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ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
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ВЕСТНИК

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

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NAS RK is pleased to announce that Bulletin of NAS RK scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of Bulletin of NAS RK in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential multidiscipline content to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы "ҚР ҰҒА Хабаршысы" ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Web of Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабаршысының Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді мультидисциплинарлы контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Вестник НАН РК» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Вестника НАН РК в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному мультидисциплинарному контенту для нашего сообщества.

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MAIN APPROACHES OF THE SUPPLEMENT OF ENERGY SECURITY IN CENTRAL ASIAN COUNTRIES

Abstract. The article provides a general description of the energy sectors in Central Asia, which were created under a single system in which each State had an influence on each other's energy security, and together they ensured the uninterrupted supply of energy resources, both for the population and for economic needs in general. A unified system involves balancing the energy interests of all countries. Reaching consensus in Soviet times did not seem to be a problem, as there was a single political center. With the independence of the countries of Central Asia, the format of relations within the framework of the Central Asian Energy System (CAES) was changed, as States prioritized the creation of independent energy systems. Over the past two decades, regional energy cooperation among Central Asian countries has been largely ignored. However, the analysis shows that the growing threats to energy security will force the leaders of the countries to reconsider their energy policy. Mitigating the possible effects of the energy crisis and ensuring a smooth transition to the energy independence of each country will require a consolidation of efforts in the energy sector. The growing problems of energy security and the lack of real prospects for the implementation of major regional projects have led Central Asian leaders to seriously consider the possibility of restoring intraregional energy trade.

Key words: energy security, energy resources, electricity, hydropower, oil pipeline, refining capacity, refinery, geopolitical changes, escalation of threats, regional cooperation.

Central Asian countries are very rich in energy resources however the current situation is still characterized by steady load growth and untapped energy in some countries and inefficient use of regional energy resources. Key concern is energy security. Evidence suggests that by 2035, energy security will notably decrease in Central Asia as domestic resources will meet less than 50 percent of annual average needs. This presents new challenges for the region to search for renewable energy solutions considering their vast potential for increasing deployment. This two-day intensive workshop, comprising of interactive lectures and group discussions, aims to examine the role of renewable energy in promoting energy security in Central Asia. It also aims to improve understanding of various policies, regulatory, technical and financial aspects of renewable energy deployment, including key challenges and opportunities for increasing uptake of renewable energy in the region.

After the disintegration of the Soviet Union, Russia inherited the infrastructure that Central Asian states needed to transport energy out of the region creating excessive dependence on the Russian pipeline network and energy market. In the 1990s, the Central Asian states continued to barter energy with each other and Russia, in almost the same way as they did in the unified Soviet energy system. However, regional energy exporters' dissatisfaction with the conditions of the energy trade dictated by Russia and the willingness of other external customers to invest in the construction of alternative pipeline networks transformed the relationships among state actors within the Central Asian energy system (CAES), which consisted of Central Asian Power System (CAPS) and natural gas pipeline networks. Shifts in the regional

gas trading dynamics also affected electricity export/import relations among Central Asian upstream and downstream countries. As a result, two interlinked levels of relationships emerged that affect energy security of the Central Asian states: first, energy supply relations within Central Asia; and second, energy export/import between Central Asian producers and external customers. The latter perfectly lines up with the energy export diversification policies, which are being prioritized, to different extents, by all Central Asian states. However, limited research has been conducted on possible pitfalls of those energy policies. In this regard, the paper aims to analyze the impact energy export diversification policies have on the governments' ability to ensure energy security in their respective countries.

There is no universal definition of energy security within the region. The measures needed to address those challenges also vary. While some scholars recommend the diversification of energy sources and suppliers, building strategic storage reserves, establishing a country/region-wide energy infrastructure and flexibility to shift fuels, 1 others expand the list and include high-quality and timely information sharing, collaboration among energy actors, investment flows, research, and development. Within the landlocked Central Asian region, energy security is fragile due to the unreliability of suppliers. The diversification of export flows between energy actors is often perceived as the best way to ensure stability and reliability of energy supplies. Yet, by pursuing policies to increase energy export capacities, some Central Asian states - Kazakhstan and Turkmenistan - affect their own energy security, while others - Uzbekistan, Tajikistan and Kyrgyzstan - compromise regional energy interactions, which eventually leads to energy insecurity for all.

Energy security is closely related to the availability of natural resources for energy consumption. Surprisingly, resource-rich countries also experience energy insecurity because they overly depend on their natural resources, which could make them vulnerable to energy price shocks. Many developing countries in Central Asia have this problem. Strengthening energy security by diversifying energy sources to include alternative green resources has therefore become crucial.

However, two barriers hinder the development of renewable energy projects. First, major renewable energy projects have a lower rate of return than fossil fuel energy projects. Second, many banks and financial institutions are reluctant to lend to renewable energy projects, considering them risky. Technological progress is required to reduce electricity generation costs and increase the rate of return. Alternative financial solutions such as non-bank financial institutions, carbon taxation and the use of tax income, issuance of green bonds, community-based financing, fintech, and so on are also needed.

