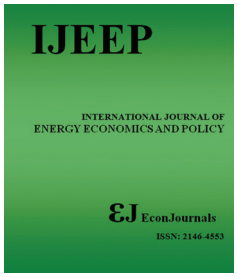
An, Jaehyung; Dorofeev, Mikhail; Zhu, Shouxian

Article

Development of energy cooperation between Russia and China

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: An, Jaehyung/Dorofeev, Mikhail et. al. (2020). Development of energy cooperation between Russia and China. In: International Journal of Energy Economics and Policy 10 (1), S. 134 - 139.
https://www.econjournals.com/index.php/ijeep/article/download/8509/4762.
doi:10.32479/ijeep.8509.



International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2020, 10(1), 134-139.

Development of Energy Cooperation Between Russia and China

Jaehyung An[1]*, Mikhail Dorofeev[2], Shouxian Zhu[3]

[1]College of Business, Hankuk University of Foreign Studies, Seoul, Korea, [2]Financial University under the Government of the Russian Federation, Moscow, Russia, [3]Institute for Urban and Environmental Studies, Chinese Academy of Social Sciences, Beijing, China. *Email: jaehyung.an@yahoo.com

Received: 02 August 2019 **Accepted:** 07 November 2019 **DOI:** https://doi.org/10.32479/ijeep.8509

ABSTRACT

The research analyses the question of to what extent the focus on state projects between Russia and China is based on the Russian desire to switch from an economy that is dependent on natural resources. Through the analysis of existing capabilities of the Russian companies to propose opportunities for innovative and technological projects that can be used in the long run. At the same time, the research will focus on energy trends and their presence in Russian and Chinese energy markets.

Keywords: Energy Sources, China Energy Policy, Resource Saving, Economic Development, Energy Cooperation
JEL Classifications: C30, D12, Q41, Q48

1. INTRODUCTION

As long as energy resource industry provides functional products for all countries in the world this industry belongs to a federal government that possesses also the right over off-shore facilities, controls and directs trade in natural resources and conducts international projects.

The objective is to shed the light on projects that should be prioritized by all groups that are involved in the energy system of both countries based on the discussions with the participants of this research.

The energy cooperation between Russian and China calls upon the analysis of recent energy production and consumption in China.

Therefore, it is significant to introduce management of energy resources.

Resource management has led to the discussion of natural gas supply options. Focusing on energy as a main state asset, the role of state-owned companies is vital and therefore is worth paying attention to.

Energy cooperation should be supported and reflected in the state's strategies.

Hence, the Russian Energy Strategy 2035 is presented. The last section of the literature review is about China Development Bank.

This section emerged during the primary data collection when the participants emphasized the role of the bank policy in energy deals between China and the emerging countries. These chapters would be expanded upon in the discussion section.

2. LITERATURE REVIEW

Many studies have been trying to explain, define and analyze influence energy price factors (Meynkhard, 2019; Wustenhagen and Bilharz, 2006). A study conducted by (Morris and Barlaz, 2011) focuses on the importance of the transformation to market oriented economy through the institutional reforms and positive

outcomes for the country. Another study emphasizes the negative consequences which the country is facing now Mikhaylov (2019a) and Mikhaylov et al. (2019).

These consequences such as high level of air pollution and energy dependency have made the Chinese government reconsider the current energy policy and build a new energy system. China's recent economic growth has been based on fundamental economic forces such as capital flow to the country in the form of foreign investments (Jaramillo and Matthews, 2005; Lopatin (2019a) and a growing production of outputs that is reflected in export (Milbrabdt et al., 2014, Morgan and Yang, 2001).

However, the reverse side of the rapid economic growth has resulted in the new challenges faced by the country- high-pollution level and high-energy consumption. Nowadays, China is known as the largest emitter of carbon dioxide. China's Energy Policy states that the country is struggling from low energy efficiency that has resulted in high energy consumption for every unit of GDP.

To reduce carbon dioxide and improve environmental pollution, China is focusing on energy conservation and energy efficiency (Mikhaylov, 2018a,b) policies, as well as turning to the development of renewable energy sources.

