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THE ENVIRONMENTAL ISSUES OF THE UKRAINIAN ENERGY SECURITY

The energy security principal directions in terms of environmental aspect have been explored in the following article. The special priority is given to extension and deepening of scientific knowledge in the field of environmentally justified energy extract and consumption in Ukraine. The straight-line relationship between the energy facilities and the environment, the significant influence of the energy sector on the nature were shown and analyzed. The ecological aspects of energy preparedness in Ukraine and the ways to reduce the ambiance impact in Ukrainian background are also mentioned in the article. The author has given an eye to the place of Ukrainian energy policy in the field of Global energy security that was also highlighted in this article.

Key words: energy security, power industry, environment, modernization, Ukraine, European Union, Global energy security.

Power industry is the most important constituent of the national economy that embraces the various sorts of energy resources production, conversion, transmission and consumption. Energy is essential for the economy and makes a huge impact on the rest of the economics, because it affects their normal functioning. The reliable, sufficient, cost-effective, ambiance safe supply of energy resources for each economy is the key to energy security, and hence sustainable development.

The problem of energy security requires advanced study. Besides the guarantees of non-cease supplementary, prices regulations and the quality inspection, the ambiance effect acquires the essential meaning either. Environmental issues and the relevant national and commonwealth approach to their solution are extremely vital. The significant influence of the energy sector on the nature in ways of the production, transmission and distribution, causing the environment and human health effects is characterized as one of the most extensive and ecologically dangerous. The inquiry engages the effect on the complex environment consisting of: air, land and water resources. They undergo the toxic emissions and greenhouse effect, engineer buildings territory needs transfer, ash and slag pollution, landscape deterioration, physical damages, etc. The indisputable fact of the power industry as a negative effect for the planet's ecosystems existence has stipulated many countries to resort the effective means of transformations of energy sector.

This is the high priority urgent problem, both for the entire international community and for Ukraine in particular. Taking into consideration the Ukraine' 2014-2015 economic crisis that is majorly based on the energy issues the ecological aspects of energy preparedness haven't been developed at sufficient level yet. Regarding the energy issues, Ukraine has worse environmental performance indicators of energy production and consumption, rather than European Union or other developed countries due to its complicated status, which consists of a numerous vulnerable sides. Taking into account the abovementioned, the purpose of the article is to research the environmental safety international experience in power industry and to detect the challenges of Ukrainian nature protection on the way of erecting the contemporary standards and requirements for the safe power system exploitations. The object of the article is the energy preparedness, while the subject appears as the environmental aspects of energy security with the special attention to Ukrainian background.

Energy security belongs to the economic and national security. The problem of energy security emerged as the need to ensure a reliable economy with all kinds of energy at cost-effective price available, abiding the requirement of harmless to the environment. Energy preparedness as one of the components of national security shows up, firstly as a guarantee of energy supply for the everlasting reproductive processes in the national economy that ensure its full ability to function and, secondly, as a condition of energy complex security. According to the definition, the energy security provides the economy consistency of national interests in the energy sector starting from existence and potential threats to internal and external risks, allows to meet in advance the real needs of fuel and energy resources for livelihood and

reliable operation of the national economy¹. The key target of energy preparedness is to assure the solid supply of different types of energy at affordable prices with minimal losses to the environment.

The energy security because of the comprehensive feature nowadays is improved to the level of global energy regulation that affects all countries involved to the energy sector. Global energy security can be defined as a condition of the global community in which all the citizens of the earth do have the guaranteed access to energy sources, which meet the needs of a healthy lifestyle, comfortable environment, intellectual and spiritual development. Otherwise, the term of the energy security quite often is exhausted within interdependence between producers, transit countries and consumer countries. Really, the main carbohydrates deposits are accumulated within a relatively small group of developing countries and emerging countries, which can provide access to these resources, based on their political reasons, which from time to time causes the international tension. As for our national background, the Ukrainian and Russian gas disputes correlate with political impact in previous 10 years. That is true, sometimes the national economy can fail because of the credits, absence of energy support and high prices. This all issues, such as ensuring reliable energy supplies, diversification of energy supply, and security of energy infrastructure can be enlisted to the group of interstate relations of carbohydrates trade.

The basic structure of the global energy security threats includes rather other vital components: mismatch of the energy capacity market offers and the growth of energy consumption; implementation of new energy-saving technologies; consequences of interruption of power supply due to man-made disasters and system failures relief; the climate regulations and more². It is evident, that energy preparedness should be taken the long view of the context of solving other important global issues: global climate change, lack of access of the poor to clean and affordable energy cost, pollution and depletion of temporary available hydrocarbon resources. The ambiance element worldwide is extremely important not only because of social value, but that it is now a policy of the leading states, which is taken into account, when business competition and PR emulation occur. The environmental harmonized-free functioning of the economy is the fundamental feature of the Western world energy preparedness.

