

Overview

Russia is the second-largest producer of dry natural gas and third-largest liquid fuels producer in the world. Despite its significant reserves of coal, it produces only modest amount of coal. Russia's economy is highly dependent on its hydrocarbons, and oil and gas revenues account for more than 50% of the federal budget revenues.

Russia is a major producer and exporter of oil and natural gas, and its economy largely depends on energy exports. Russia's economic growth continues to be driven by energy exports, given its high oil and gas production and the elevated prices for those commodities. Oil and gas revenues accounted for 52% of federal budget revenues and over 70% of total exports in 2012, according to PFC Energy.

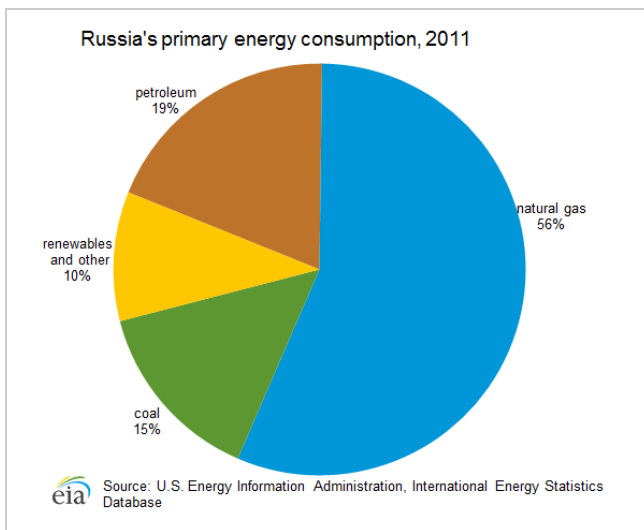
Russia was the world's third-largest producer of oil (after [Saudi Arabia](#) and the United States) Preliminary data for 2013 show that Russia still is the third-ranked producer of total liquids, with average production at 10.5 million barrels per day (bbl/d) through September 2013. Russia was the second-largest producer of natural gas in 2012 (second to the United States).

Russia is the third-largest generator of nuclear power in the world and fourth-largest in terms of installed capacity. With ten nuclear reactors currently under construction, Russia is the second country in the world in terms of number of reactors under construction in 2012, according to the International Atomic Energy Agency.

Russia consumed 32.77 quadrillion British thermal units (Btu) of energy in 2011, the majority of which was in the form of natural gas (56%). Petroleum and coal accounted for 19% and 14%, respectively.



Source: CIA, World Factbook

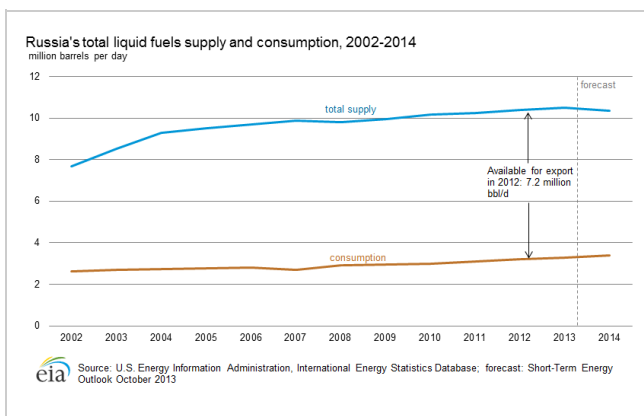


Oil

Russia was the third-largest producer of liquid fuels in 2012, following the United States and Saudi Arabia. During that year, liquid fuels production averaged 10.4 million bbl/d.

Russia's proven oil reserves were 80 billion barrels as of January 2013, according to the *Oil and Gas Journal*. Most of Russia's resources are located in Western Siberia, between the Ural Mountains and the Central Siberian Plateau and in the Volga-Urals region, extending into the Caspian Sea. Eastern Siberia holds some reserves, but the region has had little exploration.

In 2012, Russia produced an estimated 10.4 million bbl/d of total liquids (of which 9.9 million bbl/d was crude oil), and it consumed roughly 3.2 million bbl/d. Russia exported over 7 million bbl/d in 2012, including roughly 5 million bbl/d of crude oil and the remainder in products. Russia's pipeline oil exports fall under the jurisdiction of Transneft, the state-owned pipeline monopoly.



Exploration and production

Most of Russia's oil production continues to originate in West Siberia, notably from the Priobskoye and Samotlor fields. The Sakhalin group of fields in the Far East only contributes about 3% of Russia's total production, although it has yet to fulfill the expectation that it would contribute significantly to Russia's total oil production. In the longer term, however, Sakhalin, along with the untapped oil reserves in Eastern Siberia and the Russian Arctic, may play a larger role. Several international oil companies are actively working in this area. The Russian sector of the [Caspian Sea](#) and the undeveloped areas of Timan-Pechora in northern Russia also may hold large hydrocarbon reserves.

A number of new projects are in development, but these new projects may only offset declining output from aging fields and not result in significant output growth in the near term. The use of more advanced technologies and the application of improved recovery techniques are resulting in increased oil output from existing oil deposits. Fields in the Western Siberian Basin produce the majority of Russia's oil, with developments at Rosneft's

Samotlor and Priobskoye fields extracting more than 1 million bbl/d combined. Production in the region is dominated by Russian firms, although foreign companies, notably Shell, have secured access to production in Western Siberia.

