Energy Security Strategy in Kazakhstan: Environmental Security and Renewable Energy Sources

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The article addresses the key aspects of energy security policy in the Republic of Kazakhstan, suggesting that increasing the use of the renewable energy sources (RES) is crucial for reducing the country's dependence on oil and gas supplies. Greater reliance on renewables would improve economic and environmental sustainability, ensure increased energy security, and help create the conditions necessary for enhancing collaboration in Central Eurasia, as well as cooperation with Central Asian and EU states, in the energy sector. The paper also reviews several dimensions of the Kazakh oil and gas industry and its impact on the country's energy security policy. It assesses measures that might prove effective for introducing new "green" technologies aimed at limiting consumption of non-renewable natural resources and introducing a larger-scale RES-based energy production.

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Introduction

During the last decade, the availability of energy resources has been the main determinant of influence in Eurasia. Having the upper hand in terms of the available oil and gas resources and, consequently, pipeline map outlines, plays a significant role in determining the political and economic stances of Russia, Turkey and the Central Asian states, reshaping Iran's performance in the energy sphere by curbing the region's appetite for the Persian Gulf oil, and influencing the ongoing evolution of relations between global players such as Russia, China and the USA. Kazakhstan, probably the richest in terms of energy and minerals resources, is one of the largest Caspian oil exporters. In 2015 Kazakhstan exported 60.9 million tons of oil, which comprised 76.7 percent of the total amount produced in the country. Of that, 38 million tons were exported via the Caspian Pipeline Consortium.[1]

It is no wonder that Kazakhstan's energy sector is one of the leading dimensions of its socio-economic politics. Energy production is crucial for the country's economic development, which relies heavily on the growing energy exports. In this regard, it is important to identify the main strategy for energy security and sustainable energy development in the long term, in order to reduce the country's dependence on non-renewable energy resources and, consequently, improve economic sustainability and environmental conditions.

This article examines the key aspects of energy security policy in the Republic of Kazakhstan, giving an overview of the energy security and renewable energy sources concept, its development, and its current status. It focuses on the RES as a means of ensuring energy security and contributes to the understanding of Kazakhstani energy security policy, the challenges it faces, and necessary measures for introducing a larger-scale RES-based energy production.

Energy security and renewable energy resources: An overview

Currently, there are numerous definitions of sustainable development, each of which representing only some of its aspects. One of the most frequently quoted is from the Brundtland Report, defining sustainable development as "development that meets

1 Kazinform International News Agency (2016) *Kazakhstan plans to enter top 10 oil exporters*. Available at: http://www.inform.kz/en/kazakhstan-plans-to-enter-top-10-oil-exporters_a2897292 (Accessed: 14 November 2016).

the needs of the present without compromising the ability of future generations to meet their own needs";[2] which would not be possible without taking into account energy security. Energy security, defined by the IEA as "the uninterrupted availability of energy sources at an affordable price",[3] points out the necessity of optimizing use of limited resources and introducing of sustainable environmental, energy and material saving technologies. This includes the extraction and processing of raw materials, the creation of environmentally friendly products, minimization, recycling and destruction of waste and, most important, wider application of RES.

Global demand for RES is growing year-on-year. By 2050, the increase of their share in the global energy balance is projected increase by 35%. Theoretically, most of the Eurasian states have now introduced various alternative energy development programs. The reason for the constantly rising interest in renewable energy is its inexhaustible nature, immunity from price volatility on the world energy markets, and, most importantly, environmental safety. The main advantages of renewable energy sources – its limitless and environmentally friendly nature – has given rise to numerous research initiatives, which have in turn contributed to the rapid development of renewable energy in Europe and the USA, with strong expectations for its wider use in the coming decades.

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For the Central Asian republics, however, the current situation on the renewable energy arena looks quite different.

Kazakhstan: Energy sector development

Surrounded by Russia, China, and South Asian states, the Central Asian countries are the geopolitical highlight of Eurasia, making them both "a buffer and a passageway between East and West".[4]

Central Asia is a significant energy and natural resources producer, with the capacity to reduce the world's heavy reliance on Middle Eastern oil, thereby positioning the region as a center

2 International Institute for Sustainable Development (2016) *Sustainable development*. Available at: http://www.iisd.org/topic/sustainable-development (Accessed: 6 September 2016).

3 International Energy Agency (2016) *What is energy security?* Available at: https://www.iea.org/topics/energysecurity/subtopics/whatisenergysecurity/ (Accessed 2 September 2016).

