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CHALLENGES FOR THE GAS SECTOR IN CHINA

Abstract: China's use of coal will substantially decline during the near future due to environmental concerns. China is working to diversify its energy structure and improve energy efficiency by developing alternative clean energy sources. It is also increasing the importance of natural gas in energy mix. The share of natural gas in energy mix is still low, but it could double in the next two decades. China's natural gas sector will develop very quickly in the near future. But unconventional gas industries are still in early stages of development. Domestic companies need time to gain access to new technologies and know-how. Simultaneously China has to develop its gas infrastructure to enable greater use of imported natural gas.

Keywords: China, energy security, natural gas in China, shale gas.

DOI: 10.15611/pn.2014.370.25

1. Introduction

The discussion on China's energy security cannot pass over issues related to the investments made in the domestic gas sector and the strategy of increasing the share of renewable energy in the overall energy balance. For an economy so heavily dependent on coal, it is a chance not only to solve many problems arising from a fairly uniform energy structure, but also to improve the quality of the living environment. Large-scale investments in the gas sector, particularly in the context of the development of unconventional resources, and the development of international cooperation in this area has enabled China to create favourable conditions to boost the development of the sector.

The main research questions posed in this paper concern: the perception of energy security by China, the role and place of natural gas in the overall energy mix in China, as well as the identification of opportunities and possibilities for China to achieve the status of a global leader in the exploration of shale gas and production increase prospects.

Initiated more than three decades ago by Deng Xiaoping, reform and opening-up introduced major changes to the existing system of economic and social development

of China. The average annual GDP growth at 10% recorded since that time has allowed China to gain a place among the largest economies in the world. Economic development, combined with the increase in personal wealth and the process of industrialization and urbanization, has led to the emergence of new needs for energy-consuming products and equipment.

The growing demand for energy resources which can be seen in China today is conditioned by the desire to maintain the current pace of growth, which seems to be the key to maintain social stability within the country. The Chinese leadership is aware of the fact that the basis of its legitimacy depends largely on its ability to provide economic benefits to the society. It should be noted, however, that the demand for energy does not only have an economic dimension, but also determines the overall development strategy, the direction of modernization in the country, how China emerges as a global power, and whether China will be a responsible leader in environmental protection in the world.¹

Energy availability affects the development of industry, agriculture, transport, trade, services, and raising the standard of living. The increase in demand for energy is derived from the development of road, rail, and sea transport. The relatively high demand for energy is visible in the industry as well as in the sector of trade and services. Securing long-term energy supply coupled with the improvement of efficiency and the development of new technologies in China will decide about the potential and opportunities for the realization of superpower aspirations in the global space in the near future.

2. Energy security from the perspective of China

The International Energy Agency defines energy security as a constant (i.e. without breaks) availability of affordable energy sources.² The World Bank defines energy security in a similar vein, relating to it in terms of maintaining a constant state of production and using energy at a reasonable price, fostering economic growth, poverty reduction, as well as directly improving people's lives by expanding access to advanced energy services. Promotion of international energy security in the long term should be based on cooperation to ensure: energy efficiency, diversification and growth of energy supplies, and dealing with market price volatility.³

¹ Jiang Wenran, China's global quest for energy security, [in:] A. Lugg, M. Hong (eds.), *Energy Issues in the Asia-Pacific Region*, Institute of Southeast Asian Studies Publishing, Singapore 2010, pp. 167, 168.

² International Energy Agency, *Energy Security*, <http://www.iea.org/topics/energysecurity/> (retrieved: 6.01.2013).

³ The World Bank Group, *Energy Security Issues*, Moscow–Washington, DC, 2005, December 5, http://siteresources.worldbank.org/INTRUSSIANFEDERATION/Resources/Energy_Security_eng.pdf (retrieved: 22.04.2014).

For China, energy security is the ability to adapt quickly to new dependencies resulting from the rules governing global markets, as well as the development of energy diplomacy. Central to this is the departure from the previous policy of building self-sufficiency to creating a sustainable economy and a prosperous society. China's activities aim primarily at providing long-term access to foreign energy reserves, acquisition of shares in foreign stocks of raw materials for a favourable price, and protecting raw materials transport routes.

