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## Russian-Chinese Cooperation Prospects in the Electric Power Industry

### Перспективы взаимодействия Китая и России в сфере электроэнергетики

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#### Abstract

Russia and China have long been trading partners and cooperated in most industries, including the electric power sector. Even with close and long-standing ties, the further scope of Russian-Chinese relations in the electric power sector should be defined taking into account China's currently implemented Belt and Road Initiative requiring enormous resources, particularly in commodities. An analysis of Russia's electric power market shows an imbalance between the levels of demand and supply skewing to the supply side. Russian excess supply of electricity could be feasibly channelled to China under long-term contracts. For now, such supplies have not been operated at the levels planned several years ago, which indicates low utilisation of the existing potential of cooperation between the countries in the sector. Besides, considerable potential exists for partnership between Russia and China in upgrading electric power facilities and supplying electricity equipment and its subsequent maintenance.

**Key Words:** electric power sector; Russia; China; Belt and Road; prospects.

#### Аннотация

Россия и Китай являются давними внешнеторговыми партнерами и взаимодействуют в большинстве сфер, в том числе и в области электроэнергетики. Несмотря на тесные и давние взаимосвязи целесообразно выявить перспективы дальнейшего развития российско-китайских отношений в электроэнергетическом секторе с учетом того, что в настоящее время Китай реализует масштабнейшую программу «Один пояс и один путь», требующую колоссальных ресурсов, в том числе сырьевых. Проведенный анализ российского электроэнергетического рынка показал дисбаланс между объемом спроса и объемом предложения с перевесом в сторону последнего. Излишки генерируемой в России электроэнергии целесообразно поставлять в Китай на основе долгосрочных контрактов. В настоящее время объемы таких поставок не достигли планируемых несколькими годами ранее показателей, что свидетельствует о неполном использовании потенциала взаимодействия стран в рассматриваемом секторе. Помимо этого перспективным является российско-китайское партнерство в области модернизации электроэнергетических предприятий, поставок используемого в электроэнергетическом секторе оборудования с его последующим сервисным обслуживанием.

**Ключевые слова:** электроэнергетика; Россия; Китай; «Один пояс и один путь»; перспективы

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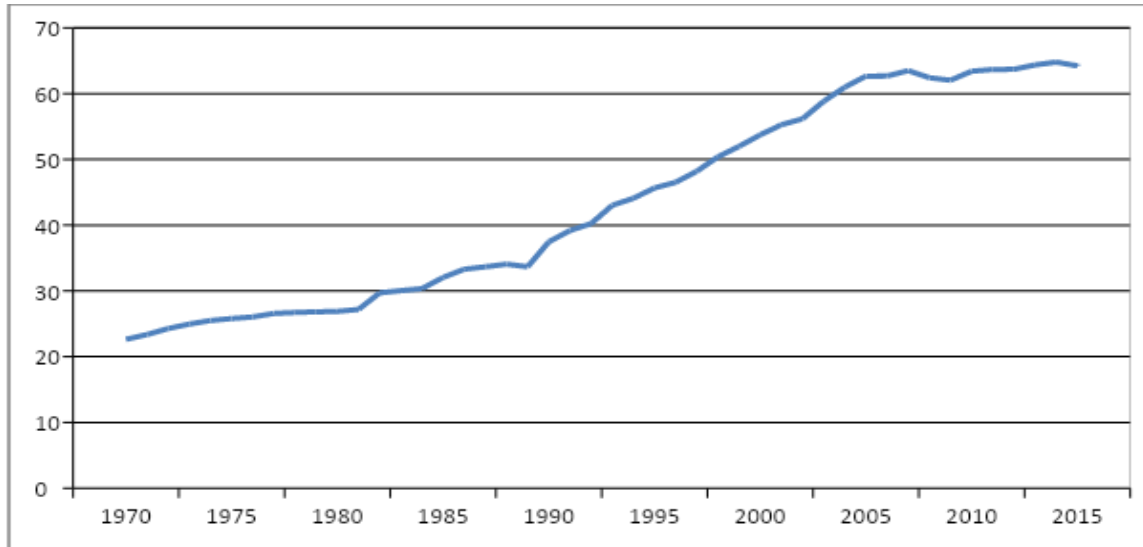
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**Introduction**

Over the last decade, China has been striding ahead in its efforts to transform itself as a global power (Figure 1). To achieve this goal, a whole

set of tasks needs to be solved, which China is trying to address as part of the comprehensive Belt and Road Initiative (BRI).



