

# Natural Gas - the Friendliest Fossil Fuel for Combating Climate Change and a Key to Sino-Russian Cooperation

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*Abstract. Natural gas is the fossil fuel that is the most friendly for the environment, because is less polluting and more efficient than other conventional fuels. Although it is not as clean as wind or solar energy, the natural gas is considered a key energy source as the world moves towards a cleaner future. In this context, and also taking into account the current economic outlook, Russia and China have developed the "Power of Siberia" pipeline. The new pipeline is the largest gas infrastructure in Russia and one of the most important successes in the relationship between the two major powers. However, the relationship between Moscow and Beijing is not as strong as it seems at first glance. China, whose economy is eight times that Russia's and increasingly technologically advanced, is the main partner of this tandem, and Russia must accept its subordinate role. The main objective of the paper is assessing the importance of the "Power of Siberia" pipeline for the Sino-Russian economic cooperation. The methodology used is mainly qualitative, based on consulting the literature, studies and articles published by established specialists.*

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**JEL classification:** Q43, Q48, Q54

## 1. Natural gas and the environment

Natural gas is an important source of energy which can make a significant contribution to reducing pollution and protecting the environment. In addition for being an internal source of abundant and safe energy, the use of natural gas also offers some environmental advantages comparing to other energy sources, especially other fossil fuels.

Natural gas is the cleanest of all fossil fuels, according to studies elaborated by the Environmental Protection Agency (EPA, 2020). Composed mainly of methane, the main products of natural gas combustion are carbon dioxide and water vapors, the same compounds that humans exhale while breathing.

Oil and coal have either much more complex molecules, or higher carbon proportions and higher nitrogen and sulfur content. Then, when burned, coal and oil emit higher levels of harmful emissions, including higher proportions of sulfur dioxide, carbon and nitrogen oxides. By combustion of coal and fuel oil ash particles are emitted in the atmosphere, contributing to pollution. Natural gas combustion releases only small amounts of sulphur dioxide and nitric oxide, virtually no ash or particulate matter and low levels of carbon monoxide, carbon dioxide and other reactive hydrocarbons.

Pollutants emitted particularly by the combustion of fossil fuels, have led to a number of urgent environmental problems in the US. Natural gas, which emits fewer chemicals harmful to the atmosphere than other fossil fuels, can help mitigate some of these environmental problems, including greenhouse gas emissions, smog, acid rain, emissions due to industrial and electricity generation, and pollution from traffic.

Global warming or the "greenhouse effect" is an environmental problem that addresses the potential of global climate change due to rising levels of atmospheric "greenhouse gases." There are certain gases in our atmosphere that are used to control the amount of heat that is kept close to the Earth's surface.

According to science, the increase in greenhouse gases will result in increased temperatures around the world, resulting in a number of catastrophic environmental impacts. In fact, the Intergovernmental Panel on

Climate Change (IPCC) predicted in the "fourth assessment report" that global average temperatures are expected to rise during the 21st century (IPCC, 2007).

Greenhouse gases include water vapours, carbon dioxide, methane, nitrogen oxides and some artificially produced chemicals, such as chlorofluorocarbons. While many of these gases occur naturally in the atmosphere, levels are increasing due to widespread burning of fossil fuels in growing human agglomerations. Reducing greenhouse gas emissions has become a major target of environmental programmes in countries around the world.

The most common greenhouse gas is the carbon dioxide. Although carbon dioxide does not capture heat as efficiently as other greenhouse gases, the amount of carbon dioxide released into the atmosphere is very high, especially due to the burning of fossil fuels.

Because carbon dioxide represents such a high proportion of the greenhouse gases from US, reducing carbon emissions can play a key role in mitigating the greenhouse effect and global warming. Natural gas combustion emits nearly 30% less carbon dioxide than oil and just under 45% less carbon dioxide than coal.

With regard to natural gas and the greenhouse effect, the fact emerged that methane, the main component of natural gas, is itself a strong greenhouse gas. Methane can capture heat almost 21 times more efficiently than carbon dioxide.

According to the EIA, although methane emissions account for only 1.1% of total US greenhouse gas emissions, it accounts for 8.5% of global greenhouse gas emissions based on global warming potential. Sources of methane emissions in the United States include leaks and emissions from the waste management and operations industry, the agricultural industry, and the oil and gas industry (EIA, 2017).

A major study by the Environmental Protection Agency (EPA) and the Institute for Gas Research (GRI) sought to respond if the reduction in CO<sub>2</sub> emissions due to increased use of natural gas would be offset by any increase in methane emission levels. The study concluded that emission reductions from increased natural gas use outweigh the harmful effects of increased methane emissions more strongly (EPA, GRI, 2006).