In shaping the overall strategy for China's energy security,⁴ importance is attributed to the following issues:

- diversification of energy sources in the energy mix,
- restructuring the coal sector and the development of modern coal technologies,
- diversification of import sources of raw materials and the expansion of pipeline network,
- increased energy savings and efficiency of energy use,
- promotion of renewable energy sources,
- development of nuclear energy,
- development of the natural gas sector and the increase in production from unconventional resources,
- rational use of domestic resources,
- creation of strategic reserves for key fuels,
- environmental protection and the improvement of living conditions of the country's inhabitants,
- international energy cooperation, mainly in developing clean technologies and environmental protection.

China's economy today is based largely on coal, which accounts for nearly 70% of the domestic demand for energy. These reserves are one of the largest in the world. In terms of total coal reserves China is second only to the United States and Russia. However, China controls almost half of the world production. Despite this, production does not balance the domestic demand, which makes China a net coal importer. The coming years will be extremely important for the Chinese mining sector. This will be primarily associated with the need to adapt to new market challenges and to raise standards of safety in mines. Coal mining will still remain the key sector of the economy, because the central authorities intend to implement a series of major projects aimed at modernizing and introducing new technologies in the production of clean coal. The possibility of extracting energy from coal while reducing environmental pollution is becoming an essential part of the ongoing restructuring of coal mining.⁵

⁴ See Ł. Gacek, *Bezpieczeństwo energetyczne Chin. Aktywność państwowych przedsiębiorstw na rynkach zagranicznych*, Księgarnia Akademicka, Kraków 2012.

⁵ See Ł. Gacek, Sektor węglowy w systemie energetycznym Chin – perspektywy rozwojowe, *Roczniki Humanistyczne* 2014, t. LXII, z. 9, pp. 83–101.

In the future, we can expect a gradual decline in the importance of coal to the domestic economy to other energy sources. One of the priorities of the Chinese authorities will be the generation of energy from renewable sources. Directing attention to clean technologies is dictated by the circumstances in the international commodity markets, as well as issues related to environmental protection.

On 24th October 2012, China published a white paper on energy policy, *China's Energy Policy 2012*, which very clearly emphasized the importance of developing alternative energy sources. The document states that China's energy development should be based on the use of advanced technologies, low consumption of raw materials, lesser environmental pollution, economic efficiency, and energy security. The document mentioned a plan to reduce, by the end of 2015, energy consumption per GDP unit by 16% as compared to 2010 and a reduction of carbon dioxide emissions per GDP unit by 17%, in line with the Twelfth Five-Year Plan (2011–2015). China has announced active promotion of the development of water, solar, wind, and nuclear power, as well as biomass and other renewable energy sources.⁶

Considering the need for greater diversification within the existing energy structure, China, in the development strategy based on low-carbon solutions, will have to focus on activities related primarily to:

- restructuring the coal sector, which should result in increased competitiveness, and the promotion of clean coal technologies,
- development of renewable energy sources,
- lifting capacity in nuclear power plants,
- increasing the importance of natural gas in energy mix.

3. Development of the gas sector in China

In light of the foregoing, a strong emphasis is put on the development of the extremely prospective natural gas sector, especially in the use of unconventional resources. As the U.S. Energy Information Administration predicts – over the next three decades until 2040, there will be a significant increase in the consumption of natural gas in the global energy use. China will be responsible for almost two thirds of the total gas consumption among developing countries. In thirty years, gas consumption in China will increase more than fourfold from 3.8 to 17.5 trillion cubic feet. In 2040, the share of gas in the energy mix of China should fluctuate around 8%, while coal will drop to about 55%. During these thirty years, the production of natural gas in China will increase more than threefold from 3.3 trillion cubic feet in 2010 to 10.3 trillion cubic feet in 2040.⁷

⁶ *Zhongguo de nengyuan zhengce (2012) baipishu* (《中国的能源政策（2012）》白皮书), The Central People's Government of the People's Republic of China, 2012, December 24, http://www.gov.cn/jrzq/2012-10/24/content_2250377.htm (retrieved: 26.02.2013).