Kazakhstan also involved private foreign ownership in the oil sector by selling off the majority of shares of Kazakhstan's state oil company. Initially, the government created a state holding company - KazMunaiGas - to oversee oil enterprises inherited from Soviet production in the Caspian basins until foreign companies could take over. Where Azerbaijan's government strengthened SOCAR, the Kazakhstani government did not convert KazMunaiGas into a full-fledged NOC, but rather it sold off its assets to foreign companies.

In October 2008, Kazakhstan's government reached an agreement with a number of foreign companies to form the new joint operating company North Caspian Operating Company (NCOC). This consortium includes equal shares to Royal Dutch Shell, Exxon Mobil, TOTAL, ENI, Kazakhstan's KazMunaiGas, with smaller shares going to other partners such as ConocoPhillips and INPEX. NCOC became the operator of assets formerly held by Agip Kazakhstan North Caspian Operating Company NV (Agip KCO), notably the giant Kashagan field. Smaller petroleum companies have stakes in a variety of Kazakhstan's energy assets. While the NOC KazMunaiGas holds minority positions in some of these assets, Kazakhstan has the most privately-owned assets in the Caspian region.

The largest and most promising deposits are located in the western part of the country, in the Caspian Sea area. Oil production in Kazakhstan (mainly condensate) in 2012 reached 79.2 million tones - below the expectations of the Ministry of Oil and Gas who forecasted the culminative total of 81 million tons a year before. The projected totals could not be met due to problems with the operation of the Tengiz field, and delays in launching the Kashagan field. More than 68.6 million tons were directed for export. In 2013, the authorities expect an output of 82 billion tones. The most important deposits on the map of those which have already begun oil production, are located in the hinterland: these are the fields Tengiz, Aktobe, Karachaganak, Uzen and Mangistau.

Since Kazakhstan has no infrastructure by which it can independently export through deep-sea ports, the dynamics of the development of oil transmission pipeline networks and the directions of export and

transit of hydrocarbons through its territory are crucial for its economic well-being and geo-political position. The growing importance of directions, alternative to Russian and which allow safe passage to the final recipient, can be observed especially in the export of oil. Individual transport threads maintain separate dynamics and political significance.

Turkmenistan and Uzbekistan are unique among resource-rich Soviet successor states in that they retained the ownership structure inherited from the Soviet Union-maintaining state ownership with control and discouraging foreign involvement. After declaring independence in 1992, the presidents of both countries asserted that the right to develop petroleum resources belongs to the state and formed fully state-owned oil and natural gas companies. In Turkmenistan, President Niyazov formed Turkmengaz and Turkmenneft for natural gas and oil, respectively, while President Karimov of Uzbekistan formed Uzbekneftegaz to manage both resources.

Turkmenistan's government launched a ten-year development plan in 1993 to become a "second Kuwait" but restricted the ability of foreign companies to invest in the sector, except for joint venture (JV) contracts with some companies. Heavy restrictions resulted in limited development of Turkmenistan's energy resources, particularly in offshore fields. Dragon Oil, an independent company headquartered in the United Arab Emirates, operates the Caspian offshore Cheleken contract area. Other NOCs such as the Chinese National Petroleum Company (CNPC) and Malaysia's Petronas have invested in Turkmenistan energy assets but do not have significant ownership shares.

Most of Turkmenistan's oil reserves are located offshore or in the Garashyzlyk area west of the country. Turkmenistan's government has been developing the offshore Cheleken project since the mid-1990s, which it has opened up to some foreign investment, including UAE's Dragon Oil. Proved and probable reserves in the contract area are around 3 million bbl of oil and 3 Tcf of natural gas. Dragon Oil exported MMbbl in 2011 from Turkmenistan's sector, with most of it going through Azerbaijan to be sold to world markets.

Because it is landlocked, Turkmenistan generally focuses on exporting natural gas through pipelines rather than as liquefied natural gas (LNG). The country received significant investment for gas field exploration in the 1980s, making it the Soviet Union's then second-largest supplier of gas. Turkmengaz operates the country's two largest fields, Dauletabad and Malai, which are oriented towards exports and account for the majority of the country's production.

The British company Gaffney, Cline, and Associates carried out the first independent audit of Turkmenistan's gas reserves in 2008 and 2009. Their report suggested that the country contains the world's fourth largest natural gas field, the South Yolotan-Osman, which was renamed Galkynysh in 2011. Turkmenistan's national gas company Turkmengaz controls onshore gas production and has limited access to international companies. In 2007, CNPC signed a production-sharing agreement with Turkmen authorities to develop natural gas fields in eastern Turkmenistan, as well as potentially exploring the Galkynysh field.