From a high rate of coal production and consumption, the country aims at increasing natural gas consumption by 11.2% and renewables, solar plants by 89.5% and wind capacity by 26.4%, according to China's 12th Five-Year Plan.

In order to develop energy efficiency, China should prepare the fundamental basic of laws and regulations Chiemchaisri et al. (2012) and Gardner et al. (1993).

There are two main laws underlying the promotion of energy efficiency in China:

The Energy Conservation Law of the People's Republic of China by Standing Committee of the National People's Congress in 1997 and amended in 2007 consists of seven chapters and six sections. The law specifies that energy conservation should greatly increase energy efficiency in energy-using sectors (industrial, construction, transportation and public sectors) by using energy in the most efficient way.

The Renewable Energy Promotion Law issued in 2005 and improved in 2009 is believed to be cental to further development of renewable energy in China. The law emphasises the countrie's goals to increase energy supply procurememt, diversify energy suppliers and improve environmental conditions due to the rapid increase in fossil energy usage.

Energy Efficiency and Energy Conservation are topics that are inextricably tied and come out after the analysis of energy consumption rate. Therefore, it is significant to follow up the studies on energy consumption which are examining the possible drivers of growing energy consumption rate. The study on correlation analysis (Amini and Reinhart, 2011; Bansal et al., 2013).

A correlation approach allowed them to investigate some of the reasons underlying energy consumption growth in general. The results which they reached were based on consumption behavior, income increase, lack of knowledge and information imperfection over rational energy use. The research mainly focused on the relation between growing energy consumption and consumers behavior, it emphasized that information flow over energy efficiency is a priority of a government to be improved.

Another study was introduced by the experts (Ahmed et al., 2014; Mikhaylov et al., 2018; Nyangarika et al., 2018) who found that energy consumption analysis cannot be based only on correlation analysis but also on regression.

At the end of the study they highlighted the importance of advanced technologies that the Chinese government should promote. Furthermore, technological developments should be accompanied by the energy saving policies. If we refer to the article Energy consumption, carbon emission, and economic growth in China (Bove and Lunghi, 2006; Cai et al., 2011).

Over the past years China has fully demonstrated several important relations between GDP indicator and growing energy consumption; between growing energy consumption and growing carbon (Denisova, 2019; Denisova et al., 2019). Apart from these paired associations, one more an artificial pair was created by the government of China. The link is adjusted by the Chinese government domestic energy price and the rate of energy consumption in the country.

This relation aims at changing the energy consumption in the short and long term (Nyangarika et al., 2019a,b). By setting high energy prices in the country, in the short run energy consumption will be increased, while in the long run decreased.

The authors stated that this measure will not have a negative impact on economic output in the long run. Following up upon the energy consumption growth, assert that the energy consumption growth is mostly based on the industrial sector.

They believe that China's growing energy demand comes mostly from heavy industry and infrastructure sectors. They also attempt to show that individual consumption matters what is also proved by International Energy Agency.

Therefore, it is not hard to explain why energy efficiency and conservation are the most popular topics to emerge in the context of growing energy consumption and why it is vital for today's China and its future. The following literature review reflects the current concerns over the correlation between energy reduction and stable economic growth in China.

The discussion on efficiency should start first of all with its importance that is highlighted in the official documents. According to the Russian State program on Energy efficiency and Energy sector development, energy efficiency is an effective way for industries and the entire economy to function in the most efficient way. Energy efficiency policy in the Chinese context comprises

all these aspect including an opportunity to develop competitive technologies. China lacks of pollution controlled equipment.

The debate over energy conservation started while time and have been confined not only to energy reduction but also to economic response (e.g., energy cost).

In 1978, Gibbons and Chandler in the article *National Energy Conservation Policy* emphasized that global energy price fluctuation affects energy consumption. Therefore, the authors believe that modernization of energy consuming facilities can be implemented in order to save and decrease energy cost. Furthermore, they reached a strong conclusion that economic growth will most likely not to slow down because of energy consumption reduction.

