Energy Security: A Paradigm Shift

Velichka Milina [*]

Since the middle of the first decade of the twenty-first century, energy security has been among the highest priorities in the security strategies and policies of developed countries. The potential risks and threats related to energy security mainly grew out of two circumstances: the predicted upcoming production peak of hydrocarbon resources vital for the modern economy, and the security of their supplies. Two key factors in the past years, however, have dramatically changed the energy sector. The first factor is the global economic crisis of the 2010s, and the other is the strategic shock from the yield of non-conventional hydrocarbon resources. Today, energy security policy requires a paradigm shift and a new model of factors and conditions for its implementation. This article offers an analysis and assessment of the changes demanding a new paradigm of efficient energy security that is adequate to the changed realities of energy markets and global economic development.

The Old Paradigm [1]

The concept of energy security that dominated for almost forty years (following the energy crisis of the 1970s) was rooted in the relatively plentiful availability of and easy access to fossil fuels, while the main threat to global energy security was considered to be the discontinuation of energy supplies. Thus, the old paradigm could be briefly summarized as "stable and continuous supplies at affordable prices." The significance of this problem was suggested by the common statement of geopolitical strategists, investment bankers, geologists, and physicists on the foreseeable depletion of oil and natural gas, and by the "final countdown" that had started in the production of hydrocarbon resources at an acceptable "energy price."[2] This fact, as well as the severe competition for energy resources due to increasing demand and consumption in developed and emerging economies, shaped the context of energy policies.

This was a period when the major consumers of energy resources (the U.S., EU, China, and India) were highly dependent on the producing countries dominating the energy market from the Middle East and the Caspian region, Russia, etc. The basic principles of the energy market were energy nationalism, the active role of "transit" countries, and the domination of producers over consumers.

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* Dr. Velichka Milina is Associate Professor of Political Science at the G.S. Rakovski National Defense Academy in Sofia, Bulgaria.

1 See Velichka Milina, "Energy Security and Geopolitics," *Connections: The Quarterly Journal* 6:4 (Winter 2007): 27-46.

2 The correlation between the energy necessary for the research and exploitation of energy resources and the energy contained in the sources. In case they are almost equal, the process of extraction of energy resources is meaningless.

Energy nationalism was the major principle that shaped the behavior of the key participants on the energy market, whether they were producing countries, transit countries, or heavy consumers of energy resources.[3] Energy nationalism created a reality where the behavior and decisions of energy markets and the supply of resources ultimately depended not on economic market factors but rather on the producers, whereas the energy market turned into an arena of interstate relations. Oil and natural gas were used as geopolitical weapons, while energy geopolitics and geoeconomics became the most essential part of global politics and the foreign policy of the key players on the energy market.

Energy (resource) nationalism is typical of exporting countries rich in hydrocarbon resources. As a rule, they follow the scenario of a phenomenon that experts diagnose as "the resource curse,"[4] or "the Dutch disease."[5] Its common feature is slow social and economic development of the country due to a lack of domestic economic stimuli, and because of local political elites who take advantage of the high export revenues to maintain closed political regimes. The main consequences are weak government institutions or authoritarian governments, restriction of civil and political liberties, lack of an independent judicial system and independent political parties, low economic effectiveness, and underdevelopment of the economy outside the extraction sector.

Negative internal economic and socio-political implications of the "resource curse" are the main reason for the big producers of resources to implement highly accentuated policies of energy nationalism. Thus, they enter into a cycle of mutual interdependence and repetition of the correlation between the internal effects of the "resource curse" and "resource nationalism":

1. High profits from energy resources allow autonomy of local elites and promote the "resource curse"
2. The political and economic effects of the "resource curse" increase oil dependency
3. The high degree of dependency increases the benefits of "resource nationalism"

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3 Due to the extreme importance for social development, in almost all countries the governments and national companies are responsible for maintaining reserves, conducting transportation, and ensuring access to energy resources. In general, oil and natural gas are government territories.

4 Probably the only significant exemption is Norway, which managed to convert its income from resources into development. To a certain extent, this group includes also the U.S. and UK as countries rich in resources.

5 This phenomenon was initially observed in the Netherlands when in the late 1950s the production boom of natural gas resulted in a series of negative economic effects. What is typical of countries with Dutch disease is that the value of their currency rises due to the fast flow of revenues from oil, gold, gas, diamonds or some other natural resources. As a result, the goods produced by the national economy become incompetitive and very cheap to export. The result is deindustrialization of the country.

4. High profits as a result of the policy of "resource nationalism" on the energy markets promote the "resource curse."[6]

These negative internal conditions resulting from the "resource curse" are the most frequently discussed phenomena in such states. At the same time, however, the effects of the "resource curse" have an impact on interstate relations in the energy sector (and others).

Studying the behavior of oil-rich countries, Thomas Friedman formulated what he called the "First Law of Petropolitics,"[7] which underlines the correlation between the increase of resources in oil and gas producing countries and their rising confidence in interstate relations and international policy. In the context of this law, it is important to take into account the effect of the interdependence between the "resource curse" and "resource nationalism" on globalized markets of energy resources and on international energy security.