⁷ U.S. Energy Information Administration, *International Energy Outlook 2013*, Washington, DC, 2013, July.

The strategic importance of natural gas for the domestic economy is recognized, as demonstrated by development plans within this sector. The overall objectives were presented on 30th November 2010 in Doha by the President of Petrochina, Zhou Jiping. He stressed that low carbon economy is the basis for achieving sustainable development. In this situation, stimulation of changes within the gas sector remains a strategic choice for the construction of China's energy security, considered both in terms of meeting the growing needs for energy and the challenges related to environmental protection and the reduction of greenhouse gas emissions. As a result of sustainable economic growth, population growth, and the accompanying industrialization and urbanization, along with the increasing emphasis on low-carbon development, China will maintain a high rate of growing demand for natural gas in the next two decades.⁸ At World Gas Conference in Kuala Lumpur on 7th June 2012, Zhou Jiping said that the Asia-Pacific region would become the largest global consumer of gas in the near future.⁹

Table 1. Production and consumption of natural gas in China in 2000–2013

Year	Production (in billion m ³)	Consumption (in billion m ³)
2000	27.2	24.5
2005	49.3	46.8
2010	94.8	106.9
2011	102.7	130.5
2012	107.2	146.3
2013	117.1	161.6

Source: study based on: *BP Statistical Review of World Energy*, June 2003, www.bp.com/statisticalreview; *BP Statistical Review of World Energy*, June 2014, www.bp.com/statisticalreview.

Natural gas reserves in China – according to BP's report – were estimated at 3.3 trillion cubic meters (115.6 trillion cubic feet) in 2013, equivalent to 1.8% of the world's resources. In the same year, the consumption of gas amounted to 161.6 billion cubic meters (4.8% of world consumption). In turn, the production reached 117.1 billion cubic meters (3.5% of world production).¹⁰ Over the last decade, there

⁸ Zhou Jiping, *China's Natural Gas Demand and CNPC's Natural Gas Business Strategy*, Doha, 30.11.2010, China National Petroleum Corporation (CNPC), http://www.cnpc.com.cn/en/press/speeches/China_s_Natural_Gas_Demand_and_CNPC_s_Natural_Gas_Business_Strategy_.shtml?COLLCC=421952902&COLLCC=421947536& (retrieved: 19.09.2013).

⁹ Zhou Jiping, *The Rapidly Growing World and Chinese Natural Gas Markets*, 25th World Gas Conference, Kuala Lumpur, Malaysia, 7.06.2012, China National Petroleum Corporation (CNPC), http://www.cnpc.com.cn/en/press/speeches/The_Rapidly_Growing_World_and_Chinese_Natural_Gas_Markets.shtml (retrieved: 19.09.2013).

¹⁰ *BP Statistical Review of World Energy*, June 2014, www.bp.com/statisticalreview (retrieved: 1.07.2014).

was a sharp increase in the share of natural gas in the energy balance in China. In 2000–2013, the consumption of raw material increased sixfold, while the production – fourfold. It is worth noting that even in the middle of the new millennium, own production allowed for balancing internal demand. Today, China is dependent on import from abroad in nearly 30%.

Satisfying further expected consumption growth will require China to take decisive steps. On the one hand, China's activities will aim at increasing diversity within the existing system of supplies from abroad, using both the opportunities posed by pipelines and the increased import of raw materials in the form of condensation. On the other hand, China will seek to increase its own production. It seems that a key role will be largely played by unconventional deposits' development, associated with the extraction of tight gas, shale gas, and coal bed methane.