4 Rywkin, M. (2005) *Stability in Central Asia: Engaging Kazakhstan, A Report On (With Policy Recommendations) U.S. Interests in Central Asia and U.S.–Kazakhstan Relations*. New York: National Committee on American Foreign Policy, p. 1. Available at: http://www.ncafp.org/articles/05%20Kazahkstan%205-05.pdf. (Accessed: 28 August 2016).

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of political, economic, and military interest. The region's political and economic development has been an object of keen scientific interest as a model of an effective post–socialist transformation. "Kazakhstan in particular and the Caspian basin in general comprised the de facto strategic petroleum reserve of the Soviet Union. Although discovered in the 1970s and 1980s, the large hydrocarbon deposits of the Caspian region remained practically unexplored until the mid-1990s. The giant Tengiz oil field was the only exception,"5 as the exploration there began in the late 1980s. Presently it still remains one of the five leading Kazakhstani offshore fields – along with Karachaganak, Mangistau, Uzen and Aktau – with estimated reserves of 750 million to 1.1 billion tons (6-9 billion barrels) of recoverable oil.6

With regard to the crucial role of the energy sector in Kazakhstan's economic development, the country is determined to develop this potential by promoting mutually beneficial cooperation with Western countries. This process began following the disintegration of the Soviet Union, and is ongoing.

The 1990s proved to be a difficult period for the oil sector due to extraordinarily low prices and, consequently, low profits for the oil and gas industries. With crude prices at about $10 per barrel, "in the wake of the Asian economic crisis, the landlocked republic's energy industry remained on the edge of self–sufficiency."[7] However, the situation changed when Kazakhstan signed the Lisbon protocol and joined the Strategic Arms Reduction Treaty (SART) in May 1992, affiliated to the Shanghai Five and later the Shanghai Cooperation Organization (SCO), and started more active cooperation with international partners. This entailed significant inflows of foreign investment.

Together with other Central Asian countries, Kazakhstan has managed to overcome a difficult transition, from part of the Soviet system to an independent state with a rapidly developing market economy open to cooperation and global partnerships. Abundant oil, gas and mineral resources mean that energy is a key element of the EU's June 2007 "Strategy for a New Partner-

5 Cohen, A. (2008) *Kazakhstan: The Road to Independence. Energy Policy and the Birth of a Nation*. Washington, D.C.: Central Asia–Caucasus Institute, p. 13.

6 Ak Zhaik (2015) *Kazakhstan to continue oil exploration in Caspian shelf in 2015.* Available at http://azh.kz/en/news/view/5326 (Accessed 10 November 2016).

7 Morse, E., Richard, J. (2002) 'The Battle for Energy Dominance', *Foreign Affairs,* 81 (2). Available at: http://www.foreignaffairs.org/20020301faessay7969/edward-l-morsejamesrichard/the-battle-for-energy-dominance.html/ (Accessed: 1 September 2016).

ship" with Central Asia, determining the priorities of successful partnership between the European Union and Central Asian states. According to observers, the EU's Central Asia strategy "explicitly acknowledges the significance of energy security and regional water cooperation for regional stability and global security,"[8] paying special attention to development of oil, gas and hydro-power resources, and sustainable development of the energy market.

Thus, the EU and Kazakhstan have been steadily developing their partnership. During the past 20 years, the EU has become Kazakhstan's top trading partner, as almost half of all exports from Kazakhstan are bound for the EU.

Gradually, the European Union has become Kazakhstan's most prominent foreign investor, as evidenced by the data presented in table 1.

Table 1. Largest foreign direct investment (FDI) countries in Kazakhstan[9]

Country	*Highest amount of foreign direct investment, in mln Euro*
Switzerland	648986.19 (688084.40 CHF million)
Netherlands	189388.00
Germany	140457.80
United Kingdom	113037.37 (82671.00 GBP million)
USA	40807.01 (46165.00 USD million)
Russian Federation	35487.47 (40147.00 USD million)
France	20881.00
Italy	14202.97

At present, Kazakhstan's geo-economic profile mainly focuses on the development of its energy resources. Table 2 gives an overview of the oil production in Kazakhstan from 2010 to 2015.[10]

8 Kramer, A. (2007) *EU Central Asia Strategy: Energy for New Human Rights*. Available at: http://www.ecc-platform.org/index.php?option=com_content&view=article&id=1086:eu-central-asia-strategy-energy-for-human-rights&catid=118&Itemid=158 (Accessed: 11 August 2016).