The International Energy Agency supports this idea in pointing out that economic growth is possible to maintain by implementing energy efficiency policies. Energy efficiency means the most rational use of energy and energy savings (Mikhaylov, 2018a,b).

3. METHODS

The research purposes were identified within the development study. Development study stands for the 'development processes and structures in particular parts of the world. There are no limits of social disciplines that fall with the development research. Therefore, politics as a social science suits to the development research.

Energy development consists of actors, structures and dynamics. Development studies is closely related to the historical knowledge. The core focus of the research was on Russia-China energy cooperation, on energy relationship, interactions between the governments and national energy companies.

Due to the novelty of the topic, this study is exploratory. This purpose of this research is to investigate energy cooperation between two countries; identify energy trends; generate new fields for further researches. Political and economic sides of the research require a qualitative approach that helps to make claims based on respondents' answers on introduced questions. The research focuses on the Russia-China energy cooperation as a significant phenomenon in bilateral cooperation, prepares open-ended questions, validates the accuracy of the research findings, makes interpretation of participants' answers, and creates possible statements.

For the above reasons, a deductive approach is considered to be the most relevant (An et al., 2019). The research is based on interviews. The findings of this study will be useful for further research whether it will enrich and expand debate on energy projects between Russia and China or look at another type of cooperation in the energy industry.

In the context of this thesis, the design seems appropriate to introduce. The purpose of this strategy is to focus on participants' description of Russia China energy cooperation, their views on its potential and technology transfer between two countries, critics on energy policies. The major part that falls into the qualitative approach is a chosen method for data collection and its further analysis (Barbour, 2013; Lopatin, 2019b; Kosov et al., 2018).

The model of energy pricing looks as follows:

$$\text{Energy cost}=\sum A+B+C+D \quad (1)$$

where A - the costs incurred by the infrastructure dependent on the annuity factor and related CAPEX cost; B - the operational costs of plant technology; C - the supply chain costs, collection, and treatment; D - the transport cost.

The method combines general and specific questions over the Russia-China energy cooperation.

4. RESULTS

Following these studies and China's current issues, it is important to track the trends based on statistical significance. In order to understand current energy cooperation the following section will present statistical data observation.

First, to understand the Chinese government concern over growing energy consumption, statistical data shows the major trends in the Chinese energy production/consumption with the Russian (Table 1).

The production/consumption of oil in both countries shows that oil production in Russia is almost equal to oil consumption in China. Whereas, the Chinese domestic oil production is slightly higher than Russian oil consumption.

Second, China is the second largest oil consumer in the world after the USA. The following first table indicates that despite the fact that Chinese crude oil import has been increased from 2015 to 2018, domestic crude oil production showed an upward trend. Table 2 demonstrates that Chinese energy export is less than energy import:

Table 1: Chinese and Russian energy production/ consumption

	2018 tb/d	
	Oil production	Oil consumption
China	4155	10221
Russia	10643	3174

Source: BP Statistical Review 2019

Table 2: Chinese Domestic Crude Oil Production (2015-2018)

	Oil Domestic Output million b/d	Oil net import million b/d
2018	4.5	5.7
2017	4.2	5.4
2016	4.1	5
2015	4.1	4.7

Source: CIA World Factbook BP Statistical Review 2019

Third, Strategic Petroleum Reserve (SPR) is viewed to be a powerful response on any cases of emergency in commercial energy supplies that can threaten country's economy.

In the context of energy cooperation and for the analysis of energy demand and energy supply, further data on crude oil reserves in the world, Russia and China is essential (Table 3-5).

World proven oil reserves at the end of 2012 achieved a point of 1668.9 billion barrels. According to a R/P ratio (reserves-to-production ratio) China might use proven oil reserves for a bit >11 years. The use of the world reserves might last for <53 years.

Fourth, it was mentioned that according to the 12th 5-year-plan the Chinese government aims at increasing natural gas consumption by 11.2%. According to China Data Online (2014), in 2013 China produced 117.1 billion cu m of natural gas; consumed more, 150 billion cu m. China exported less than imported, 2.4 billion cu m and 53 billion cu m respectively (Table 6).