Source: developed by the authors based on the Swiss Institute of Technology in Zurich (The Swiss Institute of Technology in Zurich, n.d.)

**Figure 1.** China's globalisation index

The BRI would connect the Asian, European and African continents. Cultural and humanitarian ties are also within the scope of the project, as well as financial and economic ties. The BRI project envisages the following targets: increasing trade turnover between the interested countries through elimination of trade barriers, bringing down transaction costs, improved quality and speeding up trade operations; intensifying the construction of the unified rail network and establishment of the Maritime Silk Route; fostering regional integration; increasing foreign exchange flows by transition to settlements in national currencies; development of constructive political dialogue between countries; extending the relations; building up ties between the peoples of partner countries. Besides, the base BRI scenario is constantly extended with separate programs strategically pursuing the set goals. These include programs concerning environment protection and innovation, security, etc. All of the above goals set in China are directly related to Russia, China's long-standing business partner.

A promising financial and economic direction for China as part of the BRI implementation is access to Russian energy resources, in particular in the electric power sector.

**Literature Review**

The aspects of Russian and Chinese cooperation in the electric power sector have been discussed in the works by not only Russian and Chinese but also Western researchers and experts.

General problems of cooperation between Russia and China and those relating to the BRI are researched by E. Vinokurov (2019), D.J. Rogerson (2010), S. Malle (2017), N. Van (2016) and others.

Russian-Chinese energy ties are addressed by E.S. Downs (2010), M. Hang (2018), X. Yishan (2018) and T.S. Eder (2014). The issues of competition between China and Russia, particularly in the energy sector, are discussed in Çağla Gül Yesevi and Ceren Uysal Oğuz (2014). Energy security is also addressed by researchers (Jalilvand and Westphal, 2018). Another chapter of research relates to the problems of energy cooperation under the Shanghai Cooperation Organisation (Movkebaeva, 2013).

Apart from the above, we also employed academic findings and applied works of Russian and international researchers in corporate finance (Kosorukova, Plyasova, Prokimmov and Rodin,

2018), regional economic integration (Tsertseil, Kookueva and Ordov, 2017), electric power sector, financial and economic aspects of Chinese-Russian cooperation.

Research concerning the electric power sector is also conducted by international consultants, such as McKinsey (2019).

## Methods

A range of methods of enquiry was engaged in this work, including the dialectic method, general scientific methods and special methods of research, such as analysis, synthesis, analogy and classification, as well as the historical and logical methods, which suit the textual material naturally and make it wholly comprehensive.

The paper's information base includes official Russian and international statistical information resources, data from official websites of research agencies and institutions covering the aspects of cooperation between China and Russia.

We used methods of quantitative analysis in the study of the current state of the Russian electricity market, which revealed a market imbalance, expressed in the gap between the demand and supply in the direction of the prevalence of the latter.

The application of methods of retrospective analysis revealed the features of the formation of the Russian electricity market from 2005 to the present. We presented the stages of the formation and development of the modern electric power market in Russia. In addition, the analysis showed an increase in electricity supplies from Russia to China over the past 10 years.

Analysis of specific successful practices was carried out for determining the prospects for the development of Russian-Chinese relations in the field of electricity. Methods of prospective analysis made it possible to quantitatively present the potential of Russian-Chinese interaction in the electric power sector. Moreover, they allowed us as to identify drivers of future growth in the volume of electricity supplies to China due to the joint development of shelf resources in the Arctic and the Russian Far East and the development of shipping along the Northern Sea Route.

The application of the systematic approach to studying the cooperation of China and Russia in the electric power sector helped to produce a comprehensive study.