9 Invest (2015) *Kazakhstan Foreign Direct Investment 2001-2015*. Available at: http://invest.gov.kz/?option=content&section=4&itemid=75 (Accessed: 12 August 2016).

10 Trading Economics (2015) *Kazakhstan Crude Oil Production*. Available at: http://www.tradingeconomics.com/kazakhstan/crude-oil-production/ (Accessed: 12 August 2016).

Table 2. Oil production in Kazakhstan (B/D)

Year	2010	2011	2012	2013	2014	2015
Annual oil production in Kazakhstan, in barrel per day	1,540	1,608	1,514	1,572	1,716	1,778

The European oil giants, such as Agip/Eni, Shell Development B.V., British Petroleum, and TotalFinaElf, are collaborating on prospective projects such as the development of the Karachaganak and Kashagan fields.[11] Table 3 gives an overview of foreign investors' involvement in the development of Kazakhstan's major oil and gas fields.

Table 3. European companies' involvement in Kazakhstan's oil and gas industries[12]

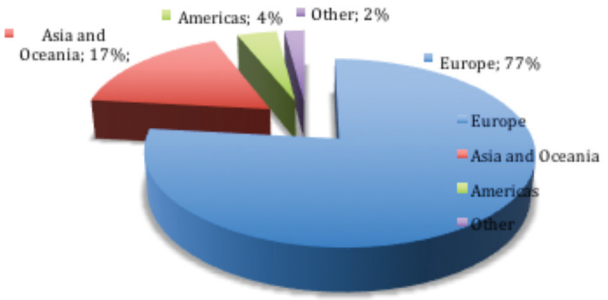
Company (country of origin)	*Field of Exploitation*
Eni (Agip) (Italy)	Karachaganak, Kashagan
Total E&P Kazakhstan (France)	Kashagan
Royal Dutch Shell (Great Britain - Netherlands)	Kashagan
British Gas (Great Britain)	Karachaganak
Repsol YPF (Spain)	South Zhambai
Petrom (Austria)	Tasbulat, Aktas
Maersk Oil (Denmark)	Dunga

11 Cohen, A. (2008) *Kazakhstan: The Road to Independence. Energy Policy and the Birth of a Nation*. Washington, D.C.: Central Asia–Caucasus Institute, p. 13.

12 ZP International LLP (2015) *Oil and gas companies of Kazakhstan*. Available at: http://zp.kz/en/25/29.html/ (Accessed 8 September 2016).

At present, Kazakhstan ranks third in the list of the EU's largest non–OPEC energy suppliers, after the Russian Federation and Norway. For Kazakhstan, Europe is the most important destination for its crude exports, as Figure 1 shows.

Figure 1. Kazakhstan's crude exports by destination[13]



Kazakhstan's limited access to sea ports increases its dependence on pipelines, which are necessary to transport its hydrocarbons to the global energy markets. The country also serves as a transit state for pipeline exports from Turkmenistan and Uzbekistan.[14] The present day pipeline structure partially explains the fact that Kazakhstan's "neighbors China and Russia are key economic partners, providing sources of export demand and government project financing."[15] Thus, this new geopolitical game in Central Asia is largely driven by energy production and the network of pipelines which serve as a gateway to the world's markets. The EU's interest can be explained by its desire to curtail Russia's influence on the European oil and gas market and to diversify its natural gas suppliers.

However, notwithstanding the apparent success of the development of Kazakh energy sector, there are a number of significant problems that require urgent action.

Kazakhstan's energy security policy: Problems and perspectives

Although Kazakhstan's growth as an important player in the global energy business helps drive its economic and

Although Kazakhstan's growth as an important player in the global energy business helps drive its economic and political development, this process also entails problematic consequences and challenges.

13 U.S. Energy Information Administration (2013) *Kazakhstan Analysis*. Available at: http://www.eia.gov/beta/international/analysis.cfm?iso=KAZ (Accessed 5 August 2016).

14 U.S. Energy Information Administration (2010) *Country Analysis Briefs, Kazakhstan*. Available at: http://www.eia.gov/emeu/cabs/Kazakhstan/pdf.pdf/ (Accessed 15 August 2016).

15 *Ibid*.

political development, this process also entails problematic consequences and challenges. One of those is pollution and the challenge of transforming its energy sector into an environmentally friendly and sustainable one. The country's energy-related carbon emissions have been considerable in the last years, as shown in table 4.