When the Soviet Union collapsed in 1991, all Turkmen gas was exported via Russian pipelines until the 200-kilometer Korpeje-Kordkuy pipeline connecting Turkmenistan and Iran opened in late 1997. That pipeline has a capacity of 8 bcm but has rarely pumped more than 6.8 bcm, leaving Turkmenistan largely dependent on Russian pipelines until a new Turkmenistan-China pipeline (capacity 40 bcm) was opened last month.

When 2009 started, Turkmenistan had contracts to sell 50-60 bcm of gas to Russia (it only amounted to a bit more than 11 bcm due to an April explosion that closed the pipeline to Russia) and 8 bcm to Iran annually. Russian-Turkmen bickering over the price for Turkmen gas and responsibility for the pipeline explosion finally ended last month when the two countries' presidents met in Ashgabat. But the new contract calls for 30 bcm of Turkmen gas, not 50 bcm.

Nader Devlet, a professor of international relations at Istanbul Trade University, tells FE/RL's Turkmen Service the launch of the new pipeline to Iran is well-timed, since it demonstrates Turkmen gas can be exported in different directions.

With the opening of the Dovletabat-Sarakhs-Khangiran pipeline, Turkmenistan starts 2010 with contracts to sell some 40 bcm to China, 30 bcm to Russia, and at least 14 bcm to Iran.

And Turkmenistan is partially compensated for the reduction in exports to Russia by the new exports to Iran. The gas for the new pipeline to Iran comes from the same field, Dovletabad that Turkmenistan has been using to supply Russia.

Iran boasts the second-largest gas reserves in the world, but its dependence on gas for half of its energy needs opens the way for trade with Turkmenistan, which has the world's fourth-largest reserves.

The importance of maintaining good trade relations with Ashgabat was exposed in early 2008, when a brief spat over prices led to a halt of Turkmen gas imports and left large areas of northern Iran without heat and electricity during an especially harsh cold spell.

Uzbek authorities believe that Uzbekistan is among the few countries in the world that have sufficient energy supplies to meet their energy demands. T.P. Salikhov from the Institute of Power Engineering and Automation in Tashkent argued that Uzbekistan achieved self-sufficiency in fuel in 1995 and became fully self-sufficient in energy resources in 1996-1997. Guided, in part, by the belief of self-sufficiency, Uzbekistan withdrew from the CAES and signed a number of agreements on exporting natural gas and electricity to external markets. However, despite that claim, energy security challenges that Uzbekistan is currently facing prove that the operation of its energy system in isolation mode has its cost. Uzbekistan does not rely on energy imports, but the country has never reached energy self-sufficiency. On top of that, having prioritized export of energy resources, Uzbekistan is negatively affecting the level of its energy security. Uzbekistan is a major fossil fuels producer in Central Asia. Uzbekneftgaz, a state-owned oil and gas company, estimates 60 percent of Uzbekistan's territory has a potential for oil and gas extraction. Total primary energy production matches the consumption level in Uzbekistan. Natural gas constitutes the major part of primary energy production.

Toby Shelley stressed, that "Uzbekistan is one of the largest natural gas producers, and consumes almost all the gas it produces, as 85% of its primary energy consumption comes to gas. Over 90 percent of all electricity in the country is generated on Thermal Power Plants (TPPs). The largest share of thermal electricity production is accounted by the gas-fired thermal power plants" [1]. So Uzbekistan consumes almost as much gas as it produces, which means that any initiative to increase gas or electricity export to external customers will come at the expense of domestic consumption. But why would Uzbek authorities pursue energy export oriented policies, when the country suffers from insufficiency of energy supplies for domestic needs?

Bilaal Abdullah is sure, that "Domestic gas consumers in Uzbekistan receive gas for discounted prices, which is 4 to 5 times lower than the price paid by importers. The country's gas sector alone is subsidized by almost US$10 billion annually [2]. Subsidies in the energy market are negatively affecting the economy, but Uzbek authorities will most likely preserve subsidies in the gas sector, as the price increase may cause social unrest among the population. And increasing gas export, to some extent, will continue to cover up the economic loss in the highly subsidized gas sector of Uzbekistan. However, it is not an issue of survival, but rather the question of sufficient gas and electricity supplies to meet economic needs and the population's needs in the foreseeable future that constitutes the core of energy security of the country. Electricity blackouts and gas supply shortages are indicators of energy security challenges that Uzbekistan has to deal with.

Paul Roberts insists, that "Over the past decade Uzbekistan has been exporting approximately 10-15 billion m3 of gas to Russia6 and 4.5 billion m3 to the Central Asian region" [3]. The leaders of Uzbekistan and China also agreed to reach and maintain the annual export volume of 10 billion m3 through the Line-C of the Central Asia China gas pipeline (CAGP), which was launched in 2015. However, outdated and inefficient natural gas transportation systems, growing internal energy demand, and the fact that no major natural gas reserves have recently been developed are indications of Uzbekistan's physical incapability to increase its gas export capacity. Because the power sector of Uzbekistan is also dependent on gas- fired TPPs, it would be naïve to rely on Uzbek electricity exports. In 2015, Uzbekistan produced 55.5 billion kWh of electricity and exported 1.3 billion kWh. Despite the extensive production volume, high technical losses do not allow Uzbek consumers to enjoy reliability and stability of electricity supplies. Export-oriented energy policies might even worsen energy insecurity in the country.

