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Does China need Russian gas?

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Introduction

Evolution of energy relationship between Russia, the world's largest gas producer, and China, the fastest growing energy consumer, is set to have major impact on the geopolitics on both regional and global level. Negotiations over future gas supplies from Russia to China have attracted a lot of attention from experts in business and academic sphere, yet only little progress has been seen in reaching a final deal so far. This paper aims to analyze prospects of the energy cooperation between two countries in terms of gas. My hypothesis is that the current deadlock in Sino-Russian negotiations over future gas supplies is caused by the dynamics of the Chinese domestic gas market and global trends in gas exploration. I argue that these factors have eased pressure on Beijing to search for new supplies, making China more reluctant to engage in a long-term binding agreement to import gas from Russia.

In the first chapter of my paper I briefly describe the current position of China and Russia in terms of energy security, with emphasis put on the gas sector. The second chapter analyses more in detail the prospects of the Chinese gas supplies. I focus on the indigenous gas production from both conventional and unconventional sources after which I continue by outlining the current and prospective structure of Chinese gas imports. The third chapter traces evolution of the Sino-Russian gas cooperation and analyzes progress that has been made in the negotiations so far. The final part of the paper is reserved for concluding remarks.

Rising dragon and weary bear

Ensuring sustainable energy supply remains one of the key challenges of the fast-growing Chinese economy. As country strives to reduce its overdependence on coal and mitigate its major environmental challenges, the authorities are in dire need of an abundant and clean fuel to substitute for coal. With reserves to production ratio 50 % higher than oil, relatively low greenhouse gas emissions, higher thermal efficiency compared to coal and oil; and 70 % to 80 % reservoir recovery, natural gas may be the answer to China's calls.[1] In June 2011 the International Energy Agency (IEA) issued a special report entitled "Are we entering a Golden Age of Gas?" The study outlined a new scenario which projects increasing role of natural gas in meeting the world's energy needs to 2035. The report also added that China will be one the key drivers behind this expansion. China's 12th Five-Year Plan (FYP), for the period 2011–2015, aims at more sustainable growth and higher energy efficiency with less environmental burden. One of its most ambitious goals is to double the share of natural gas in primary energy consumption to 8.3 % in 2015, representing a major shift from

[1] Roy L. Nersesian, *Energy for the 21st century* (New York: M.E. Sharpe, 2010), 229.

130 billion cubic meters (bcm) in 2011 to approximately 260 bcm by 2015.[2] Even though coal is still cheaper than natural gas, Chinese authorities, in particular those in coastal areas which are far from major coal mining regions, prefer the latter for its higher energy efficiency and environmental friendliness.[3] According to the IEA, China is currently world's fourth largest energy consumer with potential to soon occupy the very top of the list. It remains however unclear how will China manage to satisfy this surge in demand. Even with an ambitious plan to increase its own gas production, extensive supplies from Central Asia and more intensive participation in the Asian LNG trade it may not be enough. China has been therefore attracting a fair amount of attention from the largest gas producer – Russia.

It is no surprise that Russia sees huge potential in the Chinese booming demand for gas since dynamics of the global market has weakened its position as the largest gas producer. The European Union has been for a long time the main recipient of Russian gas, accounting for more than 60 % of Russia's total exports. The breakout of financial crisis followed by the global economic slowdown however curbed EU's demand for gas and exposed Gazprom's vulnerability caused by its overreliance on one major buyer. Yet the lack of diversity in Russia's portfolio is not the only issue. Although flows of Russian gas are likely to regain momentum as situation in the European economies improves, the competition has intensified. With the ongoing shale gas revolution in the U.S., which rendered the economy self-sufficient in terms of gas, the newly built LNG terminals in the Middle East lost their target client, making their surplus volumes available for the European market. Moreover the LNG supplies from Qatar or Saudi Arabia are using spot prices contrary to the Russian gas that is still traded on basis of long-term contracts. Flexibility of spot pricing represents a competitive advantage which created a major challenge for piped gas flowing to Europe.[4] Rigid pricing mechanism in the Russian long-term gas contracts based on oil indexation and take-or-pay clauses is therefore an issue as well. Gazprom holds a defensive stance in this matter and argues that long-term contracts are above all financial tools that enable producers to hedge against risk and guarantee stable future revenues. Russia's state-owned gas producer will soon have to start developing new gas fields in order to compensate for the depleting reserves in the Western Siberia which will also require further expansion of the existing infrastructure. Given the need for huge amount of initial capital, Gazprom sees long-term contracts as a guarantee of commercial viability of its investments. Market forces are however merciless. Although the Russian worries about the transition to volatile spot trading may be justified, the competition, such as Norwegian Statoil, has already moved to a more flexible pricing, thus undermining Gazprom's market position.[5] Even the legislation seems to play against Russia's interest in Europe. The aim of the EU's energy policy within the so-called Third Package is to liberalize energy markets across Europe which includes granting

