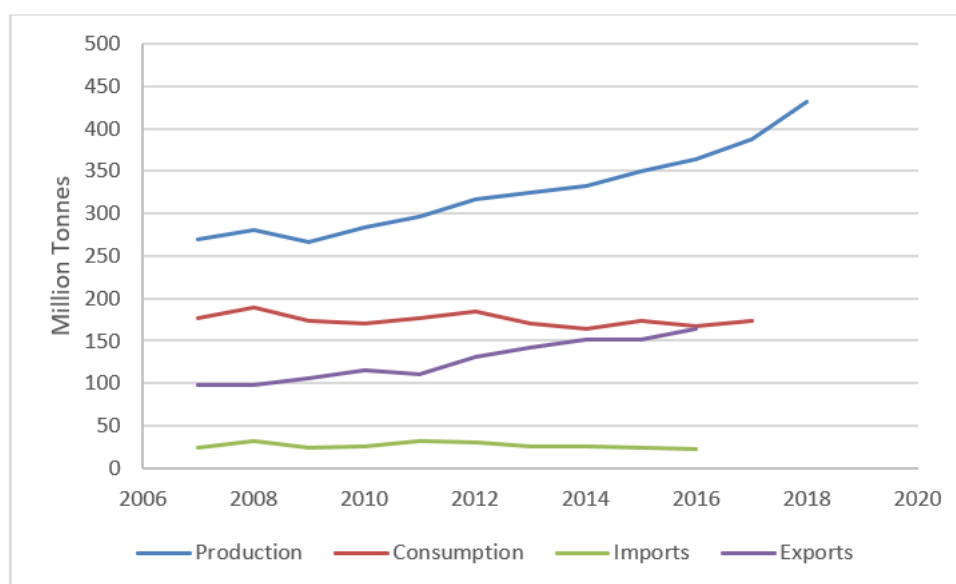
Table 26-1. Russia's Coal Reserves and Production

Indicator	Anthracite & Bituminous (million tonnes)	Sub-bituminous & Lignite (million tonnes)	Total (million tonnes)	Global Rank (# and %)
Estimated Proved Coal Reserves (2017)	69,634	90,730	160,364	2 (15.5%)
Annual Coal Production (2018)			431.76	6 (5.5%)

Sources: BP (2018), S&P Global Platts (2019).

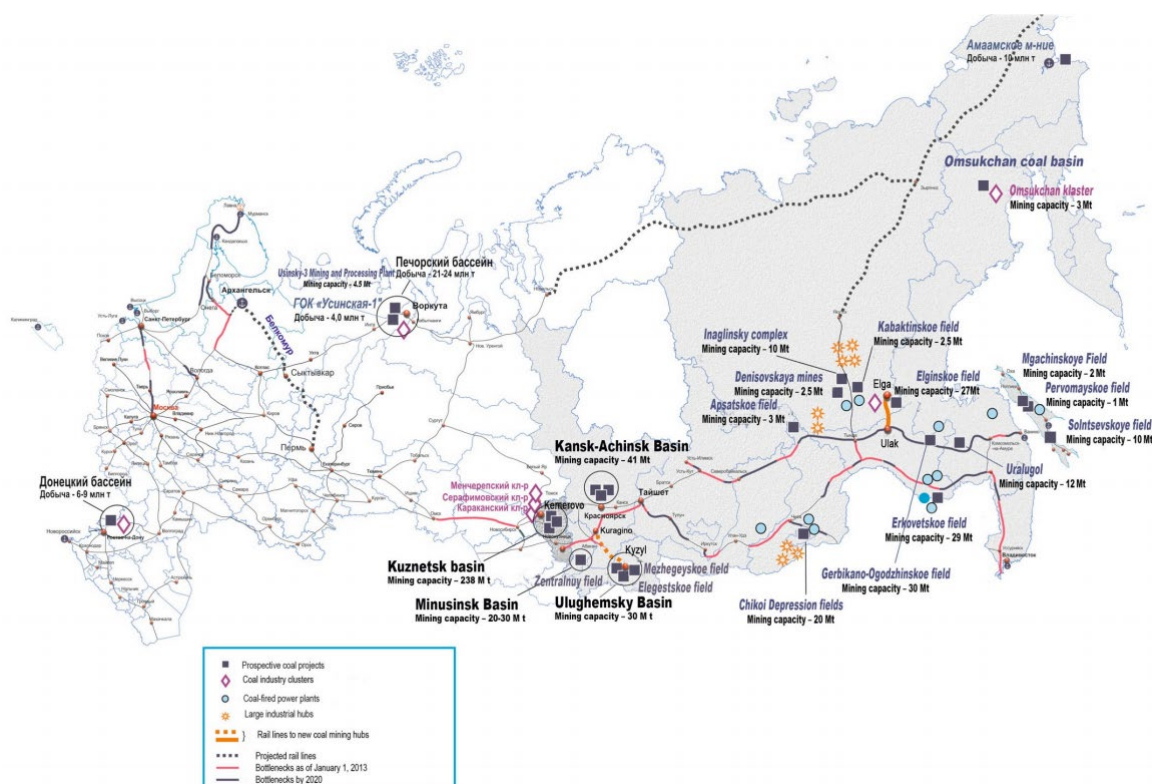
- Coal reserves are primarily concentrated in Siberia (80 percent) and the Far East region (10 percent) (Figure 26-2). There are 22 coal basins and 129 separate deposits in the country spread across 25 states and mined by 150,000 miners (Grachev, 2018).
- The main coal-producing basins in Siberia are the Kuznetsk and Kansk-Achinsk, along with the South Yakutsky Basin in the Far East region (Mochalnikov, 2015).
- Lignite is found principally in the southern part of Krasnoyarsk State (Siberia) and in Tula Province (western Russia) (IEA, 2009).
- Russia is the third-largest coal exporter in the world and saw a 38 percent increase in its exports between 2010 and 2015, especially in its exports to Asia that increased 105 percent during the same period (a breakdown of Russia's trade partners can be seen in Figure 26-3).