Within the unified energy system Uzbekistan enjoyed energy leverage over its upstream neighbors, which was compromised when parties decided to diversify energy export routes. Uzbekistan decreased the volume of gas supply to Kyrgyzstan from 800 million m3 in 2000 to 270 million m3 between 2013 and 2016. Tajikistan is currently completely cut off the Uzbek gas supply chain. Due to disagreements over the price for gas with the neighboring Tajikistan and Kyrgyzstan, Uzbekistan decided to redirect its export to China. By depriving neighboring Kyrgyzstan from access to Uzbek gas, the government of Uzbekistan

pushed Kyrgyz authorities to make a radical move, which, in its turn, weakened Uzbekistan's positions in the price bargaining and negotiations. In 2014, Kyrgyzstan sold its entire gas sector to the Russian Gazprom, hoping that Russia would serve as a mediator in the negotiations with Uzbekistan and gas imports would be restored. Uzbek gas supplies were indeed restored.

Jahangir Amuzegar wrote: "However, for Uzbekistan it is more difficult to promote its interests vis-a-vis Russia than dealing with Kyrgyzstan directly. And, Kyrgyzstan basically lost control over its strategically important gas sector. In this regard, having enjoyed a strategic location on the crossroad of energy-transporting corridors within the region, Uzbekistan's decision to leave CAES severely affected the energy security of the most dependent on it, upstream Tajikistan and Kyrgyzstan. Being cut off stable Uzbek energy supplies, Central Asian upstream countries also started establishing independent energy systems and are launching export-oriented policies, which have led to water-energy nexus controversies among regional state actors" [4].

Tajikistan possesses tremendous hydropower potential, which accounts for 4% of the world's total. Despite the fact that 98% of the power production in the country comes from HPPs, they (the HPPs) deliver only 17 billion kWh out of 527 billion kWh hypothetically possible.10 Exploiting this potential could significantly contribute to the sustainability of the energy sector not only in Tajikistan, but also in other Central Asian states, by providing large quantities of relatively inexpensive and "green" electricity. Yet, the seasonal variation of power production, outdated electricity producing facilities and insufficient power production capacities pose major obstacles for securing reliable and adequate energy supplies for domestic needs all year round. At the same time, export- prioritized energy policies further threaten Tajikistan's energy security. Energy security policies of the country imply ensuring energy independence by connecting hydropower rich regions (southern) with energy thirsty northern regions, which were previously connected to the CAPS. New energy policy of the country aims to meet energy needs of the population year-round to boost economic development and increase power export capacity.

Tajikistan annually generates around 17-18 billion kWh of electricity. The consumption volume, however, accounts for 22-24 billion kWh. Thus the overall deficit accounts for 5 billion kWh. Only in summer the country produces a surplus of 1.5 billion kWh. Tajikistan exports electricity to Kyrgyzstan and Afghanistan. Currently, the largest electricity market for Tajikistan is Afghanistan. There are a number of deficiencies in Tajikistan's electricity export diversification policies. Tajikistan itself suffers from a critical shortage of electricity supply in the winter period, during which the electricity demand exceeds the supply capacity by around 25%. According to the United Nations Development Programme report, more than 1 million people suffer from frequent and prolonged blackouts each winter in Tajikistan. The World Bank highlights that 70 percent of the population that suffers from electricity shortage during winter. Within the CAES Tajikistan exported power in summer in return for Uzbek electricity and gas imports in winter. Currently, however, Tajik authorities supply electricity to external markets without the possibility to compensate domestic winter shortages with imports.

Aging power generation facilities are no longer capable of generating electricity to the extent that they were initially designed to. Regardless of decreasing power generating capacities, Tajikistan increases the export of electricity to external markets, thus further threatening energy security of the country.

The Rogun HPP in Tadjikistan, located 110 km from the capital, will consist of 6 aggregates of 600 MW capacity each. Authorities plan to commence the first aggregate already by 2018 and the second one in 2019. July 1, 2016, Tajikistan signed an agreement with the Italian company Salini Impregilo on the construction of Rogun for US$3.9 billion. The Vaksh River was blocked to accelerate the construction process on October 29, 2016. Rogun is expected to be fully constructed in 14 years. The Tajik government expects the Rogun HPP to serve three major purposes: produce electricity in wintertime; increase electricity export capacities; and improve water management. Tajikistan, like any other country in the region, has a right to increase electricity exports to generate revenue. Moreover, improved water management is in the interests of both upstream and downstream countries. However, only increased electricity production in winter can improve energy security in the country. Rogun can increase summer and to some extent winter electricity production. Electricity that is generated in winter is intended for export mainly. However, exports cannot guarantee wintertime gas and thermal electricity imports from the neighboring states. Also, money has always been a major obstacle for the Rogun project. Tajik authorities already declined investment offers that were not serving the country's national interests. Tajikistan

attracted the new Italian contractor for the construction of the dam, but its financial aspect has not been entirely resolved yet.