[2] IEA, *World Energy Outlook 2012* (Paris: OECD/IEA, 2012), 15.
[3] Fan Gao, *Will There Be a Shale Gas Revolution in China by 2020?* (Oxford: The Oxford Institute for Energy Studies, 2012), 2.
[4] Andrey A. Konoplyanik, "Russian gas at European energy market: Why adaptation is inevitable." *Energy Strategy review* 1 (2012), 44.
[5] *Reuters*, "Statoil to squeeze Gazprom further in gas market," February 7, 2013.

pipeline access to the thirds parties. This would in effect strip Gazprom of its right to operate its pipelines.[6] Russia considers all these factors as a threat to its own security of demand and logically started to explore other potential markets to lessen its dependence on Europe. China, with its increasing hunger for gas, is the most obvious choice.

Russia's eastern neighbour is however nothing like its western counterparts. While indigenous gas reserves in Europe (not counting unconventional gas) are on the verge of depletion, China owns huge fields of yet untapped gas. In addition, the government's supply diversification policy strengthens China's overall energy security, while lack of political support for the common energy policy leaves the EU member states more exposed to the Russian influence. Russia's penetration of the Chinese gas market is therefore likely to be far from easy. To provide deeper understanding of the issue, the following section will map the prospects of the Chinese gas supplies.

Prospects of Chinese gas supplies

Indigenous production

Conventional gas reserves

In 2012, BP estimated Chinese proved recoverable natural gas reserves at 3.1 trillion cubic meters.[7] Although China started producing natural gas in 1949, its output remained at meagre 30 bcm per year until the late 1990s. It was the intensive economic growth in the last decades of the century which stimulated exploration activities, while discoveries of major untapped gas basins both onshore and offshore in the early 1990s laid foundations for the expansion of the industry.[8] The Chinese authorities also became increasingly engaged in the promotion of natural gas for energy generation. In 2003 the report entitled "China's National Energy Strategy and Reform" stressed the importance to increase current natural gas output to 6.7 – 8.9 % of country's total energy mix by 2020.[9] The early expansion of natural gas production during the 2000s was driven primarily by Chinese National Petroleum Corporation (CNPC), which dominates the domestic gas market until present day. From 2000 to 2010 Chinese natural gas output more than tripled and reached 94.5 bcm in 2010, growing at the average annual rate of 14 %. Domestic demand yet surged even faster. Since 2007 the country's consumption increased annually by around 20 % as a result of a strong economic growth and rising living standards. Keeping up with such a pace of demand growth proved to be extremely challenging for the Chinese gas industry and at the beginning of new decade it became clear that it was beyond its limits. Lack of expertise, less favourable

[6] Konoplyanik, 45.
[7] BP, *Statistical Review of World Energy 2012* (London: BP, 2012), 28.
[8] Gao, 1.
[9] Development Research Centre of the State Council, *China´s National energy Strategy and Reform* (backround report from China Development forum presented in November 2003), 16.

geological conditions and insufficient infrastructure were major setbacks.[10] In 2009 the gap between supply and demand started widening and while China extracted 110 bcm of gas in 2011, it consumed more than 130 bcm.[11]