Figure 26-1. Historical Russian Coal Production, Consumption, Imports, and Exports



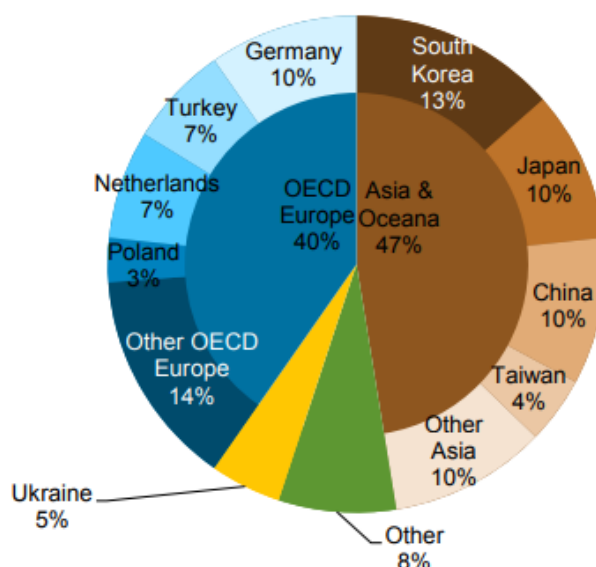
Sources: EIA (2017b), BP (2018), S&P Global Platts (2019).

Figure 26-2. Map of Russia's Coal Reserves



Source: Mochalnikov (2015).

- The majority of Russia's coal production comes from the Kuznetsk (Kuzbass) Basin in Siberia.
- In 2017, Russia consumed 44.7 percent of its coal production and exported the remainder.
 - 80 percent of the coal produced is thermal coal, with the remaining 20 percent coking coal (EBR, 2017).

Figure 26-3. Share of Russia's Coal Exports by Destination, 2016

Source: EIA (2017a).

26.1.2 STAKEHOLDERS

Table 26-2 presents a summary of key stakeholders in Russia's CMM industry.

Table 26-2. Key Stakeholders in Russia's CMM/Coalbed Methane (CBM) Industry

Stakeholder Category	Stakeholder	Role
Mining companies	▪ Severstal-Resource ▪ Evraz Holding ▪ MDM ▪ Ural Mining and Metallurgical Company ▪ Sibirsky Delovoy Soyuz ▪ Sibuglemet ▪ Belon ▪ Mechel ▪ Siberian Coal Energy Company ▪ IMH-Coal	Project hosts

Stakeholder Category	Stakeholder	Role
Equipment manufacturers	▪ Kyshtym Machine Works ▪ Druzhkov Machine Works ▪ Artemovsk Machine Works ▪ VENTPROM ▪ Yurga Machine Works	Power generation equipment supplier
Universities/research establishments	▪ Federal Research Center of Coal and Coal Chemistry of SB RAS ▪ Mining Institute of the Ural Branch of the Russian Academy of Sciences ▪ National University of Science and Technology "MISIS"/Mining Institute ▪ Uglemetan Service ▪ Promgas ▪ VostNII ▪ Skochinsky Institute of Mining (SIM)	Technical assistance
Natural gas transmission & distribution companies	▪ Gazprom	Distribution and pipeline sales
Government groups	▪ Federal Ministry of Natural Resources ▪ Russian Federation Ministry of Energy ▪ Russian Federal Mining and Industrial Inspectorate (RosTechNadzor) ▪ Regional administrations	▪ Licensing ▪ Project approval ▪ Safety standards for mines ▪ Regional environmental and safety rules and requirements