Kyrgyzstan also enjoys extensive potential for hydroelectricity production. The production capacity, however, is limited because of the aged energy infrastructure and inability of the government to introduce additional production capacities on the trans boundary Syrdarya River without the consent of littoral states. Energy policy priorities, which are linked to Kyrgyzstan's electricity export- diversification interests primarily focus on: increase power production capacity by further developing hydropower potential; Upper Naryn cascade could increase production capacities up to 942.4 million kWh; generate more electricity in the summer period, which would allow Kyrgyzstan to export electricity to Kazakhstan, Uzbekistan, and South Asian countries; introduce major power generating capacities, particularly in the winter period, build large HPPs (Kambarata-1) and/or build coal-fired Kara- Keche TPP, for both domestic and external needs.

Kyrgyzstan has the potential to annually produce up to 142.5 billion kWh of hydroelectricity. Power production facilities of Kyrgyzstan, however, are outdated and the electricity generation is insufficient to meet both domestic and external demands. Currently, the largest amount of electricity production is realized at the HPP cascade in the Toktogul reservoir. Toktogul HPP has a capacity of 1200 MW and covers one-third of the total installed power capacity of 3786 MW. Despite the fact that 19.5 billion m3 capacity of the Toktogul water reservoir allows Kyrgyzstan to export a significant volume of electricity, it rarely accumulates enough water to produce electricity in winter, because in summer most of the water is being released to meet the power needs. In 1990, Kyrgyzstan exported 4 billion kWh to Kazakhstan and Uzbekistan in summer and, in return, imported 3.2 billion kWh of electricity from Uzbekistan (2.2 billion kWh), Kazakhstan (650 million kWh), Tajikistan (245 million kWh), and Turkmenistan (250 million kWh) in winter. However, later Kyrgyzstan's power production capability has been altered. During dry years Kyrgyzstan is not capable of producing and, as a result, exporting electricity. The inability to export electricity during the dry years of 2008-2009 and 2014-2015 to Kazakhstan and Uzbekistan compromised the energy security of the country. The country lacked revenues that were meant for fuel needed to run TPPs.

On October 1, 2014, the water volume in Toktogul accounted for only 11.9 billion m3, which was 4 billion m3 less compared to the same period of the previous year. Kyrgyzstan was forced to import 400 million kWh of electricity from Kazakhstan in 2015. In July 16, 2016, the water volume in Toktogul increased up to 15 billion m3, which was 4 billion m3 more compared to the same period of the previous year, allowing Kyrgyzstan to export electricity to Kazakhstan. The power export of the country is highly dependent on a single major source of water supplies-the Syrdarya River. The stream stage in the river, according to different scenarios, is expected to drop by 10-30% already in 2030.

With the declining water availability, Kyrgyzstan's export capacity will also decrease. Prioritizing electricity export may result in insufficient power supplies for population needs, which account for 63 percent of the overall consumption, both in summer and wintertime.

Export-oriented hydropower or energy security-focused thermal power Kyrgyzstan's electric power sector consists almost completely of water run-of-river type HPPs, which can generate electricity mostly in summertime. The only HPP capable of generating electricity in winter is Toktogul and the projected Kambarata-1. Yet to produce electricity, Kambarata-1 would require accumulating a large volume of water, which could lead to water supply shortages for downstream countries. Political pressure from the downstream countries forces Kyrgyz authorities to release water during the vegetation period and to produce more electricity in summer turning the country into a major exporter, yet the one incapable of meeting its winter energy demands. To meet its winter electricity needs, the Kyrgyz government has to either develop its own limited fossil fuel potential or build TPPs or to secure stable thermal electricity import from the neighboring states. The Kara-Keche coal-fired TPP is considered to be one of the most promising projects to ensure electricity supplies in the northern parts of the country. Kara-Keche TPP's technical and economic feasibility was studied back in 1979-1983 and, according to some estimates, has a higher electricity production coefficient than any other hydropower generating facility, including Kambarata-1.

Kara-Keche project is cheaper than large HPPs and thus should be more attractive. Adding 1 kW of new power capacity costs around US$ 1,500 in TPPs. The cost of 1 kW of hydropower is approximately US$ 2,000. The construction of Kamabarata-1 will cost Kyrgyzstan US$ 5.2 billion. With a capacity of 1900 MW, 1 kW will cost US $2,700 to the government of Kyrgyzstan. Ernest Karibekov, former head of the Research Institute for the Central Asian Water and Water-Energy Resources Problem Studies, believes that financial concerns will push the construction of Kambarata-1 for another two decades. To return US$ 5.2 billion in investments, this plant will have to operate fully, selling electricity for 8 cents per kWh. Kyrgyzstan now exports electricity for around 4 cent per kWh along with the water supply.