Table 4 Emissions, by sector in 2014-2015[16]

Sector Total	Number of Companies	2014 emissions (million tCO2)	2015 allocated carbon permits (millions)
Energy	60	93.4	92
Coal mining, oil & gas extraction	66	23.4	23
Industry	40	38.6	38
Total	166	155.4	166

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Kazakhstan's energy policy is set forth in a number of documents. One of the most important of these is the Kazakhstan 2050 Development Strategy (also called the "2050 Strategy"), announced on December 15, 2012 by President N. A. Nazarbayev. The strategy calls for far-reaching economic, social and political reforms, necessary to advance the country into the 30 most developed global economies by 2050. In this regard, energy security is one of the most important sectors.

If we regard energy security as "the uninterrupted availability of

16 International Emissions Trading Association (2015) *Kazakhstan: An Emissions Trading Case Study*. Available at: http://www.ieta.org/resources/Resources/Case_Studies_Worlds_Carbon_Markets/kazakhstan_case_study_may2015.pdf (Accessed 7 September 2016).

energy sources at an affordable price,"[17] availability of the required form of energy in the required amount at the expense of domestic resources, the main indices of energy independence can be formulated as:

- the adequacy and availability of primary energies for the needs of the economy;
- equipment with required capacity for the transformation of primary energy into other forms of energy;
- adequate transport infrastructure for each type of energy;
- environmental sustainability of production, development and consumption of energy.

Energy independence is the most efficient mechanism for ensuring the energy security of the country and guaranteeing energy sustainability in relation to external factors, and the most efficient way to attain this goal is addressing the RES.

Even though the RES are described as rentable and highly efficient in the Kazakhstan 2050 Development Strategy, energy security requires urgent action, as the region's consumption of resources is disproportionate to production.

The country has all the necessary conditions for renewable energy. It has the wind potential of more than 1 trillion kWh per year - one of the best in the world on UNDP rankings; strong hydropower potential; favorable sunny climate; favorable wind conditions (particularly in a wind corridor where the wind blows in one direction, such as Yereimentau and Zhuzymdyk, or periodically changing to the opposite, e.g. Dzhungarian Gate, Shelek, Kordai) for a wide use of the RES (see Table 5 for more data on prospective regions in Kazakhstan for wind power development) such as hydraulic energy, solar and wind energy. For example, hydraulic energy potential is estimated at more than 160 billion kWh.[18] However, oil and gas still remain the most sought-after energy sources. It is obvious that the area is in need of development, and RES policy must be improved in order to introduce a

17 International Energy Agency (2016) *What is energy security?* Available at: https://www.iea.org/topics/energysecurity/subtopics/whatisenergysecurity/ (Accessed 2 September 2016).

18 Computation and Finance Center of Support of Renewable Energy Sources (2016) *Renewable energy sources possibilities in Kazakhstan*. Available at: http://www.rfc.kegoc.kz/vozmozhnosti-vozobnovlyaemyx-istochnikov-energii-v-kazaxstane/ (Accessed: 7 September 2016).

new and more effective energy model, ensure diversification of power generation technology base, eliminate the energy deficit, and address the acute environmental problems.

Table 5. Prospective regions for wind power development in Kazakhstan[19]

Location of potential wind farms	Region	No. wind generators	Projected installed capacity [MW]	Annual production [billion kWh]
Mangystau mountains	West	8,000	210	0.4
Peak Karatau	South	7,800	190	0.23
Chu-Ili mountains	South	6,800	180	0.27
Mount Ulutau	Central	3,400	90	0.13
Yerementau mountains	Central	2,100	50	0.01
Mugojary mountains	West	400	10	0.01
Dzhungarian gates	South	1,100	200	0.66
Total		29,600	930	1,71

RES are particularly rich in the southeast of Kazakhstan, which is located far from traditional energy sources, such as deposits of coal, oil and gas. The region's remoteness means that it is reliant on time-consuming transportation, and so there is significant scope to develop the renewable energy market in the region. Potentially, environmentally friendly energy sources of southern Kazakhstan could not only sustain the domestic market, but also be exported to neighboring countries, such as China, which is experiencing growing demand for electrical energy.[20]

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However, the region's enormous renewable energy potential is seriously underdeveloped. One of the main reasons for this is the insufficiency of electrical and mechanical engineering production in Kazakhstan, which hinders the

19 Karatayev, M. Clarke, M.L. (2014) 'Current energy resources in Kazakhstan and the future potential of renewables: A review: European Geosciences Union General Assembly', *Energy Procedia*, 59, pp. 97 – 104.