The risks to energy security in importing countries caused by energy-producing countries could be the result of either intentional or unintentional actions.[8] First, the growth of unfavorable consequences from the "resource curse" increases the likelihood that producing states will intentionally act in the context of "resource nationalism." Second, the political and economic consequences of the "resource curse" could have undesirable negative effects on political stability in energy-producing countries and thus threaten energy security. The revolutions that took place during the so-called Arab Spring in North Africa and the Middle East have proved that the main destabilizing political and economic factors in the region result from the negative effects of the "resource curse," and they can not be considered as applying only to a specific country. Since it is impossible to predict what impact such instability may cause, or when it is most likely to occur, destabilizing trends in energy-rich countries that are victims of "resource curse" need constant attention. This is particularly true for the energy security of the European Union, which is surrounded by energy-rich countries, including Algeria, Libya, Egypt, Syria, Azerbaijan, Iran, Turkmenistan, Uzbekistan, Kazakhstan, and Russia. These are countries that are either major sources of energy supply for the EU or represent potential sources of diversification. It could be argued that many of them show

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6 See Ed Stoddard, "The Resource Curse – Resource Nationalism Nexus: Implications for Foreign Markets," *Journal of Energy Security* (21 November 2012); available at www.ensec.org/index.php?option=com_content&view=article&id=389:the-resource-curse-resource-nationalism-nexus-implications-for-foreign-markets&catid=130:issue-content&Itemid=405.

7 "The First Law of Petropolitics posits the following: The price of oil and the pace of freedom always move in opposite directions in petrolist states. The higher the average global crude oil price rises, the more free speech, free press, free and fair elections, an independent judiciary, the rule of law, and independent political parties are eroded. And these negative trends are reinforced by the fact that the higher the price goes, the less petrolist leaders are sensitive to what the world thinks or says about them." Thomas Friedman, "The First Law of Petropolitics," *Foreign Policy* 154 (1 May 2006): 28–39; available at http://www.foreignpolicy.com/articles/2006/04/25/the_first_law_of_petropolitics.

8 Stoddard, "The Resource Curse."

symptoms of resource curse and rentier state structures. Some—such as Russia, Turkmenistan, and Egypt, for example—sometimes explicitly manifest behaviors of resource nationalism. The United States also faces similar risks arising from its dependence on imported resources from the Middle East and Latin America when these countries share characteristics similar to the "resource curse" (e.g., Venezuela).

The negative effects of the "resource curse" are a factor not to be underestimated in the old but still functioning paradigm of energy security while developing strategies for the diversification and security of supply. Emerging new trends in the energy sector suggest some decrease in the role of the behavior of rich countries on energy security.

The New Context of Energy Security

In 2008–09, several key trends started to develop in the energy sector, triggered by the influence of two new, very strong factors: the global financial and economic crisis and the shale revolution in gas and oil production.

The Global Financial Crisis and the Energy Sector

The first factor to radically change the context of energy policies was the global economic crisis. Since 2008, experts have been analyzing its characteristics and causes. It has been defined as a financial crisis, an economic crisis, a crisis of democracy and governance, a crisis of public consumption and material culture as a whole, and as an environmental crisis that will ultimately lead to a global natural disaster. There have been disputes over the depth of the crisis, the patterns of its development, and its possible outcomes, but what unites analysts are the findings on the presence of the phenomena and processes of crisis and their global nature. From this perspective, it seems reasonable to argue that today we are experiencing a multidimensional global crisis, or the first systemic crisis of the global age.[9]

According to Nikolai Kondratiev's model, the depletion of the technological and organizational potential of the latest wave of growth determines the fact that crises of different origin that develop under normal conditions within their own sphere will start to interact and overlap.[10] The result is a kind of "resonance" of the crisis phenomena in different sectors: political, economic, social, energy, etc. Furthermore, any system, including the social one, has a limit of resistance, and such a resonance—especially if it is superimposed on adverse long-term trends and/or local short-term shocks—could knock a social system out of balance.

From 1900 to 2000, the dynamics of global development was determined by the then long-term hyperbolic growth in industry. Within this wave there were several phases

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[9] See "Energy Sources and the Consequences of the Global Crisis of the 2010s," report at EnergyStrategy.ru (2012); available at http://www.energystrategy.ru/editions/krizis.htm (in Russian).

[10] On Kondratiev's waves and the contemporary economic crisis, see S. Y. Glazev, "Contemporary Theory of Wave Length in the Economic Development," available at www.group-global.org/storage_manage/download_file/20518 (in Russian).

separated by acute crises that led to a paradigm shift in development. These were the crises of the early 1930s, the crisis of the early 1970s, and the last one, at the end of the 2000s. For example, the crisis of the 1930s led to a sharp increase in the role of the state in the economy of the United States, Germany, Italy, and other industrialized nations. This process coincided with accelerated industrialization and a dramatic increase in the consumption of electricity for industry and oil as fuel.