The potential oil reserves of Eastern Siberia, the Russian Arctic, the northern Caspian Sea, and Sakhalin Island are attracting attention. A number of international oil companies have secured acreage and are investing heavily in exploration and development on hydrocarbon-rich Sakhalin Island, although the Russian government is pushing for a greater role for domestic companies in these projects. Gazprom acquired control of the Sakhalin-2 project from Shell, and it is seeking control of the marketing of gas supplies from the Sakhalin I project, led by Exxon Neftegas Limited, a subsidiary of ExxonMobil.

Russian companies are also expanding into the Arctic and Eastern Siberian regions, spurred on by tax holidays and lower oil export tariffs. While several new fields have come on line since 2009, bringing additional fields into production will take time and may require a reformed oil tax regime from the government.

Russia's oil production by region, 2012

Region	Thousand bbl/d
Western Siberia	6,422
Urals-Volga	2,312
Krasnoyarsk	368
Sakhalin	283
Komi Republic	259
Arkhangelsk	249
Irkutsk	201
Yakutiya	133
North Caucasus	64
Kaliningrad	26
Total	10,317

Source: Eastern Bloc Energy

Russia's oil and gas producing regions

West Siberia

West Siberia is Russia's main oil producing region, accounting for around 6.4 million bbl/d of liquids production, nearly two-thirds of Russia's total production. While this region is mature, West Siberian production potential is still significant but will depend on improving production economics at fields that are more complex and that contain a significant portion of remaining reserves.

The two largest oil fields in West Siberia are North Priobskoye and Samotlor, which account for about 20% of West Siberian production. Urnegoy is the largest gas field in the region. Other large oil fields in the region include Mamontovskoye and Salymkoye fields.

In addition to well-established oil fields, a number of wet gas developments in Western Siberia are under way. It is likely that gas condensate volumes from these fields will grow within the next few years as a result of these developments.

Urals-Volga

Urals-Volga was the largest producing region of the Soviet Union until the late 1970s, when it was surpassed by Western Siberia. Today, this region is a distant-second producing region, accounting for about 22% of Russia's total output. The giant Romashkinskoye field (discovered in 1948) is the largest in the region. It is operated by Tatneft. While the field reached its peak production level sometime in the late 1970s, it likely will continue to produce until at least 2030, according to Wood Mackenzie.

Urals-Volga is home to a number of other fields, although their average size is relatively small at about 140 million barrels of recoverable liquids, according to Wood Mackenzie. A significant portion of the oil produced in this region is heavy.

East Siberia

With the traditional oil-producing regions in decline, East Siberian fields will be central to continued oil production expansion efforts in Russia. The region's potential was increased with the inauguration of the Eastern Siberia-Pacific Ocean (ESPO) pipeline, which created an outlet for East Siberian oil. A total of 400,000 bbl/d of crude oil was supplied to the pipeline in its first year of operation.

The region's development was spurred by tax breaks and the removal of export duties, but most of these concessions were lifted in 2011. East Siberia has become the center of production growth for Rosneft, the state oil giant. The start-up of the Vankorskoye (Vankor) oil and gas field in August 2009 has dramatically increased production in the region and has been a significant contributor to Russia's increase in oil production since 2010. Vankor, located north of the Arctic circle, was the largest oil discovery in Russia in nearly three decades. In 2013, the field has produced about 430,000 bbl/d.

There are a number of other fields in the region, including the Verkhnechonskoye oil and gas condensate field, Yurubcheno-Tokhomskoye oil and gas condensate field, and Agaleevskoye gas and condensate fields.

Yamal Peninsula/Arctic Circle

This region is located in the Yamal-Nenets Autonomous region and it straddles Western Siberia. This region is mostly known for gas production. Crude oil development is relatively new for the region. In the near term, the region is facing transportation infrastructure constraints, although the construction of the Purpe-Samotlor pipeline ameliorated some of these constraints. Transneft also is constructing the Zapolyarye-Purpe pipeline, that will connect the Zapolyarye gas and condensate field to the Purpe-Samotlor pipeline. The pipeline will come online in three phases, the first of which is expected to be completed by the end of 2014.

In addition to the Zapolyarye gas and condensate field, the area is home to Vostochno Messoyakha and Zapadno Messoyakha, Suzun, Tagul, and Russkoye oil fields, all of which will benefit from the additional transportation availability. On the Yamal Peninsula itself, gas fields such as Yuzhno Tambey, Severno Tambey, and Khararsavey dominate the landscape, as well as the Vostochno Bovanenkov and Neitin gas and condensate fields.

North Caucasus

North Caucasus is a mature region that consists of a number of small fields. LUKoil has been actively developing some of the deposits situated in the North Caspian, such as the Yurii Korchagin, launched in 2010. Other discoveries in the area include the Khvalynskoye, Rakushechnoye, Sarmatskoye, and Zapadno Rakushechnoye fields. The development of the region is highly sensitive to taxes and export duties, and any change or cancellation of tax breaks may negatively affect the region's development.

Timan-Pechora and Barents Sea

Timan-Pechora and the Barents Sea are situated in north-western Russia. Much like those in the North Caucasus, liquids fields in these areas are relatively small. However, producers in these areas can take advantage of the developed infrastructure and can maximize their export potential via the Arctic Sea ports including the Varandey port.