20 Kazakhstan 2050 (2016) *Renewable Energy development in Kazakhstan is profitable and favorable*. Available at: https://strategy2050.kz/ru/news/1567/ (Accessed 3 September 2016).

construction of wind and solar energy production centers, small and medium-sized hydroelectric power stations on the mountain rivers of the Trans-Ili and Dzhungar Alatau, and makes it impossible to attract investments in this sector, Serial production of electrical equipment and turbines would make construction and energy production significantly cheaper and more affordable.[21]

Another reason for the slow pace of RES development in Kazakhstan is the fact that despite the clear potential for renewable energy development, there are considerable barriers in the sector, such as "low electricity tariffs; transmission losses and inefficient technologies; weak regulatory and legal frameworks to stimulate the use of renewable energy in the electricity sector; persistent governmental body reforms; inadequate levels and quality of scientific support; awareness and information barriers; and a high-risk business environment."[22]

Thus, the successful production of renewable energy in Kazakhstan would be possible only with the development of the country's own industries and related technologies.

Conclusion

The Republic of Kazakhstan has rich and abundant natural resources, including considerable supplies of quantities oil and natural gas, coal and uranium, as well as a high potential for RES use. The last two decades have seen significant economic growth, which has resulted in "an increase in primary energy consumption and a growing electricity demand", while domestic energy needs are still covered by the coal consumption. A surge in the electricity expenditure together with the growing need to overcome urgent environmental problems and to enhance energy security have contributed to public concerns and interest in expanding alternative energy use. Kazakhstan undoubtedly has the "necessary natural, climatic, and economic conditions to develop sustainable bioenergy solutions"[23], as well as wind power, hydro and solar resources.

Since almost a half of the population of Kazakhstan lives in ru-

21 *Ibid.*

22 Karatayev, M. Clarke, M.L. (2016) 'A review of current energy systems and green energy potential in Kazakhstan', *Renewable and Sustainable Energy Reviews,* 55, pp. 491–504.

23 Karatayev, M. Clarke, M.L. (2016) 'A review of current energy systems and green energy potential in Kazakhstan', *Renewable and Sustainable Energy Reviews,* 55, pp. 491–504.

ral areas (46.71% of total population as measured in 2014),[24] "small-scale renewable decentralized energy systems"[25] suggests that there is potential for reducing the heavy dependence on oil, coal and gas, which would considerably boost economic growth. Nonetheless, these measures can be adopted only with the aid of the government, and flexible regulatory support on all levels. "Longterm feed-in tariff must be approved with grid access guaranteed"[26] together with the active involvement of local and foreign investors; RES development requires significant financial inflow, and mass media must be mobilized into order to increase public awareness. These policies and technologies, adopted with stable governmental support, will help reduce dependence on fossil resources, increase the RES use and further development, and, consequently, raise the country's energy security to a completely new and more efficient level.

Thus we come to the conclusion that Kazakhstan's energy security policy can benefit in certain ways by introducing the RES on a larger scale, as this would contribute greatly to reducing the country's high reliance on fossil fuels. The increased use of RES is crucial for ensuring better economic and environmental sustainability and energy security. Nonetheless, it is necessary to consider the fact that a successful long-term energy policy can be achieved only through successive measures taken by the government and the introduction of new "green" technologies aimed at limiting consumption of non-renewable natural resources and introducing a larger-scale RES-based energy production. This would provide Kazakhstan with increased energy security in the "complex interdependencies and geopolitics of the Central Asian Energy Game."[27]

24 Trading Economics (2014) *Rural Population (% of Total Population) in Kazakhstan*. Available at: http://www.tradingeconomics.com/kazakhstan/rural-population-percent-of-total-population-wb-data.html (Accessed 20 August 2016).

25 Karatayev, M. Clarke, M.L. (2016) 'A review of current energy systems and green energy potential in Kazakhstan', *Renewable and Sustainable Energy Reviews,* 55, pp. 491–504.

26 *Ibid*.

27 Garrison, J.A., Abdurahmanov, A. (2011) 'Explaining the Central Asia Energy Game: complex interdependence and how small states influence their big neighbours', *Asian Perspective*, 35, pp. 381-405.