4. Acquisition of natural gas abroad

As a result of numerous environmental constraints and the growing demand for natural gas the fastest and still the cheapest source which allows for satisfying domestic demand is the raw material supplied through pipelines or extracted in the form of liquefied natural gas (LNG). For China, the most important issue is to create a broad mechanism of gas supplies from abroad, due to the growing domestic demand. An important role in these plans may be played by Russia and Central Asian states.¹¹ In February 2013, China and Russia signed an agreement on the construction of a pipeline, which could transport 38 billion cubic meters of gas per year, starting from 2018.¹² On 21st May 2014 in Shanghai, the state-owned China National Petroleum Corporation and Gazprom signed an agreement on long-term gas supplies to China. The agreement provides a start-up of supply for the period of thirty years from 2018 at 38 billion m³, with an option of increase to 60 billion cubic meters thereafter.¹³

A viable alternative to supplies from Russia is created by the region of Central Asia. In this respect, the agreement on the establishment of a long-term and stable strategic energy partnership signed on 23rd November 2011 in Beijing by China and Turkmenistan draws particular attention. Then, Turkmenistan obliged to increase gas exports to China from 25 to 65 billion cubic meters per year in the near future.¹⁴

¹¹ See Ł. Gacek, *Azja Centralna w polityce energetycznej Chin*, Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków 2013.

¹² S. Kravchenko, J. Rudnitsky, *Xi's First State Trip Yields 'Breakthrough' Oil Deals with Putin*, Bloomberg, 22.03.2013, <http://www.bloomberg.com/news/2013-03-22/china-s-xi-strikes-breakthrough-oil-deals-with-soulmate-putin.html> (retrieved: 23.03.2013).

¹³ *Russia, China Ink Historic Gas Supply Deal*, RIA Novosti, 21.05.2014, http://sputniknews.com/russia/20140521/190004220.html?utm_source=short_direct&utm_medium=short_url&utm_content=bmJ&utm_campaign=URL_shortening (retrieved: 29.04.2015).

¹⁴ Wu Jiao, Cui Haipei, China, Turkmenistan sign key gas agreement, *China Daily* 2011, November 24.

Between December 2009 and August 2013, China imported a total of 60 billion cubic meters of gas from the Central Asian states.¹⁵ An important role in this sphere is played by the Central Asia – China pipeline with a capacity of 30 to 40 billion m³.

In the context of plans to diversify gas supplies Burma is also attributed an important place. In July 2013, a gas pipeline from Burma was launched. The pipeline will deliver 12 billion cubic meters of gas per year to China.¹⁶

Recent years illustrate a steady increase in gas import to China in the form of liquefied natural gas. In 2012, China imported nearly 15 million tons of LNG. The raw material was imported mainly from Indonesia, Malaysia, Qatar, and Australia.¹⁷ According to Wood Mackenzie Ltd., LNG import to China may increase by 80% by 2030.¹⁸ With respect to this sector, it is worth noting the large-scale investments in the expansion of terminals for LNG reception. In mid-2013, there were six terminals in operation, while several others were under construction or have been approved for construction.¹⁹

5. Development of tight gas deposits and coal bed methane

Among the above-mentioned opportunities, tight gas has a large production potential. The largest reserves of tight gas in China which provide basis for making profitable investments in mining are located mainly in the production basins in Sichuan and Ordos. In addition to this, interesting development, perspectives are created by production sites in Songliao, Chuxiong, Qaidam, Tarim, Turfan-Hami, Junggar, and the Gulf of Bohai. Of all the places, Sulige gas deposits, stretching over an area of about 40 thousand km², remain the largest onshore gas fields in China discovered so far.²⁰

In 2012, the production of tight gas amounted to 30 billion cubic meters, representing approximately 30% of the total gas production in China. Forecasts of the China Academy of Engineering (CAE) assume an increase in production in 2020 to 80 billion cubic meters.²¹ China is trying to promote development of the sector

¹⁵ Du Juan, Tour aims to boost energy cooperation, *China Daily* 2013, September 3.

¹⁶ Du Juan, Myanmar-China gas pipeline opens, *China Daily* 2013, July 30.

¹⁷ *China buys more LNG as output increases*, *Shanghai Daily* 2013, January 22.