With reference to the government's target to increase the consumption of natural gas, the following gas resources in China are worth mentioning.

Table 3: Export and Import (2018)

China 2018	
Crude oil	
Export	**Import**
33,000 bbl/day	5.664 million bbl/day

Source: CIA World Factbook BP Statistical Review 2019

Table 4: World proven oil reserves

2012	2018
1,668.90	1,878.70

Source: BP Statistical Review 2019 of World Energy

Table 5: Proven Oil Reserves in Russia and China

Proven oil reserves 2018	
Russia	**China**
Billion barrels	
87.2	17.3
Share of total	
5.2%	1%
R/P ratio	
22.4	11.4

Source: BP Statistical Review 2013

Table 6: Natural gas production/consumption in china; export and import

China 2018	
Natural gas	
Production	**Consumption**
117.1 billion cu m	150 billion cu m
Export	**Import**
2.4 billion cu m	53 billion cu m

Source: China Data Online (2019)

There are six oil-gas fields: Sichuan, Datianchi gas field, Changging fas field, offshore field in the Bohai Sea, East China Sea, South China Sea. Oil-gas fields are located in the North, West and Northeast of China and their total output equals to 90% of national total natural gas output.

In 2009 natural gas reserves reached the point of 2.5 trillion cu m. Nevertheless, a R/P ratio was almost at the same level, 28.8.

Both countries, Russia and China, have developed their state programs for promoting energy efficiency. Russia' program is called Energy Saving and Energy efficiency Improvement until 2020 while the Chinese goals are outlined in the 12th Five-Year Plan.

According to these two programs, the countries have to solve the problems of energy intensity (Table 7-8), for a period of 10 years in Russia and for a period of 5 years in China. Despite the fact that the terms of the programs are different, estimated energy investments for reaching the set targets are almost the same.

The investments estimations for Russia and China were taken from Energy Efficiency reports provided by a global leader in energy efficiency solutions, ABB (2014), and proven by the International Energy Agency report on Energy Efficiency in Russia (IEA 2011); as far as investment amount for energy efficiency in China is concerned, the Chinese Government estimates $373 billion investments for major energy-saving projects.

Referring to Table 9 gas and coal is presented. Figures demonstrate that the rate of energy consumption of coal is dropping, while the consumption of gas is increasing. These figures also illustrate that

Table 7: Energy intensity reduction in Russia and China and estimating investments for Russia and China

	Russia by 2020	China by 2015
Reduction in energy intensity	40%	16%
Investments to save energy (US$)	320 billion	372 billion

Source: China Data Online (2019)

Table 8: Energy consumption share by fuel in Russia and China

Energy consumption share by fuel	Russia %	China %
Gas	55	4
Oil	21	18
Nuclear power	6	1
Hydroelectricity	2	7
Coal	15	70
Electricity consumption (per capita) 2011	6.000kWh	3.000kWh

Source: ABB Energy efficiency report 2019 ABB (ABB: global leader in power and automation technologies), BP Statistical Review of World Energy 2019

Table 9: Total energy consumption in China

	Crude oil %	Coal %	Gas %
2016	19.0	68.0	4.4
2017	18.6	68.4	5.0
2018	18.8	66.6	5.2

Source: China Statistical 2019

Table 10: Interest groups in any projects

Interest group	Natural gas supply option	Technology transfer	Knowledge Transfer	Disagreements	Chinese National energy strategy	Russian national energy strategy
Government officials	Separatist activity Cannot be rerouted More beneficial for the development of surrounding cities	From West to China	E&D in China		Diversification	West Siberia energy deposits
Energy companies	Pipeline	From Russia to China	E&P in China	Price for NG	Energy security	Energy export via pipelines
China Development Bank	LNG	From China to Russia	PSA in offshores	Availability of supply of NG	Buy up more energy resources as possible from resource rich countries	Energy export via LNG
Presidents	Less beneficial for the development of surrounding cities	From West to China and Russia	JVs in offshores	Volume of NG	Buy up energy deposits in resource rich countries	East Siberia energy deposits

the energy initiatives outlined above by the Chinese government will slowly achieve positive results.