In addition, researchers at Carnegie Mellon University have published a report entitled "Marcellus Slate Gas Life Cycle Greenhouse Gas Emissions", which compares greenhouse gas emissions from the Marcellus Slate region with emissions if coal is used to generate electricity. The authors found that wells in the Marcellus region emit between 20 and 50% less greenhouse gases than coal used to generate electricity (Carnegie University, 2016).

## **2. "Power of Siberia" natural gas pipeline**

### **2.1. Pipeline details**

The „Power of Siberia” is a Gazprom-operated pipeline in Eastern Siberia that transports natural gas from Russia to China. The reasons behind the construction of this pipeline are primarily economic, having strong implications for the energy security in both China and Russia in the short term. But also the reasons include environmental protection issues, being designed to reduce China's dependence on coal, which is more carbon intensive and causes more pollution than natural gas. For Russia, the pipeline allows another economic partnership in the face of resistance to pipelines being built in Western Europe.

So, the project is a unified gas transport system (GTS) that involved the development of a 4,000 km long pipeline to transport natural gas from the gas production centers of Yakutia and Irkutsk in eastern Russia to the Far East and China. The project is being developed by Gazprom, a Russian state-owned company, the world's largest natural gas producer.

Construction of the "Power of Siberia" pipeline began in September 2014 with the welding of the first joint. The first phase of the pipeline connecting the Yakutia gas production center with the Russian-Chinese border town of Blagoveshchensk was expected to begin operations in 2018. In fact, the pipeline opened in early December 2019.

"Power of Siberia" supplies gas from the gas production centers of Irkutsk (Kovyktinskoye field) and Yakutia (Chayandinskoye field) to Vladivostok through Khabarovsk. Kovyktinskoye and Chayandinskoye are the two largest gas fields in east Russia, and maintain 1.2 trillion and 1.5 trillion cubic meters of natural gas reserves, respectively (Hydrocarbons Technology, 2014).

As shown in Figure 1, the pipeline passes through five regions of Russia, namely the Irkutsk region, the Sakha Republic (Yakutia region), the Amur region, the Jewish Autonomous Region and the Khabarovsk region.

**Figure no. 1: "Power of Siberia" pipeline**



Source: Gazprom, 2020 (<https://www.gazprom.com/projects/power-of-siberia/>)

The system includes two natural gas pipelines: the 3,200 km line - Yakutia - Khabarovsk - Vladivostok and the 800 km line connecting the Kovyktinskoye gas field in the Irkutsk region with the Yakutia gas production centre. Designed to work at an operating pressure of 100 absolute atmospheres (Ata) from a 1.4 m diameter pipe, the GTS can deliver up to 61 billion cubic meters of natural gas per year.

In May 2014, Gazprom signed a \$400 billion contract with China National Petroleum (CNPC) to supply 38 billion cubic meters of natural gas over the next 30 years. Of the total value of the contract, about \$55 billion will be invested in the construction of new production and transportation facilities.

The first phase of the project involved the construction of a 2,200 km pipeline between the Chayandinskoye field in Yakutia and the city of Blagoveshchensk on the Russian-China border. The next phase of construction was an 800 km pipeline connecting the Kovyktinskoye field in the Irkutsk region with an integrated natural gas production center near the Chayandinskoye field. The 1000 km pipeline from Svobodny to Khabarovsk in the Amur region includes the last section of the natural gas pipeline.

The Yakutia-Khabarovsk-Vladivostok transmission line was built in parallel with the crude oil pipeline in eastern Siberia in the Pacific to reduce infrastructure and electricity costs.

Gazprom is the first company in Russia to use helium separation technology through membranes in the Chayandinskoye field. The technology is used to separate the helium component at the site, and only the required amount of helium can be sent through the pipe.

The pipeline project employs efficient design concepts, energy-saving technologies and advanced pipeline monitoring systems due to complex geological and climatic conditions along its route. For this reason, the longitudinally welded tubes were made of cold-resistant K60 steel with a corrosion-resistant outer lining and a smooth inner lining. High-strength tubes have been used in areas prone to intense seismic activity and tectonic continuities.

Gazprom Transgaz Tomsk, a wholly owned subsidiary of Gazprom, was responsible for the construction of the "Power of Siberia" pipeline. VNIPIgazdobychá was hired as general designer of the project.

## 2.2. China-Russia relations in the context of the construction of the "Power of Siberia" pipeline

The strategic partnership between Moscow and Beijing, a key feature of contemporary global policy, has been reinforced by significant improvements in energy cooperation between the two states. With its official release on December 2, 2019, the Siberian pipeline has become a reality.

The presidents of Russia and China saw through a remote video link what Vladimir Putin of Russia "described as a historic event, not only for the global energy market, but mainly for you and me: Russia and China". China, for its part, referred to Power of Siberia as an "initial bilateral energy cooperation project" that will serve as an "example of deep integration and mutually beneficial cooperation" between countries (Sassi, 2019).