¹⁸ D. Sethuraman, *China May Need to Boost LNG Imports by 80%*, *Wood Mackenzie Says*, Bloomberg, 22.05.2012, <http://www.bloomberg.com/news/2012-05-22/china-may-need-to-boost-lng-imports-by-80-wood-mackenzie-says.html> (retrieved: 19.09.2013).

¹⁹ J. Hua, D. Stanway, *China approves first floating terminal for LNG imports*, Reuters, 14.08.2013, <http://uk.reuters.com/article/2013/08/14/china-cnooc-lng-idUKL4N0GF24C20130814> (retrieved: 28.08.2014).

²⁰ China National Petroleum Corporation (CNPC), *Efficient Development of the Large Tight Sandstone Gas Field in Sulige*, Beijing, <http://www.cnpc.com.cn/en/press/publications/brochure/PageAssets/Images/Efficient%20Development%20of%20Gas%20Field%20in%20Sulige.pdf?COLLCC=421947749&> (retrieved: 19.09.2013).

²¹ Chen Aizhu, *Tight Gas: China's Unsung Unconventional Energy Revolution*, Reuters, 8.07.2013, <http://uk.reuters.com/article/2013/07/08/china-tightgas-idUKL3N0EG2BF20130708> (retrieved: 22.07.2014).

through the introduction of subsidies for producers. The state also seeks to develop cooperation with foreign partners.

The situation is somewhat different with respect to the prospects for development of coal bed methane. Coal bed methane in China was first extracted in the 1990s. However, the real development began in 2004, since then the development process clearly has quickened. Compared to shale gas it has the advantage that it is easier to locate and is located at shallower depths. It is estimated that China has the third-largest resources of coal bed methane in the world, giving way in this respect only to Russia and Canada. Coal bed methane was not widely used until a government program for 2006–2010 introduced a solution that facilitated launching a number of new investments in the sector. It assumed an increase in the production upper limit to 10 billion cubic meters in 2010 and 40 milliard cubic meters in 2020.²² However, the Twelfth Five-Year Plan (2011–2015) approved by the State Council assumed a decrease in the coal bed methane production upper limit on an industrial scale at the level of 21.5 billion cubic meters. Numerous restrictions on operation and the low demand in the internal market led to a situation that at the beginning of the new century Chevron and BP PLC left China. Their place was taken by small and medium-sized foreign companies. In fact, the only large international corporation was Royal Dutch Shell PLC, operating jointly with Petrochina in Shanxi province, which remained involved in coal bed methane mining. New regulations introduced since the beginning of 2010 gave local companies the opportunity to develop cooperation with foreign partners. The main goal is to attract large companies with experience and expertise in the development of coal bed methane.²³ It should be noted that the development of the sector is carried out with the financial support from the state, which provides subsidies for coal bed methane producers.

6. Shale revolution in China

High hopes for China are associated with the development of the shale gas sector. In March 2012, the Chinese Ministry of Land and Resources determined the size of shale gas reserves which may be mined on land at the level of 25.08 trillion cubic meters (886 trillion cubic feet).²⁴ This means that China has the world's largest shale gas resources. The largest deposits of shale gas are located in Sichuan, Tarim, Junggar, Songliao, Jiangnan, and Subei basins, as well as the Yangtze River delta.

China does not yet produce shale gas on an industrial scale. The government plan approved on 13th March 2012 assumed that the production of shale gas in China

²² China plans to build two pipelines transmitting coal-bed methane, Xinhua, *People's Daily* 2006, March 31.

²³ Zhou Yan, Rules to govern foreign participation in CBM, *China Daily* 2011, November 4.

²⁴ W. Zhu, *China Estimates Exploitable Shale-Gas Reserves at 25.08 TCM*, Bloomberg, 1.03.2012, <http://www.bloomberg.com/news/2012-03-01/china-estimates-exploitable-shale-gas-reserves-at-25-08-tcm-1-.html> (retrieved: 19.09.2013).

would have reached 6.5 billion cubic meters by 2015 and from 60 to 100 billion cubic meters in 2020.²⁵ In October 2013, the National Energy Administration (NEA) presented another important document setting out the policies in the development of shale gas. The plan anticipates financial support for the processes of exploration and production of shale gas. It assumes treating the industrial sector in strategic terms, introduction of subsidies to producers of gas from shale, encouragement of provincial governments to support local producers of gas, introduction of tax exemptions or reductions for shale gas producers, as well as exemptions from customs duties on the import of equipment for this sector. The new policy emphasizes the development of the sector, particularly in the context of the development of innovation and local exploration, and production technologies.²⁶

It should be noted that, as in the above cases, China subsidizes shale gas. In addition, importers of drilling equipment, which cannot be manufactured in the country, were exempted from taxes.