Exploration and production in Timan-Pechora has been somewhat disappointing. For example, LUKoil's development of the Khylichukoye project appears to have reached its peak production capacity as early as June 2010. Gazprom is planning to develop the 530-million barrel Prirazlomnoye field in the Pechora Sea after the company was granted tax breaks in July 2012. Without the tax breaks, the project would have been uneconomical. Much like Prirazlomnoye, fields in these areas are challenging and expensive to develop, particularly under the current tax and tariff system. The Barents offshore production likely will have very little effect on liquids production, as the region is home to gas fields that contain little to no liquids in the reservoirs. Gazprom is planning to develop the Shtokman gas field in the Barents Sea, but the project has been repeatedly delayed because of its costs and a lack of tax incentives, which are necessary to make it economical.

Sakhalin Island

Located off Russia's eastern shore, Sakhalin Island is home to a number of large oil and gas fields. The areas of the island are being developed in phases, with Sakhalin I and II producing oil and gas. Continued growth is expected to come from the Odoptu and Arkutun-Dagi fields in Sakhalin Island. Odoptu started producing in 2010, and Arkutun-Dagi is

expected to commence production in the first half of 2014. Other sizeable fields include Chaivo (Sakhalin I), Piltun-Astokhskoye, and Lunksoye (Sakhalin II), and Kirinskoye and Veninskoye (Sakhalin III).

Russian exploration companies and international consortia are involved in the development of the Sakhalin Island resources. Even though all of the consortia have extensive export plans via liquefied natural gas (LNG) terminals and export pipelines to the mainland, there has been little progress beyond the first two developments on the island: Sakhalin I and Sakhalin II. There also is an oil export terminal on the island.

Russia's oil grades

Russia has six main oil grades, including Russia's main export grade, Urals blend. Urals blend accounts for more than 80% of Russia's exports and is a mixture of mostly Russian crude varieties. This blend includes a wide spectrum of qualities, but it also includes some Azerbaijani and Kazakh crudes. As a result of the differing components that make up the Urals blend, there is a significant variation in its properties at each export point. On average, Urals' gravity is 31.3°API and about 1.25% sulfur content, although gravity can vary between 31° and 33° API with sulfur content ranging between 0.8% and 1.8%.

The Eastern Siberia-Pacific Ocean (ESPO) blend came on stream in late 2009 and is a mix of crudes produced in several Siberian fields. The grade is exported through the recently constructed ESPO Pipeline to [China](#) as well as through Russia's Pacific coast to other Asian countries. ESPO blend is a fairly sweet, medium-light blend, with a gravity of 35°API and 0.5% sulfur content.

Siberian Light (35.1°API, 0.57% sulfur) is usually blended into Urals and [Kazakhstan's](#) CPC Blend, but it is also exported as a separate stream. The Siberian Light volumes are mainly shipped out of the Tuapse terminal on the Black Sea, although according to Energy Intelligence, some of these volumes have also been transported to the Iranian port Neka via the Caspian Sea.

Sokol grade is mainly produced from the Chaivo field that is offshore of Sakhalin Island, but volumes from the Odoptu are also part of the stream. As additional fields come on line, such as the Arkutun-Dagi field, further volumes will be added to the blend. Sokol is a light, sweet crude with an API gravity of 36.7° and 0.24% sulfur content. Sokol is prized by Asian refiners for its high middle distillate yield, making it competitive with the Dubai and Oman grades.

Vityaz blend is a light (41°API), sweet (0.18% sulfur content), paraffin-rich crude, characterized by its high middle distillate yield. This stream is Russia's first offshore crude stream, produced under the Sakhalin II production sharing agreement (PSA). The Vityaz crude is loaded at the Prigorodnoye port, located on the Aniva Bay at the southern tip of Sakhalin Island.

The Yuzhno Khylichuyu (YK) blend is composed of crude oil produced at the eponymous fields in northern TimanPechora. The YK blend, also known as Arctic Light, is loaded at the Varendey terminal on the Barents Sea and its gravity is 33.7°API with 0.76% sulfur content.

Sector organization

Most of Russia's production remains dominated by domestic firms. Following the collapse of the Soviet Union, Russia initially privatized its oil industry, but Russia's oil and gas sector has reverted to state control over the past few years.

Starting in the late 1990s, a few privately-owned companies drove growth in the sector and, a number of international oil companies attempted to enter the market, with varying success. In 2003, BP invested in TNK, forming TNK-BP, one of country's major oil producers. However, in 2012 and 2013, TNK-BP partnership was dissolved, and BP divested its assets in Russia. The state-run Rosneft acquired nearly all of TNK-BP's assets. In the previous decade, Rosneft emerged as Russia's top producer following the liquidation of Yukos assets, which Rosneft acquired.

ConocoPhillips also entered Russia's oil exploration and production in the 1990s, but subsequent attempts by foreign firms to increase their investment in Russia were unsuccessful. While foreign companies can invest in Russia, the investment is generally

done with a Russian company, usually Rosneft.

LUKoil, a privately-held company, is the second-largest holder of oil reserves and producer in Russia, second only to Rosneft. LUKoil holds an extensive portfolio of both upstream and downstream assets. In 2004, the company signed a strategic agreement with ConocoPhillips. In 2010, ConocoPhillips agreed to sell its 20% stake back to LUKoil.

With the possible exception of ExxonMobil, which signed an agreement with Rosneft to develop the Arctic shelf and the Black Sea, foreign operators experience difficulty operating in Russia. This is particularly the case for BP, which canceled a planned Arctic partnership with Rosneft as a result of a dispute with its Russian partners. In 2013, BP sold its Russian assets, and TNK-BP assets were acquired by Rosneft.