Unconventional gas reserves

In November 2011 the Chinese Ministry of Land Resources issued a new outlook for petroleum output, boosting its gas production forecast to 450 bcm in 2030.[12] The increase in the forecast is, however, based on prospects of rapid exploitation of unconventional gas. Successful development of huge untapped unconventional gas reserves in China would have enormous implications and may lessen country's future need for imports. Unconventional gas (tight gas, coal bed methane and shale gas) was until recently too expensive to extract. Coal bed methane (CBM), the most abundant unconventional gas in China, was flared as a dangerous waste by-product of coal mining and its massive reserves (estimated now to be the fourth largest in the world) were considered to have no commercial use.[13] But progress made in natural gas drilling techniques and hydraulic fracturing changed the status of CBM in China dramatically. United States, the pioneer of unconventional gas extraction, experienced in the last decade a true shale gas revolution. Once a gas importer, the U.S. was able not only to become self-sufficient in terms of gas supplies but its production rose at such a pace that the output now exceeds domestic demand, making surplus volumes available for export. Will China follow a similar path? According to the BP World Energy Outlook, China is expected to be the most successful country in developing shale gas outside North America. By 2030 gas production from shale fields is projected to account for 20 % of total Chinese gas production.[14]

Shale revolution as the one seen in the U.S. faces several obstacles. Development of CBM started in China in the late 1980s, inspired by its previous successes in the U.S. and Australia. Exploration studies carried out during the 1990s showed huge potential of CBM in China and government therefore decided to implement preferential policy to tap it. National Energy Administration prepared in 2006 a five-year plan to launch large-scale CBM production, with an ambition to increase the output to 10 bcm per year by 2010.[15] Despite these efforts, the Chinese shale revolution did not take place and by 2009 it became clear that CBM output will not meet the target. Funding issues and lack of foreign expertise slowed down the development of the new industry. Moreover, the know-how proved not be directly transferrable as geologic conditions in China are very different from those in the U.S. or Australia.[16] The U.S. business model did not fit in the Chinese environment either. While the development of U.S. shale wells was carried out by independent small and medium sized

[10] Gao, 2.
[11] Keun-Wook Paik, "China's Gas Expansion," *Oxford Energy Forum* 89, (August 2012), 15.
[12] *Radio Free Asia*, "China Ups Gas Forecast," November 12, 2012.
[13] Gao, 2.
[14] BP, *World Energy Outlook 2030* (London: BP, 2013), 47.
[15] Gao, 8.
[16] Ibid., 21.

companies, China engaged its huge national oil corporations in the process.[17] Lack of pipeline infrastructure, environmental concerns and challenging land access represent further obstacles. So far there have been no signs of the American-like revolution and despite huge potential, China has seen little commercial unconventional gas production.[18] It is even possible that China may prove that the shale gas revolution as we have seen in the U.S. is only a regional phenomenon.

Unless major breakthrough in unconventional gas development occurs, there is little chance that China will be able satisfy its fast growing demand for energy by itself. BP estimates that Chinese gas market will overcome EU by 2030 and will require rapid import growth to close the widening gap between domestic production and demand.[19]

Imports

China became a net natural gas importer in 2007 and its foreign supplies have since gradually increased. In 2011 China imported about 31 bcm of natural gas via LNG or pipelines which accounted for around 23 % of the country's total gas consumption.[20]

LNG imports

China started importing LNG in 2006. According to the BP Statistical Review, in 2012 China imported 16.6 bcm of LNG, primarily from Australia, Qatar, Malaysia and Indonesia although some cargoes originated from African and South American producers.[21] In 2012 there were five LNG terminals in operation in the east coast of China with a total regasification capacity of around 29 bcm. Another six terminals were reported to be under construction and together with the existing capacity they are expected to provide over 50 bcm in a few years.[22] Until late 2012 LNG accounted for more than a half of Chinese gas imports but rising price has affected its competitiveness. Although long-term LNG demand will most likely accelerate, Chinese oil companies are very sensitive about the price of imported LNG.[23] Some downward pressure on price may emerge as new supplies from the U.S., Australia and Africa became available by 2015 but the extent of their impact is still unclear. Price competitiveness will nevertheless play critical role in further expansion of the Chinese LNG trade.

[17] Gao, 13.
[18] *Reuters*, "China's ragtag shale army a long way from revolution," March 11, 2013.
[19] BP, *World Energy Outlook 2030*. 47.
[20] BP, *Statistical Review of World Energy 2012*, 28.
[21] Ibid., 28.
[22] IEA, *Oil and gas emergency policy – China* (Paris: OECD/IEA, 2012), 16.
[23] Paik, "China's Gas Expansion,", 16.