## Results

### Role of energy resources in Chinese economic development

China's intensifying efforts to build economic capacity has made it increasingly engaged in the global hunt for energy resources. According to the International Energy Agency, global energy consumption in 2015 equalled 20.76 trillion kWh and the forecast puts it at 33.4 trillion kWh by 2030 and up to 41.3 trillion kWh by 2050 (Alternative Energy // <http://www.tadviser.ru/index.php>). One of the problems in Chinese economic development is the deficit of quality energy resources, with demand growing by 15% per year on average, which is directly affecting the country's energy supply stability. The problem of energy resource deficit in China is expected to deteriorate since China's high consumption rates are due to its economic structure featuring a hefty constituent of heavy industry, as well as the digitisation of the economy. Even now, the digital economy accounts for approximately 1/10 of the global energy consumption. For instance, Bitcoin cryptocurrency mining requires 14.6 TWh per year (Bitcoin Electricity Consumption: An Economic Approach, n.d.), which is comparable to national consumption in Tajikistan (13 TWh per year). The Chinese economy is now energy-dependent and this trend will continue in the future, given the increasing consumption volumes, which will influence the situation in the global energy market. That is why cooperation with Russia is more than promising for China and a potential driver for China's BRI implementation. Especially promising is the electric power sector.

In its trade relations with Russia, China's primary interest is improving its energy security. According to the International Energy Agency, China became the world's top energy consumer in 2010. In 2013, the country became the largest oil importer, taking over from the USA, which had held the top spot since the 1970s (Rossiya i Kitaya: vzaimodeistvie dvukh gigantov, n.d.).

### Russian electric power market: current state and outlook

Russia's electric power sector is now in an ambiguous condition. On the one hand, there is excess capacity (approximately 32 GW in 2016). On the other hand, the facilities are considerably worn and outdated and need an upgrade. However, financial resources are in sharp deficit.

Overall, the development of Russia's electric power market is not very dynamic.

Over the past decades, Russia has carried out several reforms in the electric power sector based on the assumption of relatively high growth rates in energy demand. However, these forecasts have proved wrong. Moreover, there were expectations that reforms in the sector would lead to improved competition and inflow of private capital to usher in modernisation and eventually bring the sector in line with state-of-the-art technology (Resolution of the Government of the Russian Federation No. 526, 2001). Unfortunately, practice has shown that investment only began to flow in the sector when power supply agreements were signed, which included the government guarantees to pay back 14% of investment to the owners of generation companies. This prompted investors to pour money in company upgrades, which appears to be a positive if not for the failed forecasts of energy demand growth.

The reform of RAO UES of Russia (2006-2008) was based on the assumption that as early as 2005-2007, the demand for energy would outpace the supply and the difference would be growing further. The reform aimed to create competition in the industry through privatisation of generation companies and new capacity buildup. At the launch of the reform, investors poured capital in investment projects with an average rate of return of 14% on average and a payback period of 15 years with expectations of future energy consumption growth of 4.1%-5.2% a year. However, actual figures appeared to defy forecasts soon after that. The first decline in consumption was observed in 2008-2009 (with demand falling by 4.6% in 2009) and the second considerable negative change was registered in 2013 when consumption fell by 0.6% (Semashko, 2014).

The growing market imbalance between energy supply and demand in Russia is due, in particular, to the fact that energy sector reforms involve active commissioning of new facilities. For instance, the power capacity of the Sayano-Shushenskaya and Boguchanskaya Hydro Power Plants increased by 722 MW in 2015 and 600 MW were added at two blocks of the Kurskaya and Leningradskaya nuclear power plants. The loss on decommissioned items only equalled 957 MW. Meanwhile, the demand declined by 5,187 MW.

Further deterioration of the existing imbalance in the Russian market is associated with the plans to

double by 2035 the production at nuclear power plants, for which there is no acute demand in Russia and which may be built further in Russia's huge territories. It is also worth noting that generation costs per 1 kW at a nuclear power plant are on average five times the level of a combined-cycle gas turbine (Gotova, 2014).