A number of ministries are involved in the oil sector. The Ministry of Natural Resources issues field licenses, monitors compliance with license agreements, and levies fines for violations of environmental regulations. The Ministry of Finance is responsible for tax policy for the energy sector, and the Ministry of Economic Development is responsible for regulations of tariffs and energy sector reforms. The Ministry of Energy oversees policy.

Within these ministries, regulatory agencies involved in the sector include the Federal Energy Commission (oil transportation tariffs), the Commission for State Policy on the Oil Market (formulates policy for regulating oil and oil product markets), and the Commission on Protective Measures in Foreign Trade and Customs and Tariff Policy (sets crude oil export tariffs).

Russia's oil production by company, 2012

Company	Thousand bbl/d
Rosneft	2,448
Lukoil	1,670
TNK-BP	1,493
Surgutneftegaz	1,223
Gazprom Neft	626
Tatneft	518
Slavneft	356
Gazprom	314
Bashneft	307
Russneft	295
PSA operators	283
Novatek	85
Others	697
Total	10,315

Source: Eastern Bloc Energy

Refinery sector

Russia has 40 oil refineries with a total crude oil distillation capacity of 5.5 million bbl/d, according to *Oil and Gas Journal*. Rosneft, the largest refinery operator, has a crude distillation capacity of 1.3 million bbl/d and operates Russia's largest refinery, the 385,176-bbl/d Angarsk facility. LUKoil is the second-largest operator of refineries in Russia with a crude distillation capacity of 1 million bbl/d.

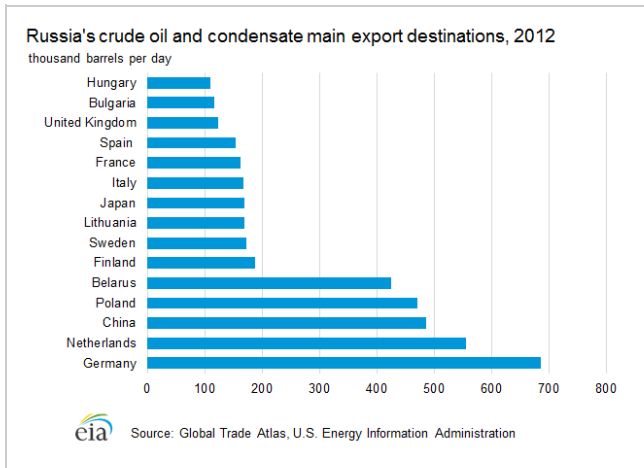
Oil Exports

Russia's Transneft holds a monopoly over Russia's pipeline network, however pipeline exports have been displaced somewhat by seaborne exports over the last year.

In 2012, Russia had roughly 7.2 million bbl/d of total liquid fuels available for exports. The vast majority of Russian exports (84%) went to European countries, particularly Germany, Netherlands, and Poland. Around 18% of Russia's oil exports were destined for Asia, while the remainder went mostly to the Americas. Russia's crude oil exports to North America and

South America have been largely displaced by increases in crude oil production in the United States, [Canada](#), and, to a lesser extent, in [Brazil](#), [Colombia](#), and other countries on the continent. More than 80% of Russia's oil is exported via the Transneft pipeline system, and the remainder is shipped via rail and on vessels that load at independently-owned terminals.

Russia also exports fairly sizeable volumes of oil products. According to Eastern Bloc, Russia exported about 1.2 million bbl/d of fuel oil and an additional 889,000 bbl/d of diesel in 2012. It exported smaller volumes of gasoline (52,000 bbl/d) and liquefied petroleum gas (56,000 bbl/d) during the same year.



Pipelines

Russia has an extensive domestic distribution and export pipeline network. Russia's pipeline network is nearly completely owned and run by the state-run Transneft, which transports about 88% of all crude oil and about 27% of oil products produced in Russia. These pipelines include a number of domestic pipeline networks, pipelines that transport oil to export terminals such as Novorossiysk on the Black Sea and Primorsk on the Baltic Sea, as well as a number of export pipelines that deliver oil to western European markets. Russian export pipelines include Druzhba, Baltic Pipeline System, North-West Pipeline System, Tengiz-Novorossiysk, and Baku-Novorossiysk. All of these pipelines, with the exception of the Tengiz-Novorossiysk, are Transneft-controlled.

Russia's oil pipelines

Pipeline	Route	Length (miles)	Capacity (million bbl/d)	Details
Current pipelines				
Druzhba	Northern Route: Belarus, Poland Germany; Southern Route: Belarus, Ukraine, Slovakia, Czech Republic, Hungary	2,400	2	
Baltic Pipeline System 1	Timan Pechora to Primorsk Terminal	730	1.5	
Baltic Pipeline System 2	Unecha to Ust-Luga Terminal	620	1	
North-West Pipeline System	Polotsk to Butinge and Ventspils	500	0.3	Branches off of Druzhba near Russia-Belarus border and transports Russian oil via Belarus to Latvia and Lithuania
Caspian Pipeline Consortium (CPC)	Tengiz (Kazakhstan) to Russian Black Sea port of Novorossiysk	940	0.7	Planned expansion to 1.4 million bbl/d by 2016
Baku-Novorossiysk Pipeline	Sangachal Terminal (Azerbaijan) to Russian Black Sea port of Novorossiysk	830	0.1	Planned expansion to 0.3 million bbl/d
Eastern Siberia-Pacific Ocean (ESPO) Pipeline	Taishet-Skovorodino-Kozmino Bay (with a 60-mile spur running from Skovorodino to Daqing in	270	0.6	Capacity of ESPO I and ESPO II each are 0.6 million bbl/d. The Daqing spur capacity is 0.3