Currently, energy policy priorities of Kyrgyzstan focus on mitigating the energy crisis and increasing the production capacity to the point when the country stops being dependent on power imports from the neighboring states. For the construction of a large HPP, Kyrgyzstan has to rely on external funding. The Russian company RusHydro was supposed to build 4 HPPs in the Upper Naryn cascade to increase production capacity up to 942.4 million kWh, but the agreement was denounced on August 10, 2016. In this regard, Kyrgyzstan has to focus, to a large extent, on energy security projects and concentrate less on initiatives designed to diversify export routes.

Guided partially by the belief of self-sufficiency, Uzbekistan decided to withdraw from the CAES and to redirect gas and electricity exports to external markets. Due to its strategic location on the crossroad of energy-transporting corridors within the region, this decision affected the overall security of the CAES. Energy supply cuts, in combination with highly subsidized and inefficient energy sectors, the under-developed renewable energy sector, a lack of countrywide electricity transmission and gas supply net-works, as well as disagreements over the water withdrawal balance have severely affected the availability and affordability of energy supplies in Central Asian upstream countries and sustainability and efficiency in downstream states.

Designed to ensure electricity supply to meet peak demand in winter, there is no guarantee that the Rogun and Kambarata-1 HPPs will not be extensively used for export purposes. Currently, there is a surplus of electricity production in Tajikistan and Kyrgyzstan and it is argued that CASA-1000 is supposed to transport it to southern neighbors. Afghanistan and Pakistan are mostly in need of electricity import in winter and both Rogun and Kambarata-1 can provide it. In this sense, Kyrgyzstan and Tajikistan may decide to increase export of electricity even at the expense of domestic consumption. The possibility of exporting electricity in wintertime will make Rogun and Kambarata-1 economically attractive projects, but with a limited contribution to energy security. This does not mean that Tajik and Kyrgyz authorities should give up trying to implement these projects. Given their interest in generating extra revenue, they most likely will not do so in any case. What it means, though, is that the contribution of these projects to each country's energy security might be limited and even damaging for Central Asian states.

General schemes of Rogun and Kambarata dams were designed in Tashkent (Uzbekistan). Working in the water mode to primarily release water for irrigation purposes in the downstream countries, Nurek, the largest HPP in Tajikistan, was never capable of accumulating enough water to produce a significant volume of electricity in winter. Toktogul HPP, with the capacity to potentially accumulate enough water to produce electricity any time of the year, mostly generated electricity in the summertime. In the 1990s, to keep the water mode functioning, Central Asian countries signed a number of agreements, according to which downstream states were ensured stable water supply for irrigation purposes. In exchange, Central Asian upstream countries received natural gas, oil products, and thermal electricity in wintertime to meet their energy demands.

Michaels, Robert J. noticed: "However, when Uzbekistan withdrew from the CAPS and it was no longer possible to ensure coordinated operation of the unified electric power system, Tajikistan and Kyrgyzstan decided to turn the water mode of operating HPPs into the energy mode focused on producing as much electricity as possible whenever there was a need" [5]. Both Tajikistan and Kyrgyzstan, having experienced the deficiency of gas and winter electricity supplies, transformed their energy sectors first to meet their needs and second to significantly increase electricity export capacity. Currently, Tajikistan and Kyrgyzstan are physically incapable of accumulating a large amount of water to produce electricity both in summer and winter. When Uzbekistan withdrew from the CAES, Tajikistan was left in complete isolation. With no possibility to export electricity, both Tajikistan and Kyrgyzstan had to spill water.

Tajikistan, for instance, consumes 10-11% of water from Amudarya, when it is entitled to over 15%. The governments of the Central Asian upstream countries are counting on the Rogun and Kambarata-1 dams to increase their ability to accumulate more water and generate more electricity for both domestic consumption and export purposes. Operating those facilities in the energy mode prioritizing energy production, in an attempt to increase power production to further increase the export capacity, will most likely escalate existing tensions over management of water resources.

Oleg Chervinskiy madr the conclusion, that "In the long term, Kazakhstan aims to diversify energy sources in the consumption balance. The country's short-term goal, however, is to diversify its energy export routes, primarily for oil and gas. This lines up with the Multi-vector Foreign Policy adopted by the government. Yet, moving energy resources out does not directly contribute to the energy security of the country and as the analysis shows, to a certain extent, negatively affects stability and reliability of energy supplies for domestic consumers" [6]. There are a number of key energy policy priorities for Kazakhstan identified by the government. Kazakhstan's current energy policy priority is to secure external demand and to draw profit from energy export. Second, to reduce its dependence on unreliable neighboring Uzbekistan and Kyrgyzstan, Kazakh authorities have been strengthening its independent and self-sustaining energy system. Third, newly adopted programs aim at introducing large-scale renewable energy generating capacities. Fourth, while Kazakhstan attempts to limit the extent of energy cooperation with the neighboring Central Asian states, in which the former is more vulnerable, recent events highlight that such dependency is largely unavoidable in the short to medium term perspective.