26.1.3 STATUS OF COAL AND THE COAL MINING INDUSTRY

- Coal mining is entirely privatized in Russia, with 169 companies operating in the country at the end of 2016 (Uzhakhov, 2016).
 - The five largest companies are the Siberian Coal Energy Company, UK Kuzbassrazrezugol, SDS-Coal, Rapsadskay Coal Company (Evraz Holding), and Mechel Mining.
- The *Russian Energy Strategy to 2030*, released in November 2009, outlined plans to decrease the economy's reliance on energy exports; however, coal exports have increased 25 percent since 2013 (Grachev, 2018).

- Despite increasing production and export rates, railway and seaport access limitations stemming from the remoteness of coal mine operations from population centers restrict Russia's overall potential coal production.
- Russian Ministry of Energy projections predict that coal production centers in the East will increase overall production by 80 million tons by 2020.

26.2 Overview of CMM Emissions and Development Potential

- As of 2015, Russia had six operational CMM utilization projects, the majority of which used CMM for power generation or boiler fuel. Two additional CMM projects were in the development stages (USEPA, 2015).
- 70 percent of total methane emissions from Russia's coal mining sector originate from Kuzbass.
- Under the auspices of collaboration through the Global Methane Initiative, the U.S. Environmental Protection Agency conducted a pre-feasibility study at the Alardinskaya and Uskovskaya coal mines. The pre-feasibility study revealed:
 - Gas content increases as one drills deeper into the formation, with a methane content of 15 cubic meters per tonne (m^3/tonne) at 250-meters deep and double that amount, 30 m^3/tonne , at 650-meters deep.
 - Extensive pre-drainage already existed, and the feasibility project studied the viability of capturing CMM for power generation (USEPA, 2014).

26.2.1 CMM EMISSIONS FROM OPERATING MINES

- CMM in Russia is primarily located in three coal basins: Kuzbass, Pechora, and Donetsk.
- Methane emissions from Russia's underground and surface coal mines totaled approximately 70 million tonnes carbon dioxide equivalent (tCO_2) in 2016 (see Figure 26-4).
- In 2016, 3.48 percent of methane emissions, or 85,850 tonnes, were captured and utilized from underground Russian coal mines (UNFCCC, 2019).

Figure 26-4. Reported Historical Methane Emissions from Russia's Underground and Surface Coal Mines



Data source: UNFCCC (2019); the methane-to-CO₂ conversion rate used was 28.

- In 2011, the Russian government passed Resolution No. 315, which stipulates that degassing is mandatory in operating mines when the methane content exceeds 13 m³/tonne of coal mined. Table 26-3 provides information on the average methane concentration for selected coal basins in Russia.

Table 26-3. Average Methane Concentrations for Selected Russian Coal Basins

Region	Coal Basins	Methane average concentration (m ³ /tonne)
Central	Near Moscow	8
Northwestern	Pechora	32.1
Southern	Donetsk	28.4
Volga	Kizelovsky	13.8
Ural	Makhnevsko-Kamensky and Chelyabinsk	13.8
Siberian	Gorlovsky, Irkutsk, Kansk-Achinsky, Kuznetsky, Minusinsk, Taimyr, and Tungusky	15.7
Far Eastern	Beringovsky, Bureinsky, Zyryansky, Lensky, Omsukchansky, Partizansky, Razdolnensky, Sakhalin, Uglovsky, Khankaysky, and South Ussuriysky	18.9

Source: UNFCCC (2019).

- The majority of methane utilization has traditionally occurred in the Pechora Coal Basin; since 2010, the Kuzbass Basin, which has 13 trillion m³ in CBM reserves and is

the location of Russia's largest coal mining operations, has started utilizing captured gas for power generation (Tailakov et al., 2017).