For the beginning of 2018 China produced 1.8 trillion tons of coal. And there are 137 enterprises that are working in the Oil & Natural gas sector in China.

In concluding this section, it is necessary to mention that China is the largest producer and consumer of the coal in the world (BP Statistical Review of World Energy). This has many implications for the reconsidering China's role in worsening environmental condition.

However, China is not using only coal for energy; growing energy demand make China import crude oil and natural gas from Africa, Middle East, Central Asia and the Asia Pacific region.

By using the traditional sources of energy China is becoming an important player in the global energy market.

The global energy market consists of dependent and independent-energy resource countries which might face the challenges in the process of managing energy resources rationally.

5. DISCUSSION

Significantly the role of vertically integrated projects is introduced.

The Russian companies, Gazprom and Rosneft fall under the category of state-owned companies or vertically integrated. The participants' answers revealed that these two Russian companies and the Chinese state-owned energy companies such as CNPC and Sinopec are the major players in the gas business and the energy deals between Russia and China.

As stated by the participants vertically integrated company controls the entire supply chain. However, vertically integrated project is a vertically controlled, i.e., controlled by high-level officials. The natural gas deal signed by Russia and China is an example of a vertically integrated project (Table 10).

The event led to the discussion over interest groups. It has become obvious that the Russian and Chinese energy companies are an example of the coalescence of state and business. The findings indicate that in the context of the management of strategic resources such types of energy businesses are inevitable.

Binbin overviews the energy industry in China and emphasizes that the Chinese government considers vertically integrated NOCs as more efficient and productive. Therefore, the state is keeping the control over energy companies that work in upstream and downstream sectors.

However, during the analysis of estimated amounts of investments for the gas deal implementation, following assumption can be drawn.

The Russia-China gas deal might have had a discord between the Russian high level officials and energy business community. According to Vladimir Putin's answers to journalist questions the required amount of investments is currently estimated at being worth $80 billion (2014). From this amount we may estimate that Gazprom investments are worth $55 billion, while CNPC's portion is $25 billion of CDB's loan. The information that was shared by a participant that Gazprom is obliged to pay back to CDB more than 100%, could not be found in available sources.

If the information can be proved, Gazprom did not probably lead the negotiations with CNPC; the agreement was facilitated by the Russian government and politics.

In the most cases, especially in authority centralized countries like Russia or China, there are president and government which stand behind the energy policy formation.

In the light of recent events taken place in Ukraine, Russian energy policy formation prioritizes the development of energy cooperation with the Asian partners that will reduce reliance on energy export to Europe.

6. ACKNOWLEDGEMENTS

This work was supported by Hankuk University of Foreign Studies Research Fund.

REFERENCES

Ahmed, S.I., Johari, A., Hashim, H., Mat, R., Lim, J.S., Nagadi, N., Ali, A. (2014), Optimal landfill gas utilization for renewable energy production. Environmental Progress and Sustainable Energy, 34(1), 289-298.

Amini, H.R., Reinhart, D.R. (2011), Regional prediction of long-term landfill gas to energy potential. Waste Management, 31(9-10), 2020-2026.

An, J., Mikhaylov, A., Moiseev, N. (2019), Oil price predictors: Machine learning approach. International Journal of Energy Economics and Policy, 9(5), 1-6.

Bansal, A., Illukpitiya, P., Singh, S.P., Tegegne, F. (2013), Economic competitiveness of ethanol production from cellulosic feedstock in Tennessee. Renewable Energy, 59, 53-57.

Barbour, R. (2013), Introducing Qualitative Research: A Student's Guide. 2nd ed. Thousand Oaks, CA: Sage Publications.

Bove, R., Lunghi, P. (2006), Electric power generation from landfill gas using traditional and innovative technologies. Energy Conversion and Management, 47(11-12), 1391-1401.