	China)		million bbl/d.
Purpe-Samotlor Pipeline	Oil fields in the Yamal-Nenets and Ob Basin (including Vankor field) to the ESPO Pipeline	266	0.5
Proposed pipeline			
Zapolyarye-Purpe Pipeline	Oil fields in the Zapolyarye region and new fields in Yamal-Nenets region to the ESPO and Purpe-Samotlor Pipelines	310	0.9

Source: Source: Transneft, IHS, PFC Energy, Petroleum Economist

Ports

There are at least 18 ports serving as export outlets for Russian oil to various markets, including Europe, the Americas, and Asia. Among these ports, eight stand out because of their importance:

Primorsk is Russia's largest oil terminal, with a loading capacity of 1.5 million bbl/d. It is located near St. Petersburg and is a two-berth harbor that can accommodate ships with maximum length of 307 meters (335 yards).

Kozmino Bay is located in Russia's far eastern Primorsky province. Crude loaded at Kozmino Bay is transported via the ESPO pipeline and rail to the terminal. The port's initial capacity of 300,000 bbl/d will eventually be expanded to 1 million bbl/d.

Novorossiysk is Russia's main oil terminal on the Black Sea coast. Its load capacity is 950,000 bbl/d, and it can load tankers up to 150,000 deadweight tons (dwt).

Tuapse is located on the northeastern shore of the Black Sea, southeast of Novorossiysk. Two of the six berths load crude oil. The port mainly exports Siberian Light. Its loading capacity is about 350,000 bbl/d. In addition, the terminal has more than 580,000 bbl of oil and oil products storage capacity. The port can accommodate tankers with up to 80,000 dwt.

De-Kastri is located in Russia's Far East, southwest of the Tatar Strait that separates Sakhalin Island from the Russian mainland. Its export capacity is 250,000 bbl/d. The port can accommodate Aframax vessels.

Yuzhny terminal is located in Ukraine, near Odessa, although it mainly exports Russian and Kazakh crude oil via the Black Sea. This port's load capacity is 315,000 bbl/d, and it can accommodate vessels up to 70,000 dwt.

Prigorodnoye is located on Sakhalin Island on the Aniva Bay. The port is capable of loading 100 Aframax and 160 LNG vessels each year.

Varandey is a fixed, ice-resistant offshore oil export terminal in the Russian Arctic, owned and operated by LUKoil. The terminal's capacity is approximately 240,000 bbl/d. Oil loaded at Varandey is shipped west to Murmansk for reloading onto larger vessels.

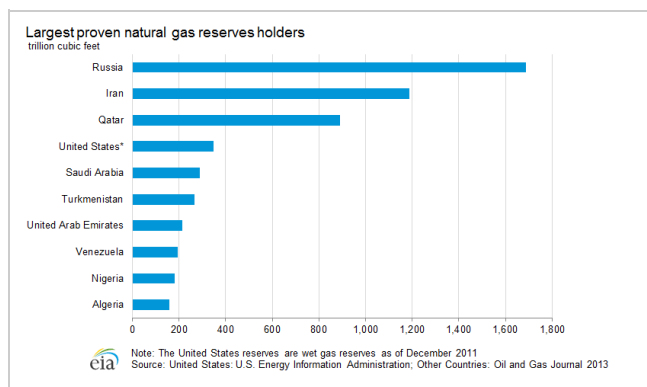
Rail export routes

Rail exports comprise a very small portion of Russian oil exports. Rail is generally used as an alternative to Transneft's pipeline network, although rail shipments generally are costlier than pipeline exports. Russia exports crude oil and petroleum products by rail to Estonia and Latvia. Crude oil also is transported to China via rail to Harbin, China and to central China via Mongolia.

Natural gas

Russia holds the largest natural gas reserves in the world, and is the second-largest producer of dry natural gas.

According to the *Oil and Gas Journal*, Russia held the world's largest natural gas reserves, with 1,688 trillion cubic feet (Tcf), as of January 1, 2013. Russia's reserves account for about a quarter of the world's total proven reserves. The majority of these reserves are located in Siberia, with the Yamburg, Urengoy, and Medvezh'ye fields alone accounting for more than 40% of Russia's total reserves, while other significant deposits are located in northern Russia.



Sector organization

The state-run Gazprom dominates Russia's upstream, producing about 74% of Russia's total natural gas output. Gazprom also controls most of Russia's gas reserves, with more than 65% of proven reserves being directly controlled by the company and additional reserves being controlled by Gazprom in joint ventures with other companies.

While independent producers have gained importance, with producers such as Novatek and LUKoil contributing increasing volumes to Russia's production in recent years, upstream opportunities remain fairly limited for independent producers and other companies, including Russian oil majors. Gazprom's position is further cemented by its legal monopoly on Russian gas exports, although its monopoly on gas exports may be ending soon. Russia's government has announced that it intends to liberalize liquefied natural gas (LNG) exports starting in January 2014, breaking Gazprom's absolute export monopoly.

Much like the oil sector, a number of ministries are involved in the gas sector. The Ministry of Natural Resources issues field licenses, monitors compliance with license agreements, and levies fines for violations of environmental regulations. The Finance Ministry is responsible for tax policy for the energy sector, while the Ministry of Economic Development has influence over regulations of tariffs and energy sector reforms. The Ministry of Energy oversees energy policy.

Within these ministries, regulatory agencies involved in the sector include the Federal Energy Commission (regulates wholesale gas prices), Regional Energy Commission (regulates retail gas prices), and Commission for State Policy on the Oil Market (formulates policy for regulating the gas market).