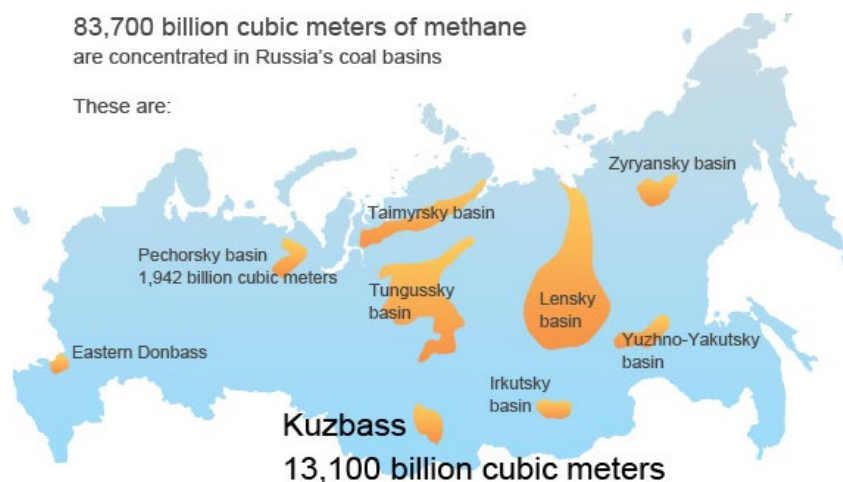
26.2.2 CMM EMISSIONS FROM ABANDONED COAL MINES

- Russia had 61 underground coal mines in 2018, down from 225 in the early 1980s (Kilimnik et al., 2007; Tarazanov, 2018).
- There are no recent official statistics on the number of abandoned mines or their emissions in Russia, but many coal mines were reported to have closed during the early 1990s.
- There are 43 abandoned mines in the Kuzbass Basin; however, most of these mines are flooded, making any abandoned mine methane capture projects difficult or unlikely (Jones, 2005).

26.2.3 CBM FROM VIRGIN COAL SEAMS

- Russia has an estimated 83.7 trillion m³ of coal seam methane, with the Kuzbass Basin possibly being the biggest CBM reserve in the world, with 13.1 trillion m³ in reserves (Gazprom, 2019a; Figure 26-5).

Figure 26-5. CBM Distribution in the Kuzbass Basin in Russia



Source: Gazprom (2019a).

26.3 Opportunities and Challenges to Greater CMM Recovery and Use

26.3.1 MARKET AND INFRASTRUCTURE FACTORS

- In Russia, CMM and CBM must compete economically with large, domestic, cheaply extracted proven gas reserves.
- State regulations keep the large gas supply at a low sales price, making it difficult for a CMM project to achieve financial viability. The domestic price of natural gas has, however, increased 16 percent since 2013, making projects more feasible (Gazprom, 2019b).
- Technological challenges continue to exist for the economic extraction of CMM from saturated, low-permeability coal seams.
- Natural gas infrastructure and markets exist within 20 to 100 kilometers of high-priority CBM/CMM production areas (M2M Workshop-Russia, 2005). Power production projects utilizing CMM in the Kuzbass Basin could have an internal rate of return upward of 25 percent (Tailakov et al., 2017).
- In 2017, Russia produced 635.6 billion cubic feet (bcf) of natural gas and consumed 424.8 bcf, exporting the difference to Europe and Asia (BP, 2018).

26.3.2 REGULATORY INFORMATION

- Russia is ranked fourth in the world in greenhouse gas emissions.
- Russia has yet to ratify the Paris Agreement (Table 26-4) (Sauer, 2019).

Table 26-4. Russia's Climate Change Mitigation Commitment

Agreement	Signature	Ratification
UNFCCC*	June 13, 1992	December 28, 1994
Kyoto Protocol**	March 11, 1999	November 18, 2004
Paris Agreement***	April 22, 2016	September 23, 2019

Sources: * UN (1992), ** UN (1997), *** UN (2015).

- Regional authorities monitor activities of coal companies and issue licenses for subsoil use, but there is no central government body regulating CMM development (IEA, 2009).

- CMM is owned by the state with three licenses available: exploration, production, and combined licenses.
- The license is applied for at the Territorial Authority, which publishes a tender announcement. The tender is held with a minimum starting price determined by the Federal Agency and it typically takes about one year to obtain a license.
- While an additional license is not required for CMM recovered from and used within a mine, new mineral extraction licenses are needed if the recovered CMM is sold to another party or used for heat and power generation and then sold to another party (IEA, 2009).
- A “Guide for Safe Operation of CMM Energy Units” has been prepared in Kuzbass for the safe installation of CMM recovery and utilization systems in coal mines (e.g., captured gas must be above 30 percent methane for utilization).
- Initiatives such as a government decision on gradual price increases for natural gas for industrial and residential users, liberalization of the electricity market, and renewable energy targets inclusive of CMM, will facilitate the creation of a market where CMM could become competitive with other energy sources.

26.4 References

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