Pipeline imports

In 2011 Chinese imports of piped gas amounted to 14.3 bcm and originated exclusively from Turkmenistan.[24] In view of price hikes in the LNG trade, Chinese government has prioritized gas imports via pipelines and in the second half of 2012 the volume of piped gas exceeded for the first time supplies of the LNG.[25] With Central Asian gas already flowing in, China has another two potential suppliers, Myanmar and Russia. Myanmar's contribution to the Chinese gas import portfolio is expected to be rather modest. A pipeline connecting coast of Myanmar with southwest China is expected to begin pumping gas at the end of May 2013. Its capacity will be 12 bcm per year with most of that supply to come from the country's gas fields in the Indian Ocean.[26] Apart from Russia, which will be further discussed in the next chapter, it is undoubtedly Turkmenistan which holds the greatest potential.

China received first gas supplies from Turkmenistan in 2010. Given its status of a former Soviet republic, Russia was able to preserve its influence in the country even after the dissolution of the Soviet Union and remained the largest importer of Turkmen gas until the first decade of the new millennium. As a part of a policy to diversify the export portfolio and lessen its dependence on Russia, Turkmen leaders initiated talks with China and in 2006 both countries concluded a framework agreement on future cooperation.[27] China was allowed to participate in developing of natural gas on the eastern bank of the Amu Darya River, near the Uzbek border, and became therefore the only foreign investor in Turkmenistan's onshore fields. Moreover, both countries agreed to build a Central Asia-China pipeline to secure gas transit.[28] Russia continued to dominate the local market until April 2009 when pipeline blast halted Turkmen gas which was destined for Russia.[29] The accident was followed by a series of hostile accusations from both sides and commercial ties between two countries froze, causing Russian gas sales to drop radically. The sharp decrease in total volume of gas exported to Russia manifested itself already by the end of 2009, creating a major gap in the state's budget. This sudden downturn in Russo-Turkmen partnership created an unparalleled opportunity for China. With Russia out of the equation, Beijing was no longer forced to compete for the country's vast gas resources with its main rival; and Turkmen government, in dire need to compensate for the revenue loss, removed remaining barriers to finish the construction of Turkmenistan-China pipeline.[30] Beijing also heavily invested in the development of new gas fields through several loans worth total of USD 8.1 billion, which further strengthened its position.[31] Value of Turkmen partnership increased further after 2011, when petroleum auditing firm Gaffney Cline & Associates confirmed that Galkynysh

[24] BP, *Statistical Review of World Energy 2012*, 28.
[25] *Bloomberg*, "China Piped Gas Imperils $100 Billion LNG Plans: Energy Markets," October 10, 2012.
[26] *Financial Times*, "China-Myanmar pipeline to open in May," January 21, 2013.
[27] Slavomír Horák, "Turkmenistan´s Shifting Energy Geopolitics in 2009-2011,"*Problems of Past-Communism* 59, 2, (March/April 2012), 19.
[28] Simon Pirani, *Central Asian and Caspian Gas Production and the constraints on Export* (Oxford: The Oxford Institute for Energy Studies, 2012), 23.
[29] *Reuters*, "Pipeline blast halts Turkmen exports to Russia," April 9, 2009.
[30] Pirani, 83.
[31] *Businessweek*, "China loans Turkmens $4bln in exchange for gas," April 26, 2011.

field (formerly known as South Yolotan) has between 13.1 trillion and 21.1 trillion cubic meters of natural gas reserves, making it the second largest field in the world. The field is expected to begin production in 2013.[32] The new discoveries also led to a new agreement between Ashgabat and Beijing to increase the ultimate volume of Turkmen gas supplies to 65 bcm per year, up from the previously agreed 40 bcm per year.[33] By the end of 2012 around 20 bcm per year was already transported via the Turkmenistan-China pipeline and Turkmen supplies are expected to climb up to 30 bcm per year by 2015. Kazakhstan and Uzbekistan could add another 20 – 25 bcm per year but their contribution will be constrained by lack of infrastructure and their own consumption requirements, given their proved reserves are much smaller than those in Turkmenistan.[34] As for the transit infrastructure, the Central Asia-China gas pipeline has now two operational branches, Line A and Line B, capable of carrying 23 bcm per year. CNPC signed agreement with Uzbekneftgaz and KuzMunaiGas to build Line C which will run in parallel to the operating branches and upgrade total deliverability of the pipeline to 55 bcm per year.[35] Meeting the target of 65 bcm per year will however require further expansion of the transit network.