The high-developed countries realized that the global energy security threats could not be penetrated separately by each state. For the moment, countries of the world consistently implement and coordinate plots to ensure energy security at the international level. One of the strongest achievements is the reduction of the harmful energy consumption. These matters include the following hazardous substances: coal dust, carbon monoxide, nitrogen dioxide, carbon black, vanadium, calcium oxide, inorganic dust, manganese and its compounds. In recent years there have been succeeded some changes in the structure and energy consumption within the mentioned above. The share of oil in the total consumption from 1960 to 2010 dropped from 39 to 33%, coal - from 37 to 30%, while the share of natural gas grew by 16 to 24% and nuclear energy from 0.2 to 5%. While foreseen of availability of oil and gas reducing, industrialized consumers are looking for ways to more efficient usage of the available resource base, based on the non-traditional nature-safe energy technologies.

In emerging-market country, energy policy plays a crucial role for the so-called their full market establishment and further development of internationally competitive geopolitical interior. Study and implementation of international experience of ecological safety in production, transmission, distribution of energy resources is extremely important for Ukraine to accomplish the relief in its extremely politicized energy sector. In comparison, Ukraine has faced the complicated hazardous treats today, which have not even ever occurred in developed countries. They got in touch with Ukrainian weakening economy, so now it is impossible to succeed in the entire industry sector simultaneously. During the first decade of the independence from USSR, Ukraine had to adopt its vintage out of date technologies plants to the new requirements and to save the people's wages. The salaries went down, the technologies superannuated and the market economy caused losses in industry production because of the high prime cost in comparison to the Western countries. The Ukrainian Government tried to balance between the social care, such as the income level support and the sequenced economy growth. Eventually, many fields of the national economy and social life have become neglected and disregarded. That razed also the energy sector. The governmental and business power resources technologies exist still at infancy stage even today while the ecology issues are apparently cared only by civil society and Ukrainian foreign partners.

¹ Свірчевська, Ю.А. (2014). Сутність енергетичної безпеки країни та чинники, що на неї впливають. *Геополітика и екогеодинамика регіонів*. Симферополь.

² Слупський, Б.В. (2009). *Екологічна безпека як складова енергетичної безпеки: дії міжнародної спільноти й України. Стратегічні пріоритети*. Київ: Національний інститут стратегічних досліджень.

The main features of hodiernal Ukrainian energy sector has got several fragile sides:

- 1) the absence of coincidence in the needs and capacity of country's own energy resources supply;
- 2) obsolete technologies of and energy consumption, which causes huge energy wastes;
- 3) lack of market regulation of the energy sector of Ukraine, when the prices for private citizen consumers of electricity and natural gas supplied by the state are not economically justified and are reimbursed by high prices for businesses;
- 4) the political dependence of the energy sector from energy supplying countries, primarily from Russia;
- 5) ecological legislative framework at the embryonic level, absence of environmental care programs and ambiance crimes amenability.

The priority areas of energy industry in Ukraine traditionally include the extraction of mineral resources, thermal power, nuclear power, hydropower, wind power, geothermal energy, and bioenergy. Typically, each sphere of energy production has its own peculiarities.

Ukraine is recognized as one of the richest mineral deposits in the world. The mineral extraction process utilizes about one third of the total national production assets and engage the employment of 20% of labor-age population and 25% of the country's gross domestic product (GDP). Extractive industries dominate the structure of the GDP of Ukraine, while in the U.S. they amount to 2.6% of GDP, Germany - 1.1%, France - 0.8%, Japan - 0.6%¹. In old mining district areas during the last decades of human-caused activity, the environmental problems have become a large-scale, including the high degree of man-made pollution and stress, activation and development of dangerous geological processes infringement hydrogeological conditions.

In the light of natural gas cost improvement, based on its artificially high fees, established by countries-suppliers (first of all - Russia), Ukraine tries to find the way out in its own energy sources such as coal. However, the construction and operation of various buildings and mining engineering structures make the significant negative impact on the geological environment. This is especially true of quarries and mines, that is why the developed countries try to minimize the coal exploitation in contrast. Underground cavities formed because of the tectonic processes upper crust violation, which is often caused by man-made earthquakes, mudslides and landslides. Usually fertile soils are being destroyed after quarrying and accumulation in the gob of heap dumps. Taking into account the following economic and political situation, concerning Russian energy support, Ukraine cannot quit coal mining.