Russia's natural gas production by company, 2012

Company	Bcf/d
Gazprom	47.1
Rosneft	1.2
LUKoil	1.6
Surgutneftegaz	1.2
TNK-BP	1.3
Others	1.6
ITERA	1.2
Novatek	5.5
PSA operators	2.6
Total	63.4

Source: Eastern Bloc Energy

Exploration and production

The bulk of the country's natural gas reserves under development and production are in the upper Western Siberia. However, Gazprom is increasingly investing in new regions, such as the Yamal Peninsula, Eastern Siberia, and Sakhalin Island, to bring gas deposits in these areas into production. Some of the most prolific fields in Siberia include Yamburg, Urengoy, and Medvezh'ye, all of which are licensed to Gazprom. These three fields have seen output declines in recent years. A substantial amount of natural gas is also associated with oil deposits in the country's oil heartland in Western Siberia.

In 2012, Russia was the world's second-largest dry natural gas producer (23.8 Tcf), second only to the United States (24.1 Tcf).

Independent gas producers such as Novatek have been increasing their production rates, with non-Gazprom sources expected to increase further in the future. Higher production rates have resulted from a growing number of companies entering the sector, including oil companies looking to develop their gas reserves.

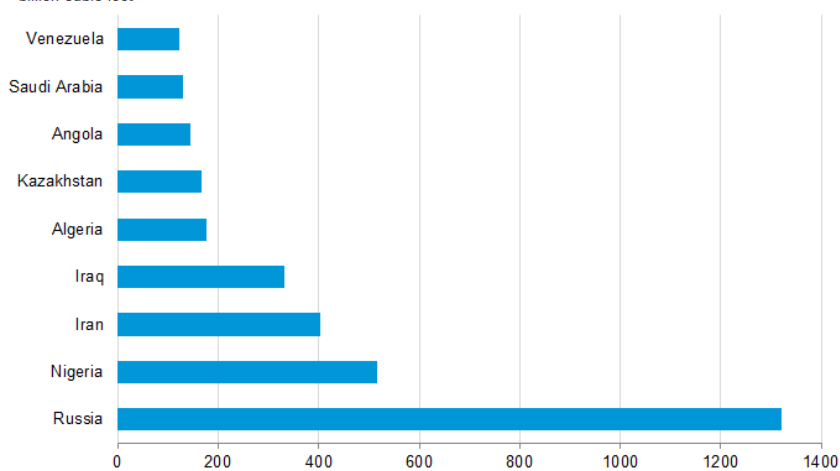
Russian government efforts to decrease the widespread practice of gas flaring and to enforce gas utilization requirements for oil extraction may result in additional increases in production.

Gas flaring

In Russia, natural gas associated with oil production is often flared. According to the U.S. National Oceanic and Atmospheric Administration, Russia flared an estimated 1,320 Bcf of natural gas in 2011, the most of any country. At this level, Russia alone accounted for about 27% of the total volume of gas flared globally in 2011. Although a number of Russian government initiatives and policies have set reduction targets for gas flared, thus far, decreases in gas flared have not occurred.

Largest source countries of flared natural gas, 2011

billion cubic feet



Source: National Oceanic and Atmospheric Administration

Russia's natural gas production by region, 2012

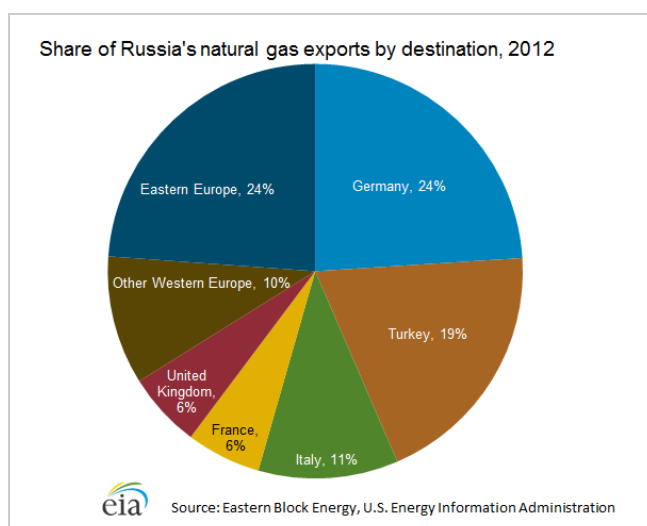
Region	Bcf/d
Siberia	59.6
Tyumen	55.9
Yamalo-Nenets	52.4
Khanti-Mansiisk	3.5
Tomsk	0.4
Krasnoyarsk	0.2
Irkuts	0.2
Yakutsk	0.2
Sakhalin	2.7
Urals Volga	3.3
Orenburg	1.5
Astrakhan	1.1
Others	0.7

Komi Republic	0.3
North Caucasus	0.1
Total	63.4

Source: Eastern Bloc Energy

Natural gas exports

Russia sends about 76% of its natural gas exports to customers in Western Europe, with Germany, Turkey, Italy, France, and the United Kingdom receiving the bulk of these volumes. Smaller volumes of natural gas are also shipped via the Gazprom pipeline network to Austria, Finland, and Greece.