Turkmen gas industry still lacks capacity to exploit to full extent its gas potential but with Chinese investment flowing in and its energy demand rising, the partnership between two countries is likely to grow strong. This has two major implications. Firstly, Russia will have to compete for Chinese market with its former republic, and unlike Russia, Turkmenistan is much closer to becoming a major supplier of gas to China. Secondly, Beijing can use its growing influence in Turkmenistan as leverage in the current negotiations with Russia and gain the upper hand.

Sino-Russian gas partnership?

Energy partnership between the largest gas producer and soon-to-be largest energy consumer will have major implications for energy geopolitics and both regional and global gas market. Rapidly growing Chinese gas demand presents an unprecedented opportunity for Russia not only in terms of market expansion but also for the development of its Far Eastern gas reserves. According to the official Russian energy strategy published in 2010, gas production in the East Siberia is forecasted to increase up to 132-152 bcm by 2030.[36] However, development of these untapped super-giant fields requires a market of sufficient size to justify the infrastructure costs. Although the national strategy initially allowed for the penetration of the American market, shale gas boom took the U.S. out of the equation,

[32] *Reuters*, "Big Turkmen field to produce gas next year," November 15, 2012.
[33] *Platts*, "Turkmenistan to increase gas supplies to China to 65 bcm/year," November 24, 2011.
[34] Pirani, 83.
[35] CNPC, "Turkmenistan".
[36] Ministry of Energy of the Russian Federation, *Energy Strategy of Russia for the Period up to 2030* (Moscow: Ministry of Energy of the Russian Federation, 2010), 80.

leaving Asia-Pacific region as the main prospective recipient of gas from Russia's eastern fields. The target group of potential supplies now encompasses China, Japan and both Koreas, yet without Chinese engagement there is only little chance that Gazprom will undergo the costly development of a large-scale gas production. Negotiations between two countries over the prospects of future gas supplies have stalled for more than a decade.

The origins of gas cooperation between China and Russia can be traced back to 1992 when Chinese National Petroleum Corporation proposed to export oil from East Siberia to Russia and Japan. Later in 1994 a memorandum of understanding was signed between CNPC and Russian Energy Ministry to construct long-distance pipelines to supply China with gas [37] The Kovykta gas field in Irkutsk was destined to be the source of future gas supplies, although at that time it was operated by an independent company Sidanco, not Gazprom. The fact that Gazprom was the state company responsible for gas exports (this status was legally confirmed in 2006) but did not own major asset in East Siberia thus generated a lot of confusion in the negotiations.[38] The issue of disputed ownership of the Kovykta gas field slowed down the negotiations until 2006, when it seemed that both China and Russia were ready to sign a protocol, agreeing that first exports would take place in 2011 and total volumes would reach up to 68 bcm per year. By the end of the same year the talks however reached a deadlock as both parties were unable to find a common ground for the gas pricing. As for the Kovykta field ownership, some progress was made in 2007 when Gazprom agreed to buy Sidanco's successor TNK-BP out of its interest in the field, but negotiations had stalled once again in 2008 at the outbreak of the financial crisis.[39] In 2010, after governmental threats to revoke its license to the field, the Russo-British venture was forced to push its unit into bankruptcy in an act of desperation to retrieve its investment. The resolution of field's ownership finally came in 2011 when Gazprom purchased the license from TNK-BP for USD 770 million.[40] Securing Kovykta's ownership still left two obstacles for closing the deal: route and price. China prioritized eastern route which would supply densely populated north-eastern provinces of Heilongjiang, Jilin and Liaoning and solve their problem of gas shortages. Russia on the other hand preferred the "Altai route" which would enable Gazprom to divert surplus volumes from its west Siberian fields to China and become "swing supplier".[41] Although both countries tried to push forward their alternative, the main setback in the negotiations appeared to be the price of future supplies. In 2011 Platts informed that Moscow sought realistic gas price of USD 350 per thousand cubic meters while China was offering USD 235. That was nevertheless still above the price of USD 200-210 which it paid for the gas from Central Asia.[42]

[37] Keun-Wook Paik, *Pipeline Gas Introduction to the Korean Peninsula* (London: Chatham House, 2005), 4.
[38] James Henderson, *The Pricing Debate over Russian Gas Exports to China* (Oxford: The Oxford Institute for Energy Studies, 2012), 5.
[39] *Financial Times*, "TNK-BP edges towards an accord with Gazprom," June 16, 2007.
[40] *Financial Times*, "Gazprom pays $770m for TNK-BP gas field," March 1, 2011.
[41] Keun-Wook Paik, Glada Lahn and Jens Hein, *Through the Dragon Gate* (London: Chatham House, 2012), 6.
[42] Platts, "Moscow seeks "realistic" gas price of $350/1,000 cu m in China deal," June 21, 2011.