Gas production from the Black Sea. So far, the energy issues experts stated that gas production from the Black Sea bed remains almost the only opportunity to provide energy independence for Ukraine without acute global technology innovations apply. In 2013, the leading British energy corporation Shell concluded with Ukrainian Government the contract on the gas bounds inquiry. At the end of 2013, the agreement on the distribution of hydrocarbon production on the shelf of the Black Sea between Ukraine and two more foreign companies ENI (Italian) and EDF (French) was also signed. But since Russia overrun the territory of the Ukrainian Crimea region, the strategic Ukrainian territory, which guarantees the access to Black sea and its energy resources, Shell withdrew from talks on gas production in hydrocarbon Scythian area. In June 2014 U.S. Ambassador to Ukraine Jeffrey Payette announced, that the international companies are temporary unlikely to participate in any projects on the Crimean Peninsula, including shelf gas production². So far, the American ExxonMobil and Chevron has frozen the Black sea gas mining projects until the Crimea will be reimbursed to Ukraine as an only legal power instead of Russian invasion. Therefore, after the Western countries condemn of Russia occupation, the mining at Crimea become impossible even by conqueror because of the sanctions focused on its economic isolation. For instance, on August 1, the EU and the United States banned the supply of equipment for deepwater exploration and production of oil in the Arctic and shale oil to Russian Federation³. Either British Royal Dutch Shell quit its gasoline stations

¹ Мандрик, В.О. (2005). Еколого-економічні проблеми відтворення порушених земель у контексті вимог екологічної політики. *Науковий вісник: Екологізація економіки як інструмент сталого розвитку в умовах конкурентного середовища*. Львів: НЛТУ України.

² ExxonMobil отказалась от работы на черноморском шельфе Крыма вслед за Shell. *Сайт новостей Black Sea News*. <<http://www.blackseanews.net/read/81249>>.

³ Хронология введения санкций против российских граждан и компаний. *РИА новости*. <<http://ria.ru/spravka/20150216/1046144422.html>>.

business at the Crimea region in May 2014¹.

Heat energy. The most environmentally harmful polluting emissions are generated by heat energy. Moreover, the technical condition of Ukrainian companies in fuel & energy complex industry and chronic lack of investment resources for their technological upgrading leaves a lot to be desired, so Ukrainian power plants in the range of sustainable sources of environmental risk. Thermal Power Plant (TPP) produces up to 60-80% of electricity in Ukraine. While in energy progress, they resort to the solid (coal), liquid (oil) and gaseous (natural gas) fuel. Heat and power stations (CHP) emit into the atmosphere range 30% of the total volume of all hazardous industrial waste. They cause a significant impact on the environment of the area production and the location of the state of the biosphere as a whole. Total amount of harmful emissions is analyzed by government in sporadic and unsystematic method, which makes it difficult to monitor the actual condition of the environment effectively and detect the level of impact on the health of the population.

Nuclear power plants cause less of environmental damage than heat. The transition from fossil fuels to nuclear reduces chemical pollution. However, the operation of nuclear power plants is always a certain probability of failure. There were more than 150 accidents at nuclear power plants, combined with radiation leaking worldwide. Some of them - occurred in the U.S., Germany, UK - had a very serious and severe economic, environmental and psychological consequences. The biggest atomic plant crash disaster revealed after the Chernobyl accident in Ukraine in 1986.

Ecology experts estimate that the level of air pollution would increase in 1000 times if all conditional power plants on the planet switch to coal. If all the stations resort to make atomic, the emissions would fall 10 times lower than the current level. Ultimately, not all countries are ready to move to operate nuclear power plants, especially those who faced the threat of nuclear contamination, for instance, the plant «Fukushima-1» damage after the earthquake in 2011 in Japan. Since 2014, Japan starts the program of the traditional nature gas import in spite of the atomic energy production².

Hydraulic power industry could be considered the most environmentally friendly mean of obtaining electricity but there are the adverse effects of the construction and operation of HPP. It requires the construction of dams and reservoirs that alter the natural hydrological regime of rivers and cause the changes in local climatic conditions. The era of hydropower in Ukraine began in the 20s of XX century with the establishment of the first electric energy generator on the largest Ukrainian river of «Dnieper» HPP. Since the river faced a number of hydroelectric power stations, which are producing the range of 2% of all electricity in the country, it has caused flooding of hundreds thousands of hectares of fertile wetlands. Violation of the hydrological regime of the Dnieper, in addition, led to a decrease in the number and even the disappearance of populations of many valuable commercial fish species.

Extraction of shale gas by hydraulic fracturing is one of the most negotiable issues of the ecological society worldwide. For instance, in France, the 5-year ban on the fracturing technology for the development of shale gas, introduced in 2012, remains effective. At the same time, in 2010, Ukraine issued Exxon Mobil and Shell licenses for the shale gas exploration. Industrial productions in these areas are expected to start in 2018-2019 respectively. Some energy specialists emphasize that the experimental energy production in Ukraine has to be first legally supported because of the probable risks of environment disasters.