Kazakhstan has an export-oriented economy and is highly dependent on shipments of oil and related products (73 percent of total exports). At the same time, Kazakhstan has very limited options for its oil export diversification policies. Despite the fact that Kazakhstan has access to the Caspian Sea lanes, oil export is largely covered by pipeline networks. Around 85% of Kazakh oil reaches the highest paying European customers. Kazakhstan exported over 64 million tons of oil through the Atyrau-Samara pipeline, Caspian Pipeline Consortium, Atasu-Alashankou pipeline, and Aktau sea port in 2014 and almost the same volume of oil in 2015. And, most of that oil is being delivered via pipeline systems, which are controlled by Russia. Kazakhstan, to some extent, reduced its dependence on the Russian corridor by engaging in the trade of oil with China through the Kazakhstan-China oil pipeline. This pipeline allows Kazakhstan to supply 20 million tons of oil to China annually.

However, Kazakhstan-China oil trade never required the pipeline's full capacities. In case the demand for Kazakh oil decreases in the European market, Kazakhstan will be able to redirect it to China. Meanwhile, due to commitments to supply an agreed volume of oil to the European consumers, Kazakhstan fails to reduce its dependence on the Russian pipeline networks [7].

In the Concept of the Development of Gas Sector of Kazakhstan until 2030 noted, that "The Development of the domestic gas sector in Kazakhstan is linked to the oil sector development, which is very much export-oriented. The Government prioritizes oil exports over developing the gas sector, which would increase the production capacities significantly" [8].

The negative consequences of excessive dependence on the Russian pipelines, Central Asian exporters started pursuing diversification of gas export routes to obtain access to various energy markets. However, the Central Asian region is considered to be a source of energy for customers from outside the region [9, P.68]. Thus, increasing the volume of gas, oil and electricity exports has a reverse effect on the availability of gas for domestic and intra-regional consumption. For exporting countries, moving energy out to external markets does not contribute to their energy security in terms of availability of resources for domestic consumption [10, P.100]. Energy sectors regulated by market mechanisms can naturally eliminate the difference between domestic and external energy prices, thus increasing the attractiveness of internal markets.

In the conclusion we would like to note, that however, the development of energy sectors extensively controlled and subsidized by state actors requires government policies that are specifically designed to ensure energy security, not the ones prioritizing export of energy resources to external markets. Negative impacts of export diversification policies can be mitigated by prioritizing intra-Central Asian energy trade and pursuing long–term, transparent and reliable energy policies.

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ОРТА-АЗИЯЛЫҚ МЕМЛЕКЕТТЕРДЕГІ ЭНЕРГЕТИКАЛЫҚ ҚАУІПСІЗДІКТІ ҚАМТАМАСЫЗ ЕТУДІҢ НЕГІЗГІ ТӘСІЛДЕРІ

Аннотация. Мақалада Орталық Азияның энергетикалық секторларының жалпы сипаттамасы берілген, олар энергетиканың бірыңғай жүйесін ұсынды, онда әрбір мемлекет шеңберінде энергетикалық секторлардың пайда болғаның айқындады, олар бірігіп энергетикалық қауіпсіздікті қамтамасыз етіп келген үзіліссіз энергетикалық ресурстарды жеткізу үшін де, бір-біріне әсеретін әрі халық үшін, әрі экономикалық мұқтаждықтарды қамтамасыз ету үшін тұтастай теңгерудің бірыңғай жүйесін барлық елдердің энергети-калық мүдделерін көздейтінің анықтады. Бұл елдердің бірыңғай жүйесі барлық елдердің энергетикалық мүдделерін қамтамасыз етеді. Кеңес заманда консенсусқа қол жеткізу мүмкін болмады, себебі саяси жүйе оған қарсылық жасады. Орталық Азия елдерінің тәуелсіздік алғаннан кейін Орталық Азиялық энергетикалық жүйесінде жаңа қатынастар форматы пайда болды, себебі олар тәуелсіз энергетикалық жүйелерін құрды. Соңғы екі онжылдықта Орталық Азия елдерінің арасындағы өңірлік энергетикалық ынтымақтастық еленбеді Алайда талдау көрсеткендей, энергетикалық қауіпсіздіктің күшеюіне байланысты ел басшыларының энерге-тикалық саясатын саясатын қайта қарауға мәжбүр етті. Әр елдің энергетикалық тәуелсіздігіне қойылатын қалыпты көшуін қамтамасыз ету ықтимал зардаптарын жұмсартуға энергетикалық дағдарыс пен энергетика секторында күш-жігерлерін шоғырландыру қажет етеді. Энергетикалық қауіпсіздік пен өңірлік ірі жобаларды іске асыру үшін Орталық Азия елдерінің басшыларын шындап ішкі өңірлік сауданы қалпына келтіру мүмкіндігін қарастырудың нақты болмауының болашағының проблемаларының шиеленісуін дәлелдеді.