Extraction of shale gas in China is carried out with the participation of national companies and international consortia, where, however, the key role is played by the former. The first round of tender for shale gas extraction in China ended in mid-2011. Six companies, i.e. Petrochina, Sinopec, CNOOC, Shaanxi Yanchang Petroleum Group Co., Coalbed Methane China United Co., and Henan Provincial Coal Seam Gas Development and Utilization Co. were granted the rights to conduct exploration activities in four blocks. The tender attracted the attention of foreign energy companies, but the rights to tender were only granted to Chinese entities. Foreign companies were invited to enter partnerships with Chinese companies. In the second round, adjudicated in January 2013, the right to develop another 19 gas blocks was allocated to sixteen companies. In the context of this tender's round adjudication, attention is drawn to the fact that the selected sixteen companies have not had any experience in the exploration and extraction of shale gas. They do not have the technology necessary in the context of the activities either.

7. Challenges for the development of the shale gas sector

Unconventional gas deposits, as opposed to conventional deposits are difficult to develop, although they are easy to discover. It is already known that the plan to increase the production of shale gas in China to 6.5 billion cubic meters, and from 60 to 100 billion cubic meters in 2020 will be difficult to achieve. At the beginning

²⁵ *Yeyanqi fazhan jihua 2011-2015 nian* (页岩气发展规划2011-2015年), National Development and Reform Commission (NDRC), 13.03.2012, <http://www.ndrc.gov.cn/zcfb/zcfbtz/2012tz/W020120316370486643634.pdf> (retrieved: 19.09.2013).

²⁶ *Yeyanqi chanye zhengce* (页岩气产业政策), National Energy Administration, 22.10.2013, http://zfxgk.nea.gov.cn/auto86/201310/t20131030_1715.htm (retrieved: 18.03.2014).

of 2013, it was predicted that its production in 2020 would have amounted to only 18 billion cubic meters.²⁷

It is impacted by a number of factors, and the first one is the high drilling costs. Complicated mining technology and the specificity of rock structures makes the use of the same methods of extraction as in the United States virtually impossible. Chinese deposits are characterized by a specific geological structure. Many Chinese shale formations have a high clay content, which makes them very flexible and therefore less susceptible to breaking. Besides, they are located in the deeper parts of the earth than in the United States.²⁸

Another problem is the very unfavourable social attitude toward shale gas production. Given the fact that the underground raw materials are owned by the state, the residents of regions where the search is conducted have a little chance to become beneficiaries of the production.

The impact of hydraulic fracturing on water sources, as well as the whole environment, still remains indefinite. Water is used during the course of drilling and hydraulic fracturing, which allows for freeing the trapped material. A big problem for China is that most of the shale gas resources are located in areas which contend with water scarcity.²⁹

A major problem slowing down the development of the shale gas in China is the monopolization of the market by large state-owned enterprises. Given the cost and pricing structure, especially when compared to conventional gas, big companies are not particularly interested in the development of the industry. It could be driven by other smaller local companies that would have been satisfied with smaller profits or foreign corporations whose experience and technology would reduce the costs. Restrictions on foreign companies, and therefore the lack of broader foreign investments on their part, are an obstacle to the Chinese access to advanced technology. China can only partially compensate for this by purchasing shares in projects related to shale gas abroad.³⁰

An important challenge for the shale gas industry in China will involve obtaining necessary mining technology and know-how. For several years, Chinese companies have shown a lively activity in the international markets, trying to get access to these areas. It should be noted that in this matter the first successes related to the

²⁷ B. Haas, R. Katakey, *China's Shale Gas No Revolution as Price Imperils Output: Energy*, Bloomberg, 19.02.2013, <http://www.bloomberg.com/news/2013-02-19/china-s-shale-gas-no-revolution-as-price-imperils-output-energy.html> (retrieved: 5.09.2013).