Pipelines

In addition to dominating the upstream, Gazprom dominates Russia's natural gas pipeline system. There are currently 10 major pipelines in Russia, eight of which are export pipelines. The Yamal-Europe I, Northern Lights, Soyuz, Bratstvo, and Nord Stream pipelines all carry Russian gas to Eastern and Western European markets via Ukraine, Belarus, and across the Baltic Sea. These five pipelines have a combined capacity of nearly 6 Tcf per day. Three other pipelines — Blue Stream, North Caucasus, and Mozdok-Gazi-Magomed — connect Russia's production areas to consumers in Turkey and the Former Soviet Union (FSU) republics in the east.

Gazprom's ownership of the Russian pipeline system continues to limit competition, including independent gas producers who have unsuccessfully tried to gain access to the system through a third-party access (TPA) mechanism. While the Russian government agreed to ensure TPA to the domestic pipeline system, actual changes have not occurred. Allowing open access to other producers would allow oil companies to monetize their associated gas production rather than flare the gas.

Notable current and proposed natural gas pipelines

Unified Gas Supply System is Russia's domestic gas pipeline system, which is owned and controlled by Gazprom. It operates about 104,000 miles of high-pressure gas pipelines, as well as 268 compressor stations, 6 gas processing facilities and 25 underground gas storage facilities with a combined storage capacity of 2.4 Tcf.

Yamal-Europe I carries Russian gas to Poland and Germany via Belarus with a throughput capacity of 1.2 Tcf annually. The currently proposed **Yamal-Europe II** would expand the existing pipeline by 1 Tcf, although disputes between Poland and Gazprom on routing of the pipeline make the project less likely.

Blue Stream is a 750-mile long pipeline that connects Izobilnoye in Russia to Samsun, Turkey via the Black Sea. The pipeline's capacity is approximately 560 Bcf per year.

North Caucasus is a 350-Bcf pipeline that runs to Georgia and Armenia. This pipeline is a frequent target of sabotage in the Northern Caucasus. It can transport about 500 Bcf of

natural gas each year.

Yamburg-Uzhgorod, Orenburg-Uzhgorod, Urengoy-Uzhgorod, and Dolina-Uzhgorod are four pipelines, with annual combined throughput capacity of between 700 Bcf and 1 Tcf that carry Russian gas to Western European countries (mainly Germany, Italy, and France) via Ukraine.

Gazi-Magomed-Mozdok pipeline connects southern Russia with [Azerbaijan](#). Initially, this pipeline was used to export Russian gas to Azerbaijan, but it has been reversed and now it can ship about 200 Bcf of Azerbaijan's gas to Russia each year. It is approximately 400 miles long.

Nord Stream is a 760-mile offshore twin pipeline that runs between Vyborg, Russia and Greifswald, Germany along the Baltic seabed. Its annual throughput capacity is 1.9 Tcf, and it ships gas from Yuzhno-Russkoye field directly to Germany and northern Europe. The first line was launched in November 2011, and the second line was placed into service at the end of 2012.

South Stream pipeline would transport natural gas from Izobilnoye in Russia and would run for 560 miles under the Black Sea, achieving a maximum water depth of over 6,500 feet. The second, onshore component will cross Bulgaria. As a result of the Russia-Ukraine disputes, the pipeline will be constructed through Turkey's waters, avoiding Ukraine's territory altogether. Construction began in December 2012, and the first gas is expected to flow by 2015.

Liquefied natural gas

Russia is an exporter of liquefied natural gas (LNG). The Sakhalin Energy's LNG plant has been operating since 2009, and it can export up to 788 MMcf of LNG per year on two trains. The majority of the LNG has been contracted to Japanese and South Korean buyers under long-term supply agreements. In 2012, Sakhalin LNG exports went to [Japan](#) (76%), [South Korea](#) (20%), [China](#) (3.5%), and [Taiwan](#) (0.6%), according to PFC Energy.

Project partners have considered additional trains and plan to have a third train in operation between 2017 and 2018 at the Sakhalin Energy LNG plant. However, the new trains would require other sources of gas in addition to Lunskeye and Piltun-Astonkhskeye fields. To this end, Gazprom is exploring the Kirinskoye Block in Sakhalin III.

There are a number of proposals in various stages of planning and construction for new LNG terminals in Russia, including:

Yamal LNG, which includes a proposal for three trains, and a total liquefaction capacity of 1.3 Bcf of LNG. The plant would use the large South Tambey gas condensate field as feedstock, according to PFC Energy. Partners in the project include Novatek (80%) and Total (20%). The Arctic Yamal peninsula project is technologically, politically, and economically challenging. The plant will be situated on unstable permafrost, and shipping will take place via the Kara Sea, which is icebound for about 10 months of the year. The project's prospects have improved recently as Russia announced a lifting of the export monopoly. Previously, a number of banks announced that they would be willing to finance the project once the export monopoly was lifted.

Shtokman LNG is a Gazprom-led project to be built in conjunction with development of the 3.9 Tcf Shtokman gas field in the Barents Sea. It is planned as a two-train, 591 MMcf of LNG project, but the project is currently stalled and is highly uncertain.

Electricity

Russia is one of the top producers and consumers of electric power in the world, with more than 220 gigawatts of installed generation capacity. In 2011, electric power generation totaled approximately 996 billion kilowatthours, and Russia consumed about 861 billion kilowatthours.

Fossil fuels (oil, natural gas, and coal) are used to generate roughly 68% of Russia's electricity, followed by hydropower (20%) and nuclear (11%). Russia's power sector includes over 440 fossil fuel and hydropower plants, of which 77 are coal plants. There are

also 33 nuclear reactors at 10 nuclear power plants.