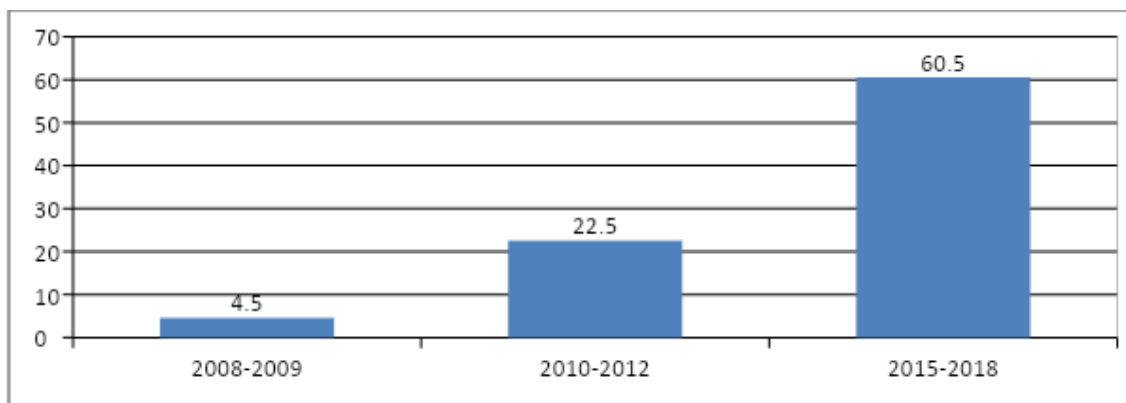
In 2013, the state renewable energy facilitation program was launched (Russian Federation Government Resolution No. 1-p dated 8 January 2009, "Fundamental Areas for State Policy in Raising Energy Efficiency in the Electricity Sector Through the Use of Renewable Energy Sources to 2020") and is now still operational. The development of alternative energy sources will skew the demand and supply balance even more to the supply side, although generally alternative energy is a very relevant point for Russia, as its every region would be able to opt for the most suitable type, whether solar, wind, bioenergy, small hydro or geothermal power. However, for now, the share of renewable energy sources in power generation in the Russian market is extremely small (less than 1%), although it is expected to grow to 3.2% by 2035 (Tekslar, 2017), even despite global reserves of alternative energy sources being 5,000 times the current consumption. For that reason, the project of a major renewable energy and coal-fired complex in the Russian Far East oriented at exports to China appears a particularly promising prospect.

### **Outlook of Chinese-Russian partnership in the electric power sector**

Excess capacity has been recently an issue for many European countries. In Russia, one of the causes is the gap between the actual consumption and forecast levels. With supply outpacing demand, it would be logical to cut production. However, in some cases, there is no option to terminate power supply agreements, as that would pose risks to either generation companies themselves or supply reliability for the end consumers of electric and heat supply or lead to social tensions since many generation companies are local economic mainstays. Such a situation provides a perfect opportunity for China to tap into the Russian electric power market. With no possibility of closing generation companies amid clear excess capacity, there is a way for China to enter the market and sign energy supply agreements both for the BRI and other needs. Clearly, China may well seek price discounts and bring down the cost of energy supplies. Another aspect to take into consideration here is that an emerging trend is taking hold in Russia with

major players establishing their own facilities capable of generation for internal needs. Distributed generation may reach 10% of the total power by 2025.

Between 2008 and 2018, the electric power supply to China rose approximately threefold reaching 20 billion kWh. It is considerable progress beyond doubt, however, it falls short of the original plans developed before 2008 (Figure 2).



Source: Ognev (2015)

**Figure 2.** Project stages of energy exports to China, billion kWh

Accordingly, the potential of Russian-Chinese relations in the electric power sector including the realisation of the BRI is yet quite expansive. A promising direction of Chinese engagement in the Russian electric power market is potential engagement in the upgrades of facilities, since despite the reforms implemented in the industry and conclusion of power supply agreements with obligations of upgrades and new construction, there is still a very high percentage of outdated equipment in operation (according to INFOLine estimates, the degree of wear in the Russian electric power sector is approximately 65%).

In May 2018, Russia's Inter RAO and the State Grid Corporation of China decided to resume the Erkovetskaya coal-fired power plant project. Additional funding will be also committed by Vnesheconombank. The construction budget is approximately \$8 billion or more than \$10 billion if electric power lines and mine construction are taken into account (Russia and China get back to coal-fired power plant project, 2018).

Rosseti invites the State Grid Corporation of China to cooperate in upgrading electric power facilities in Russia, which suites China's goals in the BRI (Rosseti interested in Chinese engagement in upgrading Russian facilities, 2018).

With that, sanctions imposed against Russia by some countries (not China) raise the issue of import substitution of part of equipment operated in the electric power sector. For China, sanctions against Russia are in fact positive, as such outlook opens the way for China to bring in its equipment for Russian operations and sign respective agreements to deliver and service such equipment.