CNPC still finds Gazprom's price disproportionate given that the company cannot increase domestic gas prices, which are strictly controlled by the Chinese authorities and Beijing is therefore unwilling to commit to potentially excessive level of high cost imports. Gazprom's current stance is that Russia will continue exporting LNG to other Asian countries that are willing to pay the price and China can join in if it wants to. Russia at the same time however refuses to grant China any interest in the development of its Eastern and Far Eastern fields or pipelines. On the other hand, Central Asian supplies, LNG and potential expansion of indigenous gas production permit China not to accept Russia's terms.[43] Even if a deal is eventually struck, Russian gas potential is likely to be largely unfulfilled, because China at present simply does not need that much of Russian gas. Shortly before submission of this paper, negotiations between two countries reached a new milestone. In March 2013 Reuters informed that Gazprom and CNPC agreed that 38 bcm of gas from East Siberian fields will flow annually to China via a new pipeline starting in 2018. Although the agreement settled the issue of the route, it fell short of a final accommodation on price which means that the deal is still not definitive.[44] Given that Gazprom was forced to agree to the eastern route and lower contracted volumes, while the price issue was left unsettled, this further proves that Sino-Russian gas trade is still far from reaching its full potential.

Conclusion

Despite ambitious projections of skyrocketing rise in domestic gas production, current studies indicate that China is unlikely to satisfy its fast-growing consumption by itself. If further progress is made in the development of huge reserves of the untapped unconventional gas, China may be able to significantly reduce its future need for gas supplies from abroad, but up to the present day the commercial production of coal bed methane has been only marginal and its future prospects are not very optimistic. The only thing which is certain is that Chinese demand for gas will rise tremendously and if indigenous output does not keep up, the economy will require gas supplies from abroad to close the widening gap between demand and supply. China has already developed a diversified import portfolio which includes piped gas from Central Asia and Myanmar and various LNG suppliers. This means that even though China will not avoid importing gas, it may not need to import it from Russia. Turkmenistan seems to have satisfied China's need for a major gas supplier and Russia therefore paradoxically faces strong competition from its former republic. Negotiations over Russia's gas supplies to China have stalled for almost two decades and although a new agreement was reached recently, the final deal was not yet struck. Russia holds strong stance and is not willing to make any unnecessary concession while China is currently in a position where it can comfortably wait for a "better" opportunity. A failure to reach an agreement may however come as costly for both players. China would be deprived

[43] Keun-Wook Paik, "Sino-Russian gas cooperation: the reality and implications," *East Asia Forum*, January 19, 2013.
[44] *Reuters*, "Russia, China find compromise on gas deal after 15 year standoff," March 25, 2013.

of the huge potential of Russia's eastern gas fields while Russia would lose a major client capable of counterbalancing its overdependence on the EU.

Bibliography

Books and journal articles

British Petroleum. *Statistical Review of World Energy 2012*. London: BP, 2012.

British Petroleum, *World Energy Outlook 2030*. London: BP, 2013.

Development Research Centre of the State Council, *China's National energy Strategy and Reform* (background report from China Development forum presented in November 2003).

Gao, Fan. *Will There Be a Shale Gas Revolution in China by 2020?* Oxford: The Oxford Institute for Energy Studies, 2012.

Henderson, James. *The Pricing Debate over Russian Gas Exports to China.* Oxford: The Oxford Institute for Energy Studies, 2012.

Horák, Slavomír. "Turkmenistan's Shifting Energy Geopolitics in 2009-2011."*Problems of Past-Communism* 59, 2, (March/April 2012): 18 – 30.

International Energy Agency. *Oil and gas emergency policy – China.* Paris: OECD/IEA, 2012.

International Energy Agency. *World Energy Outlook 2012*. Paris: OECD/IEA, 2012.

Konoplyanik, Andery A. "Russian gas at European energy market: Why adaptation is inevitable." *Energy Strategy review* 1 (2012): 42 – 56.