²⁸ J. Tollefson, China slow to tap shale-gas bonanza, *Nature* 2013, vol. 494, no. 7437, 21 February.

²⁹ Wang Xiacong, Environmental frets as frackers move in, *Caixin Online* 2012, November 20, <http://english.caixin.com/2012-11-20/100462881.html> (retrieved: 19.09.2013).

³⁰ K. Kushkina, E. Chow, "Golden age" of gas in China. Is there still a window of opportunity for more gas exports to China?, Center for Strategic & International Studies (CSIS), IREX.org, 30.07.2012, http://csis.org/images/stories/energy/120830KKushkina_EChow_ChinaShaleGas.pdf (retrieved: 19.09.2013).

acquisition of foreign assets have been reported. CNOOC Ltd was the first Chinese energy company which acquired the shares in an American mining company and shale gas producer – Chesapeake Energy Corp. Apart from CNOOC Ltd, also other companies from China, including Sinopec and Shenhua Energy Co Ltd, have taken actions related to investments in American and Canadian shale gas deposits. Chinese companies have a reason to direct their attention to the United States. China has adequate financial resources to make acquisitions in shale gas mining projects, essential in the context of acquiring the necessary experience and technology. Companies from China often overpay when purchasing shares in foreign deposits. The aim in this case is, however, the acquisition of the necessary technology and workforce training.

8. Conclusions

China's energy security will largely depend on the situation in the coal sector. The undertaken activities related to the promotion of renewable energy sources and stimulating investment in the gas sector will not change substantially in the foreseeable term of the existing energy structure. Although the share of natural gas will double over the next two decades, it will constitute only the tenth part of the overall energy mix of the country. The expected increase in the demand for energy will still continue to be covered mostly by coal.

The development of the gas sector, particularly in relation to the exploration and development of unconventional resources, requires time and patience. Acquiring the necessary technology and mining personnel training forces China to cooperate with foreign partners. Therefore, China seeks to acquire, often paying exorbitant prices, shares in projects related to the extraction of shale gas abroad. This allows for the introduction of the state's own staff to companies with relevant expertise and experience. The lack of a developed mining technology prevents a rapid change that would revolutionize the industry. Taking into account also other restrictions, as mentioned earlier, for now, China has little chance of becoming a global leader in the production of shale gas.

One of the reasons for correction plans for shale gas production in China has also become a steady increase in import of liquefied natural gas, and the signed agreements for the supply of gas from Russia and Central Asia. In this matter, China has a number of options allowing for effectively negotiating favourable prices on the international markets.

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WYZWANIA STOJĄCE PRZED CHIŃSKIM SEKTOREM GAZOWYM

Streszczenie: Gospodarka Chin jest oparta na węglu, niemniej jednak podejmowane są działania na rzecz ograniczenia jego zużycia. W trosce o środowisko naturalne Chiny podejmują działania na rzecz promocji czystych i odnawialnych źródeł energii. Ważne miejsce w tym obszarze zajmują działania związane z rozwojem sektora gazowego. Udział gazu w ogólnym bilansie energetycznym nie jest zbyt duży, ale przyjęta strategia rozwojowa każe sądzić, że w ciągu dwóch dekad będzie on systematycznie wzrastał. Duże nadzieje związane są z zagospodarowaniem złóż niekonwencjonalnych. Wymaga to jednak czasu, biorąc pod uwagę brak odpowiedniej wiedzy i doświadczenia u chińskich podmiotów działających w tej branży. Kolejnym wyzwaniem będzie dalsza rozbudowa infrastruktury gazowej.

Słowa kluczowe: Chiny, bezpieczeństwo energetyczne, sektor gazowy w Chinach, gaz z łupków.