Cai, X., Zhang, X., Wang, D. (2011), Land availability for biofuel production. Environmental Sciences Technology, 45(2), 334-339.

Chiemchaisri, C., Chiemchaisri, W., Kumar, S., Wicramarachchi, P.N. (2012), Reduction of methane emission from landfill through microbial activities in cover soil: A brief review. Journal Critical Reviews in Environmental Science and Technology, 42(4), 412-434.

Denisova, V. (2019), Energy efficiency as a way to ecological safety: Evidence from Russia. International Journal of Energy Economics and Policy, 9(5), 32-37.

Denisova, V., Mikhaylov, A., Lopatin, E. (2019), Blockchain infrastructure and growth of global power consumption. International Journal of Energy Economics and Policy, 9(4), 22-29.

Gardner, N., Manley, B.J.W., Pearson, J.M. (1993), Gas emissions from landfills and their contributions to global warming. Applied Energy, 44(2), 166-174.

Jaramillo, P., Matthews, H.S. (2005), Landfill-gas-to-energy projects: Analysis of net private and social benefits. Environmental Science and Technology, 39, 7365-7373.

Kosov, M., Akhmadeev, R., Smirnov, D., Solyannikova, S., Rycova, I. (2018), Energy industry: Effectiveness from innovations. International Journal of Energy Economics and Policy, 8(4), 83-89.

Lopatin, E. (2019a), Methodological approaches to research resource saving industrial enterprises. International Journal of Energy Economics and Policy, 9(4), 181-187.

Lopatin, E. (2019b), Assessment of Russian banking system performance and sustainability. Banks and Bank Systems, 14(3), 202-211.

Meynkhard, A. (2019), Energy efficient development model for regions of the Russian federation: Evidence of crypto mining. International Journal of Energy Economics and Policy, 9(4), 16-21.

Mikhaylov, A. (2018a), Pricing in oil market and using probit model for analysis of stock market effects. International Journal of Energy Economics and Policy, 2, 69-73.

Mikhaylov, A. (2018b), Volatility spillover effect between stock and exchange rate in oil exporting countries. International Journal of Energy Economics and Policy, 8(3), 321-326.

Mikhaylov, A. (2019), Oil and gas budget revenues in Russia after crisis in 2015. International Journal of Energy Economics and Policy, 9(2), 375-380.

Mikhaylov, A., Sokolinskaya, N., Lopatin, E. (2019), Asset allocation in equity, fixed-income and cryptocurrency on the base of individual risk sentiment. Investment Management and Financial Innovations, 16(2), 171-181.

Mikhaylov, A., Sokolinskaya, N., Nyangarika, A. (2018), Optimal carry trade strategy based on currencies of energy and developed economies. Journal of Reviews on Global Economics, 7, 582-592.

Milbrabdt, A.R., Heimiller, D.M., Perry, A.D., Field, C.B. (2014), Renewable energy potential on marginal lands in the United States. Renewable and Sustainable Energy Review, 29, 473-481.

Morgan, S.M., Yang, Q. (2001), Use of landfill gas for electricity generation. Practice Periodical of Hazardous, Toxic, and Radio Waste Management, 5(1), 14-24.

Morris, J.W., Barlaz, M.A. (2011), A performance-based system for the long-term management of municipal waste landfills. Waste Management, 31(4), 649-662.

Nyangarika, A., Mikhaylov, A., Richter, U. (2019b), Oil price factors: Forecasting on the base of modified auto-regressive integrated moving average model. International Journal of Energy Economics and Policy, 9(1), 149-159.

Nyangarika, A., Mikhaylov, A., Richter, U. (2019a), Influence oil price towards economic indicators in Russia. International Journal of Energy Economics and Policy, 9(1), 123-129.

Nyangarika, A., Mikhaylov, A., Tang, B.J. (2018), Correlation of oil prices and gross domestic product in oil producing countries. International Journal of Energy Economics and Policy, 8(5), 42-48.

Wustenhagen, R., Bilharz, M. (2006), Green energy market development in Germany: Effective public policy and emerging customer demand. Energy Policy, 34, 1681-1696.