Ministry of Energy of the Russian Federation. *Energy Strategy of Russia for the Period up to 2030*. Moscow: Ministry of Energy of the Russian Federation, 2010.

Nersesian, Roy L. *Energy for the 21st century.* New York: M.E. Sharpe, 2010.

Paik, Keun-Wook. "Sino-Russian gas cooperation: the reality and implications." *East Asia Forum*, January 19, 2013. Accessed March 25, 2013. http://www.eastasiaforum.org/2013/01/19/sino-russian-gas-cooperation-the-reality-and-implications/

Paik, Keun-Wook. *Pipeline Gas Introduction to the Korean Peninsula* (London: Chatham House, 2005).

Paik, Keun-Wook; Glada Lahn and Jens Hein. *Through the Dragon Gate* (London: Chatham House, 2012).

Paik, Keun-Wook. "China's Gas Expansion." *Oxford Energy Forum* 89, (August 2012): 15 – 17.

Pirani, Simon. *Central Asian and Caspian Gas Production and the constraints on Export.* Oxford: The Oxford Institute for Energy Studies, 2012.

Newspaper articles

Bloomberg. "China Piped Gas Imperils $100 Billion LNG Plans: Energy Markets." October 10, 2012. Accessed March 26, 2013. http://www.bloomberg.com/news/2012-10-10/china-piped-gas-imperils-100-billion-lng-plans-energy-markets.html

Businessweek. "China loans Turkmens $4bln in exchange for gas." April 26, 2011. Accessed March 25, 2013. http://www.businessweek.com/ap/financialnews/D9MRG3CO0.htm

Financial Times. "*Gazprom pays $770m for TNK-BP gas field."* March 1, 2011. Accessed March 25, 2013. http://www.ft.com/cms/s/0/1f0c62da-43fe-11e0-8f20-00144feab49a.html

Financial Times. "TNK-BP edges towards an accord with Gazprom." June 16, 2007. Accessed March 25, 2013. http://www.ft.com/cms/s/0/a3eaa602-1ba7-11dc-bc55-000b5df10621.html

Financial Times. "China-Myanmar pipeline to open in May." January 21, 2013. Accessed March 25, 2013. http://www.ft.com/intl/cms/s/0/faf733ae-63b6-11e2-af8c-00144feab49a.html#axzz2P7pgI11U

Platts. "Moscow seeks "realistic" gas price of $350/1,000 cu m in China deal." June 21, 2011. Accessed March 25, 2013. http://www.platts.com/RSSFeedDetailedNews/RSSFeed/NaturalGas/8024191

Platts. "Turkmenistan to increase gas supplies to China to 65 bcm/year." November 24, 2011. Accessed March 25, 2013. http://www.platts.com/RSSFeedDetailedNews/RSSFeed/NaturalGas/8621275

Radio Free Asia. "China Ups Gas Forecast," November 12, 2012. Accessed March 25, 2013. http://www.rfa.org/english/commentaries/energy_watch/forecast-11122012112847.html

Reuters. "Big Turkmen field to produce gas next year." November 15, 2012. Accessed March 25, 2013. http://www.reuters.com/article/2012/11/15/gas-turkmenistan-idUSL5E8MFBVX20121115

Reuters. "China's ragtag shale army a long way from revolution." March 11, 2013. Accessed March 25, 2013. http://www.reuters.com/article/2013/03/11/china-shale-idUSL4N0B13X20130311

Reuters. "Pipeline blast halts Turkmen exports to Russia." April 9, 2009. Accessed March 25, 2013. *http://www.reuters.com/article/2009/04/09/turkmenistan-russia-gas-idUSL959981620090409*

Reuters. "Russia, China find compromise on gas deal after 15 year standoff." March 25, 2013. Accessed March 28, 2013. http://www.reuters.com/article/2013/03/25/russia-china-gas-idUSL5N0CH1IH20130325

Reuters. "Statoil to squeeze Gazprom further in gas market." February 7, 2013. Accessed March 28, 2013. http://www.reuters.com/article/2013/02/07/statoil-gas-idUSL4N0B76DU20130207

Websites

CNPC. "Turkmenistan." Accessed March 25, 2013. http://www.cnpc.com.cn/en/cnpcworldwide/turkmenistan/?COLLCC=2917585125&

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