The signing of the treaty was announced in Shanghai in May 2014, a few weeks after the annexation of Crimea to the Russian Federation. Many observers were happy to portray the event as a critical point when Moscow finally headed to Beijing to defend itself against Western diplomatic and economic defeat in the early stages of the Ukrainian crisis. Indeed, Russia's plans to export oil and gas to the Asian market, going back to the long-term goals of the Kremlin, Boris Yeltsin's first presidency.

Therefore, under the 2014 contract, Gazprom will supply 38 billion cubic meters of natural gas to China National Petroleum Corporation (CNPC) over the next 30 years. By comparison, this is more than Brazil's annual gas consumption and is slightly below France's total consumption.

Exports of Russian natural resources are economically vital. According to the Federal Customs Service, between August 2018 and September 2019, they accounted for 65.38% of the total volume of Russian exports. Exports of natural resources are also an important component of the Russian state budget. In 2018, the crude oil and gas sector accounted for 46.35% of budget revenues, a sharp increase from 39.57% in 2017, mainly due to rising oil prices and the introduction of a new pipeline in China in January 2018.

Russia is the largest exporter of natural gas, surpassing 247 billion cubic meters in 2018. The European market is the main recipient, with around 200 billion cubic meters sent last year.

However, China is the world's largest market for natural gas imports, and the International Energy Agency expects China's growth to account for more than 40% of global gas demand by 2024, driven by government policy to improve gas quality and reduce coal use in electricity generation (currently around 58%). A key element in the implementation of the Blue Sky War 2018-2020 Action Plan, published in July 2018, is to accelerate the conversion of industrial facilities and appliances from coal to natural gas, especially in northern China. As a result of Beijing's policies, in 2018, natural gas consumption increased by 17% compared to the previous year, while imports increased by 30.8%.

Russia in particular must benefit from this growing demand. One confirmation is that the Washington-Beijing trade war has stopped all Chinese imports of liquefied natural gas (LNG) from the United States since May. The chairman of the publicly traded CNPC state group, PetroChina, said last August that "if there had not been a trade war there, the United States would have been a very promising source of growth in China's gas supply."

The Kremlin considers the construction of a new pipeline network and the production of new fields in the Russian Far East as a cornerstone of the development of these regions. After the disintegration of the Soviet Union, the population here fell by an average of 20%, reaching an astonishing 70% in some regions, and many citizens moved to western Russia.

Currently, the Far Eastern Federal District, which is the largest but also the least populated in the Federation, has an average gas network coverage of 13%, while the Federal District of Siberia, more than 7 times larger than France, has only 6.8% covered. Nationally, Russia covers 67.2% in this regard.

Thus, infrastructure development in the Russian Far East not only aims to improve access to Asian markets, but the Kremlin also sees industrial and social development across the region as a necessary initiative. In 2015, Putin reaffirmed that the future of the Far East remains "a key center for Russia's socio-economic development and a region that must be effectively integrated throughout the Asia-Pacific region."

The development of Eastern Siberia and the Russian Far East is deeply linked to the integration of the Russian Federation with northeast Asian markets. This means not only China, but also Japan and South Korea, and could then extend to Southeast Asia.

For Nikolai Patrushev, secretary of the Russian Security Council, strengthening dialogue with China is an "absolute and long-term priority" that seeks to ensure "national security and stable social and economic development."

Increasing energy interdependence between Moscow and Beijing is the key to understanding the long-term relationship between the two governments. However, the energy partnership is not limited to "Siberia's power", as Beijing is an exceptional partner in developing Moscow's efforts to leverage its Arctic resource base.

Investments and technologies provided by China were essential for the timely implementation of the Yamal LNG project. Chinese companies, along with French company Total and a Japanese consortium, also joined the Arctic LNG-2 project, managed by Russian company NOVATEK, and ignored US and European sanctions on the Russian energy sector.

Russia is currently in talks with China on new supplies for the same areas that now supply natural gas to European markets. Faced with European difficulties, Putin has already said that Russia will "easily change the flow east."

### 2.3. “Power of Siberia 2”

The obvious benefits led to the "Power of Siberia" agreement, which exports natural gas from the far east of Russia to northern China. In addition to this success, Gazprom and Moscow promoted Pipeline 2 of the "Power of Siberia" project from Western Siberia to China's Xinjiang region. The proposal was accepted by Beijing because the region is already supplying Central Asian natural gas, and now the "Power of Siberia 2" project is gaining ground due to the coronavirus epidemic and Gazprom's tight plan (Meliksetian, 2020).

Russia's relations with the West have cooled since the Ukraine crisis and the annexation of Crimea. Since then, Moscow has confirmed that it is not politically isolated, increasingly involved in projects with its neighboring Asian giant. However, the problem is that much of Gazprom's export capacity is running low in Europe. Thus, turning to China was key to reducing dependence.