At the end of the 2014, instead of the Donbass region non-ceasing military confrontation, geographically close to the Kharkiv region, where Shell operates, and the common energy projects remained actual. The Chair and General Manager of Shell Ukraine Exploration and Production LLC Graham Tiley announced in December, that Shell would continue its investigations for shale gas in Ukraine, will cooperate with Kharkiv region authorities and will maintain the appropriate level of investments for the project³.

The common aspect of the Ukrainian power industry problem is associated with old equipment, use of environmentally dangerous technologies, failure to comply with technical requirements and standards,

¹ Shell остановила работу 22 АЗС в Крыму и готовит их передачу в аренду. *OILNEWS*.

<http://oilnews.com.ua/a/news/Shell_ostanovila_rabotu_22_AZS_v_Krimu_i_gotovit_ih_peredachu_v_arendu/212858>

² Американская ExxonMobil отказалась от планов добывать газ на крымском шельфе. *Сайт новостей «Зеркало недели»*. <http://zn.ua/ECONOMICS/amerikanskaya-exxonmobil-otkazalas-ot-planov-dobyvat-gaz-na-krymskom-shelfe-146244_.html>.

³ Shell разочаровалась в востоке Украины, но компания пока не уходит из страны. *Neftegaz.Ru*. <<http://neftegaz.ru/news/view/132725>>.

the accumulation of waste industry, ignoring the requirement to play disturbed lands. In the past Ukraine used to be the country with strong heavy industry, that is why many of the production assets are still serving the power-engineering needs. From the one hand, it makes easier to solve the energy problems throughout the country, but from the other hand, that causes serious inconveniences. Actually, the environmental peculiarities of the Ukraine energy sector currently reveal in two aspects: the extraction of energy resources and their usage, which are accommodated in vintage patterns. Almost all of them are imperilment the hazard because of the lack of law regulation or in view of the imperfect old technologies, employed for the energy sector performance. For instance, the fossil fuel emission reductions of Ukrainian enterprises electricity sector are several times higher than in industrial countries.

The Ukrainian energy equipment, employed in power plants, does not meet EU requirements and truly needs its replacement or total reconstruction. Fortunately, the EU member states express the definite interest to participate in the process of Ukrainian economy rebuilding and they are also interested in Ukrainian markets and national business. The EU is ready to hit these targets in many ways, including the energy industry support and legislative system adaptation. Ukrainian Government appreciates and expects the appropriate transformations in the near future. At the beginning of the summer 2014, the Ukrainian Prime-minister A. Yatsenyuk has already drafted a bill on the modernization and reorganization of the Ukrainian gas transport system by attracting the investors from the European Union and the United States¹. The Ukrainian authorities expect, that Ukraine will be able to sell foreign investors up to 49% stake in the operating company actions of its gas transportation system until the end of the 2017². While Ukrainian EU collaborates in the West hope to establish the project of the Energy Union, which will guarantee the EU independence from unsustainable Russian gas support, Ukraine can acquire the new opportunities if being involved to the common European energy market.

Summary. Energy security of any country is based on the following main factors - diversification of energy generation and imports and the appropriate level of energy efficiency. As it turned out the energy preparedness - is a global issue, ensuring its consistent efforts and should be achieved by national governments with cooperation with their foreign counterparts around the world. The most effective step of the modern developed countries is the minimization of the hazardous energy production and consumption. That activity is resorted to because of the ecological aspect of the energy security, which sometimes is neglected by the developing and emerging countries. Ukraine is a country with high percentage of energy imports, which makes its energy vulnerability and dependence on countries supplying energy. Unresolved energy security issues cause the lack of the attention to the ambiance level of the problem. But environmental pollution largely creates intense situation not only in the locations of power industry facilities and consumption plants, but also in the entire region, spreading and threatening human health, nature safety and economic stability in the state. However, the European integration of Ukraine offers more scopes for the challenges in the field of energy security in light of the ecological legislation adoption, financial support and common energy proposals.

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¹ Яценюк закликав Раду ухвалити законопроект про модернізацію ГТС. *Сайт новин ІА УНІАН*. <<http://economics.unian.ua/energetics/930487-yatsenyuk-zaklikav-radu-uhvaliti-zakonoprojekt-pro-modernizatsiyu-gts.html>>.

² Украина сможет продать 49% акций ГТС западным инвесторам не раньше 2017 года. *UNIAN News website*. <<http://economics.unian.net/energetics/1010664-ukraina-smojet-prodat-49-aktsiy-gts-zapadnyim-investoram-ne-ranshe-2017-goda.html>>.

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