Russia's electric power generation totaled 996 billion kilowatthours (BkWh) in 2011, and net electricity consumption stood at 861 BkWh. Russia exported approximately 22 BkWh of electricity in 2011, mainly to Finland, China, and Lithuania. Some electricity was also exported to Georgia, Ukraine, and Azerbaijan, according to the Customs Committee of Russia.

Sector organization

Russia's Ministry of Energy regulates the country's power sector with the exception of nuclear energy, which is administered by the State Atomic Energy Corporation (Rosatom).

There are eight separate regional power systems in the Russian electricity sector, seven of which are connected to the main power grid. These systems are: Northwest, Center, South, Volga, Urals, Western Siberia, Siberia, and Far East. The Far East region is the only one not connected to an integrated power system. Federal Grid Company (FGC), which is more than 70% owned by the Russian government, controls most of the transmission and distribution in Russia. The grid comprises almost 2 million miles of power lines, 73,000 miles of which are high-voltage cables over 220 kilovolts (Kv).

The Russian power sector was restructured in the last decade, and much of it was privatized. The reform divided the electricity sector into wholesale companies that participate in a new wholesale market where the country's transmission grid remains mostly under state control. The government has been trying to attract private investment into the wholesale and regional electric generating companies. As part of the market reform, most of Russia's fossil-fueled power generation was also privatized, while nuclear and hydropower remained under state control.

Nuclear power

Russia has an installed nuclear capacity of 23.6 gigawatts, distributed across 33 operational nuclear reactors at 10 locations. Nine plants are located west of the Ural Mountains. The only exception is the Bilibino plant. Russia's nuclear power facilities are aging. Nine of the country's 33 nuclear reactors use the RBMK design employed in Ukraine's Chernobyl plant. The working life of a reactor is considered to be 30 years, and 16 of Russia's nuclear reactors are 30 or more years old. Russia has an active life extension program; the period for extension is established by the government as 15 years. Construction on Russia's newest reactor, the 950-MW Kalinin 4 reactor, was completed in September 2012, and it commenced commercial operation in December 2012.

Operating nuclear power reactors in Russia

Reactor	Capacity MWe net	Date of commercial operation	Scheduled retirement date
Balakovo 1	950	May-86	2015
Balakovo 2	950	Jan-88	2017
Balakovo 3	950	Apr-89	2018
Balakovo 4	950	Dec-93	2023
Beloyarsk 3	560	Nov-81	2025
Bilibino 1	11	Apr-74	2019
Bilibino 2	11	Feb-75	2019
Bilibino 3	11	Feb-76	2020
Bilibino 4	11	Jan-77	2021
Kalinin 1	950	Jun-85	2014
Kalinin 2	950	Mar-87	2016
Kalinin 3	950	Nov-13	2034
Kalinin 4	950	Dec-13	2042
Kola 1	411	Dec-73	2018
Kola 2	411	Feb-75	2019
Kola 3	411	Dec-82	2026
Kola 4	411	Dec-84	2029
Kursk 1	925	Oct-77	2016

Kursk 2	925	Aug-79	2024
Kursk 3	925	Mar-84	2013
Kursk 4	925	Feb-86	2015
Leningrad 1	925	Nov-74	2018
Leningrad 2	925	Feb-76	2020
Leningrad 3	925	Jun-80	2024
Leningrad 4	925	Aug-81	2025
Novovoronezh 3	385	Jun-72	2016
Novovoronezh 4	385	Mar-73	2017
Novovoronezh 5	950	Feb-81	2035
Smolensk 1	925	Sep-83	2022
Smolensk 2	925	Jul-85	2015
Smolensk 3	925	Oct-90	2020
Rostov 1	950	Dec-01	2030
Rostov 2	950	Dec-10	2030
Total	23,643		

Source: International Atomic Energy Agency, Power Reactor Information System

Russia's current Federal Target Program envisions a 25% to 30% nuclear power share of total generation by 2030, 45% to 50% by 2050, and 70% to 80% by 2100. To achieve these goals, the rapidly aging nuclear reactor fleet in Russia will need to be replaced with new nuclear power plants. As of September 2013, 10 new nuclear reactors were under construction across Russia, with 8,382 MWe net generating capacity, according to the IAEA. One of the plants under construction is a floating nuclear power plant, which is expected to commence operations in 2019.

In addition to the 10 nuclear reactors currently under construction, there are another 25 units planned, with a total gross generating capacity 27,809 MWe. These units are expected to be completed between 2017 and 2025.

Coal

Despite its sizeable reserves, Russia's production of coal is relatively modest, the country ranks sixth largest in the world coal production.

With 173 billion short tons, Russia held the world's second-largest recoverable coal reserves, behind the United States, which held roughly 261 billion short tons in 2008, the most recent year for which these data are available. Russia produced 389 million short tons in 2012, according to Eastern Bloc Energy, of which about 80% was steam coal and 20% was coking coal. Most of Russia's coal (66%) is produced using the opencast mining method. Following a restructuring of the sector a few years ago, nearly all of domestic coal production comes from independent producers.

Russia's coal production by region, 2012

Region	Million short tons
Kuzbass	219.2
East Siberia	53.1
Kansk Achinsk	44.9
Far East	35.7
Pechora	15.7
Yakutsk	13.4
Donbass (Rostov)	6.2
Moscow	0.3
Urals fields	0.1
Others	0.1
Total	388.8

Source: Eastern Bloc Energy

Notes

- Data presented in the text are the most recent available as of November 26, 2013.
 - Data are EIA estimates unless otherwise noted.
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Sources

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