Gazprom's first proposal for a pipeline to western China through the Altai region was replaced by a "Mongolian alternative" (Figure 2) with an annual capacity of 50 billion cubic meters. Russia's recent insistence stems from Moscow's claim that its position in a key European market is in danger. The coronavirus epidemic further increased pressure. Alexander Gabuev, chief investigator at Carnegie Moscow Center, said: "Gazprom believes that its position in the European market will deteriorate in the long run due to increased competition and pressure from some countries to reduce their dependence on Russia. Gazprom should sell natural gas to Jamal and western Siberia." and China is in the immediate vicinity of the big market."

Figure no. 2: “Power of Siberia 2” pipeline



Source: ICIS, 2020 (<https://www.icis.com/explore/resources/news/2020/03/31/10488588/gazprom-s-plans-for-power-of-siberia-2-pipe-to-china-move-forward>)

China is a key element for Russia, which can be seen at first glance when examining Gazprom's investment in pipeline expansion. These investments have recently been made and, despite quarantine measures, there were nearly 3,000 employees infected with coronavirus who have worked at gas stations and compressors.

Russia is more willing to reach an agreement between the two sides. In theory, Beijing has more options because of its relative proximity to large gas producers and the size and opportunities of the Chinese market. However, since Donald Trump arrived at the White House, U.S.-China relations have deteriorated dramatically, pressuring Beijing and Moscow of each other.

Economic relations between Russia and China have already had the potential to improve due to the complementary nature of the economies of the two states. The pandemic highlighted the upward and downward trends in relations with Russia and the United States.

According to Lin Boqiang, dean of China's Energy Policy Research Institute at Xiamen University,

"Before the current situation between China and the United States, China planned to buy a lot of energy from the United States as a result of the trade agreement. But now the situation seems uncertain, which will certainly encourage China to cooperate more closely with Russia. "

Beijing alternatives are represented by increased imports from Central Asia. None of these alternatives are attractive for a variety of reasons. LNG is shipped from politically hostile countries, e.g. U.S. and Australia, or goods have to cross blockades, like the Strait of Malacca.

Despite the favourable environment, it remains to be seen whether an agreement will be reached. In the case of the "Power of Siberia 1" pipeline, it took four years from the signing of the terms and conditions to the signing of the contract. In addition, construction lasted five years since the signing of the contract. "Power of Siberia 2" could take a similar amount of time, meaning it could work around 2030.

Another advantage is the flexibility of Gazprom when considering the route to Mongolia. Russian gas can be transported to the highly polluted capital, Ulan Bator, which is one of the most polluted cities in the world. Poverty and a relatively small state budget exclude large energy projects that would bring cleaner fuel to Mongolian cities. Therefore, the "Power of Siberia 2" line is a unique opportunity.

However, the biggest beneficiaries would be China and Russia, as the pipeline could further strengthen the political and economic integration of the world's second-largest economy and the world's largest energy producer.

### 3. Conclusions

Natural gas is a fossil fuel, but cleaner and more efficient than other conventional fuels. By burning, it produces 45% less carbon dioxide than coal, 30% less than oil, and 15% less than wood. During combustion, it produces heat, carbon dioxide and water vapors. It is not as clean as wind or solar energy, but natural gas is the cleanest fossil fuel and many consider it a key element as the world moves towards a cleaner future.

The "Power of Siberia" project is a unified gas transport system developed to transport natural gas from the gas production centers of Yakutia and Irkutsk in eastern Russia to the Far East and China. The construction began in September 2014 with the welding of the first joint. The first phase of the pipeline connecting the Yakutia gas production center with the Russian-Chinese border town of Blagoveshchensk opened in early December 2019.

However, the relationship between the two states is not as strong as it seems at first glance. China, whose economy is eight times that Russia's and increasingly technologically advanced, is the main partner of this tandem. Russia is reconciling its subordinate role with mixed emotions, recognizing the power difference on the one hand and hoping to benefit from closer ties to the world's most dynamic economy on the other.

Like the relationship between Russia and China, the actual version of the "The Power of Siberia" project may be less positive than the official version. Mikhail Krutikhin, of the Carnegie Center in Moscow, said concisely: he is in a favorable negotiating position. The details of the contract have not been made public, but we assume that Russian gas to China is marketed with a lower margin than European shipments. "

Finally, while it is an important project for Russia and China, the consequences of the agreement are not as promising as originally thought. However, Moscow's warm relations with Beijing are the result of "comfort conditions" and, at the same time, of a deep and mutual distrust of the Western-led global order. By anchoring China through the "Power of Siberia" pipeline, Russia is closing many doors and threatening its own energy trade - and energy security in the long run.

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