In the autumn of 2018, Rosseti and China Energy Engineering Corporation Ltd. – one of the largest suppliers of integrated energy solutions – signed an agreement to exchange technologies and agreed on a long-term mutually beneficial partnership in the construction of power transmission and distribution facilities on a turnkey basis with the possibility of Energy China providing funding. The Chinese company will participate in the promising project on digitalizing the power grid complex of Russia planned until 2030 (Rossiya i Kitai vykhodyat na novyi uroven partnerstva v elektroenergetike, 2018).

#### **Potential of Russian-Chinese relations in the energy sector**

To be sure, China is not restricting its energy ties with Russia solely within the electric power market. Russia is already China's largest supplier of energy resources. Over the past 10 years, more than 300 million tonnes of oil, 55 million tonnes

of petroleum-based products, 150 million tonnes of coal were supplied to China (First Russian-Chinese Energy Business Forum Hosted in Beijing, 2018).

Rosneft has been implementing a long-term project of supplying oil to China together with CNPC. In 2017, Rosneft delivered approximately 40 million tonnes of oil to China, which is about 6.5% of China's total fuel requirements. To ensure smooth supply operation, the Eastern Siberia – Pacific Ocean pipeline was built.

Russian gas supplies are also within China's focus. At the end of 2019, the Power of Siberia project is expected to be brought into full operation and supply gas from Yamal to Chinese western provinces. The Power of Siberia project is a gas pipeline running from Yakutia to China with a capacity of 38 billion cubic meters per year and total cost of more than 2.9 trillion roubles (Rossiya i Kitai: tolko energetika i lichnye garantii, 2017). Active construction has been underway on the gas processing plant at the border with a capacity of 42 billion cubic meters and total cost of 790.6 billion roubles, funded, in particular, by China Development Bank, as well as the gas chemical complex. Chinese banks are also providing loan financing for the Yamal LNG project, with 9.3 billion euros and 9.8 billion yuans provided in 2016 by Export-Import Bank of China and China Development Bank respectively.

Besides, there are successfully developing projects in the coal sector, nuclear power generation and several related industries. The investment intensity of the implemented and currently running energy projects in Russian eastern regions oriented at the Chinese market is approximately 100 billion US dollars. Rosneft also signed a one-year contract to supply up to 2.4 million tonnes of oil to ChemChina, which, in turn, will commit 40% of the total funding requirements of 1.5 trillion roubles in the construction project of a petrochemical complex in Primorsky kray with a capacity of 24 million tonnes of oil products and 6.6 million tonnes of petrochemicals. Rosneft also signed a joint venture agreement with Beijing Gas to develop a network of gas filling stations (V Pekine proshel pervyi Rossiisko-kitaiskii energeticheskii biznes-forum, 2018).

The potential of Russian-Chinese cooperation in the fuel and energy sector is not exhausted, expectations are for bringing the turnover to 200 billion US dollars. At the same time, China's annual demand for oil and gas in the next 20-25

years will rise by 125-250 million tonnes and 350-550 billion cubic meters respectively. These requirements can be in a significant part met by increasing supplies from Russia. For that, conditions have to be established for attracting investment in energy production and transit. New growth points in the Russian-Chinese cooperation may be found in the joint development of offshore oil and gas resources of the Arctic and the Russian Far East and navigation along the Northern Sea Route.

## Discussion

China's implementation of the BRI creates potential investment interest in most Russian industries, particularly commodity sectors and energy. Generally, China maintains a positive view concerning Russian investment destinations (Fu, Ma, Hu, 2018). However, there are numerous administrative challenges and red tape hindering Russian-Chinese ties: difficulties in securing bilateral agreements, particularly the prolonged procedure, which requires harmonisation of national regulations regarding bilateral agreements.

The Russian electric power sector is quite attractive for China, its product being a much-needed input for developing the Chinese economy and implementing the BRI. However, for now, China has a growing circle of potential partners willing to supply their energy resources, particularly in Central Asia, and Russia should be practicably pursuing an active market strategy to make sure it can retain the partner with such huge potential.

## Conclusion

For each partner country in the BRI, China is developing a separate strategy, pursuing relations based on specific areas of cooperation, particularly in the historical context. Russia has been China's long-standing and close partner, so the two countries have pursued cooperation in all economic and social sectors for the efficient and beneficial realisation of financial and economic potential. However, a more active approach is required in such mutual relations, particularly in the investment area.

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