Түйін сөздер: энергетикалық қауіпсіздік, энергия ресурстары, электроэнергиясы, су электроэнергиясы, мұнай құбыры, мұнай өндеу көлемі, мұнай өндеу заводы, геосаяси өзгерістер, қорқытуды күшейту, аймақтық ынтымақтастық.

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ОСНОВНЫЕ ПОДХОДЫ ОБЕСПЕЧЕНИЯ ЭНЕРГЕТИЧЕСКОЙ БЕЗОПАСНОСТИ В ЦЕНТРАЛЬНО-АЗИАТСКИХ СТРАНАХ

Аннотация. В статье представлена общая характеристика энергетических секторов в Центральной Азии, которые создавались в рамках единой системы, в которой каждое государство имело влияние на энергетическую безопасность друг друга, а вместе они обеспечивали бесперебойные поставки энергетических ресурсов, как для населения, так и для экономических нужд в целом. Единая система предполагает балансирование энергетических интересов всех стран. Достижение консенсуса в советское время не представлялось проблемой, так как существовал единый политический центр. С обретением странами Центральной Азии независимости, формат отношений в рамках Центрально-Азиатской Энергетической Системы (ЦАЭС) был изменен, поскольку государства ставили приоритетом создание независимых энергетических систем. На протяжении последних двух десятилетий региональное энергетическое сотрудничество между странами Центральной Азии во многом игнорировалось. Однако анализ показывает, что нарастающие угрозы энергетической безопасности заставят лидеров стран пересмотреть свою энергетическую политику. Смягчение возможных последствий энергетического кризиса и обеспечение плавного перехода к энергетической независимости каждой из стран, потребует консолидация усилий в энергетическом секторе. Обострение проблем энергетической безопасности и отсутствие реальных перспектив для реализации крупных региональных проектов заставляют руководителей стран Центральной Азии серьезно рассмотреть возможность восстановления внутрирегиональной торговли энергоресурсов.

Ключевые слова: энергетическая безопасность, энергоресурсы, электричество, гидроэлектроэнергия, нефтепровод, нефтеперерабатывающие мощности, нефтеперерабатывающий завод, геополитические изменения, эскалация угроз, региональное сотрудничество.

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REFERENCES

[1] Toby Shelley, Oil: Politics, Poverty and the Planet (London: Zed Books Ltd, 2015). http://dx.doi.org/10.18411/a-2018-008 (in English).

[2] Bilaal Abdullah, Peak Oil Paradigm Shift: The Urgent Need for a Sustainable Energy Model (London: Medianet, 2005); and Kenneth S. Deffeyes, Beyond Oil: The View from Hubbert's Peak (New York: Hill and Wang, 2017), 3-12. http://doi.org/10.17803/2311-5998.2016.32.4.081-090 (in English).

[3] Paul Roberts, The End of Oil: On the Edge of a Perilous New World (New York: Houghton Mifflin, 2014), 44-65. http://doi.org/10.24411/2078-5356-2015-10004 (in English).

[4] Jahangir Amuzegar, Managing the Oil Wealth: OPEC's Windfalls and Pitfalls (London: I.B. Tauris, 2016), 1-22. http://doi.org/10.18611/2221-3279-2017-4-2- (12)-82-86 (in English).

[5] Michaels, Robert J. (2018). Electricity and Its Regulation. https://doi.org/10.32014/2018.2518-1467 (in English).

[6] Oleg Chervinskiy, "How Astana Was Planning to Look for Kashagan on the Ground," February 20, 2017 http://www.ratel.kz/outlook/kak_astana_planirovala_iskat_vtoroj_kashagan_na_sushe#commentshttps://doi.org/10.32014/2019.2019-1467.8 (in English).

[7] Energy Polices of IEA Review//OECD Publications. Paris, 2018.https://doi.org/10.32014/2018.2518-1467.35 https://doi.org/10.32014/2018.2518-1467.35 (in English).

[8] government of the republic of kazakhstan, concept of the development of gas sector of kazakhstan until 2030, online.zakon.kz, december 5, 2014, http://online.zakon.kz/document/?doc_id=31641775. (in english).

[9] ayupova z.k., kussainov d.u., bekbergenova a.k., winston nagan. Major ideas and main values of the universal uno declaration on human rights: the 70-years' experience. – bulletin of the national academy of sciences of the republic of kazakhstan. –vol. 1. –2019. – p.68-74 doi https://doi.org/10.32014/2019.2518-1467.8 (in english).

[10] ayupova z.k., kussainov d.u., winston nagan. About modernization tendencies in the legal system of the republic of uzbekistan.– bulletin of the national academy of sciences of the republic of kazakhstan. –vol. 2. –2019. – p.100-107 doi https://doi.org/10.32014/2019.2518-1467.46(in english).

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