The crisis of the 1970s led to the transition of the U.S. and Western Europe toward post-industrial development based on globalization, informatization, and liberalization of the socio-economic sphere. There was acceleration in the development of nuclear energy, and the demand for natural gas as an energy fuel grew.

In the late 2000s, the rate of economic and energy growth approached the peak rates seen in the 1950s and 1960s, with the highest rates being in developing countries. In fact, the most important feature of the pre-crisis growth period is the combination of post-industrial development in developed countries and rapid industrialization in developing countries (mainly China). During this period, however, the involvement of key developing countries in the global economy gradually exhausted the potential of globalization, informatization, and liberalization—i.e. the main elements of the third wave of growth—which became apparent during the global crisis of 2008–09. In the energy sector, this crisis coincided with the transition from "industrial" and "hydrocarbon" to "neo-industrial"[11] and "smart" energy, which includes a number of aspects: smart grids, energy efficiency (in the broad sense), renewable energy, new principles of organization of energy systems, and a shift of focus from the producer to the consumer.

These trends will be predominant in about twenty years. Up to 2030, all realistic scenarios for global energy production and consumption preserve the leading role of hydrocarbon fuels as sources of energy, although this does not preclude the shift to "neo-industrial" energy. According to expert estimates, in the energy markets this will take place through the convergence of the globalization and regionalization processes in the energy sector, as it is already happening in many industrial sectors.[12] Global domination of producers will be gradually replaced by domination of energy consumers, which could in the near future seriously change the current global situation in the energy sector.

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[11] See A. I. Gromov, "New Driving Forces for the Development of Oil and Gas Complex," report at EnergyStrategy.ru (2012); available at http://www.energystrategy.ru/press-c/source/Gromov_NEA-4-12.pdf (in Russian).

[12] For details see the following publications in the Russian language: *World Energy: State, Problems, Prospects* (Moscow: Energy Publishing, 2007), www.energystrategy.ru/editions/mir_en.htm; V. V. Bushuev and A. M. Mastepanov, eds., *Global Energy and Sustainable Development: A White Paper* (Moscow: International Center for Sustainable Energy Development, 2009), www.energystrategy.ru/editions/white_book.htm; V.V. Bushuev and V.A. Kalamanov, eds., *White Paper: World Energy – 2050*, Second edition (Moscow: International Center for Sustainable Energy Development, 2013), www.isedc-u.com.

The Impact of the Shale Boom

The second factor that dramatically changed the energy markets was the quiet shale revolution in gas and oil production. Its effect on the prices of energy resources and geopolitics is still to be analyzed and assessed. What is going on, what are the parameters of the shale boom, and what are its geopolitical consequences?

During the first decade of the new century, expert analyses on energy security claimed that the peak in the production of hydrocarbon resources would occur within twenty years and then, unless an alternative source for the increasingly massive demand for fuel for industry and transport is found, mankind is doomed to economic apocalypse. No one had predicted the forthcoming (in 2008) occurrence of the "black swan"—the introduction of a new method for the production of unconventional (shale) gas at reasonable yield prices.[13] The essence of this method is horizontal drilling and hydraulic fracturing of the so-called shale rocks where oil and gas are not to be found in concentrated deposits, but are "spread" across the layers, stored in miniature cracks and porous pockets, and therefore can not be extracted with traditional drilling methods.

Today, as a result of the exploitation of these new technologies for the extraction of unconventional hydrocarbon resources, the United States since 2009 has been the world's biggest producer of natural gas, and according to the International Energy Agency, by 2020 they will replace Saudi Arabia as the largest oil producer.[14] A report by the U.S. Energy Information Administration from June 2013[15] points out that the shale oil reserves will increase the world deposits by 11 percent, and the shale gas formations will increase world natural gas deposits by 47 percent. As a share of all resources, shale oil constitutes 10 percent, while shale gas represents 32 percent. Here, however, we need to make a clarification. This data refers to technically recoverable but not necessarily economically effective resources. Technically recoverable resources represent oil and natural gas volumes that could be produced with current technology regardless of the production costs. Economically recoverable resources are those that could be profitably produced under current market conditions.

The economic recoverability of oil and gas resources depends on three factors: the costs of drilling and completing wells; the volume of oil or natural gas produced from an average well over its lifetime; and the prices received for oil and gas production. Recent experience with shale gas production in the United States and other countries shows that the assessment of economically recoverable resources could be significantly affected by

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13 "The Black Swan is a rare and unusual event that comes unexpectedly and is characterised by three features—it is unpredictable, it has huge impact and it could be explained by hindsight. Normal, routine and expected events are 'white swans.'" See Nassim Taleb, *The Black Swan: The Impact of the Highly Improbable in Life and on the Market* (New York: Random House, 2010).

14 International Energy Agency, *World Energy Outlook 2012* (12 November 2012); available at http://www.worldenergyoutlook.org/publications/weo-2012/#d.en.26099.

15 U.S. Energy Information Administration (EIA), "Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States" (13 June 2013); available at www.eia.gov/analysis/studies/worldshalegas/.

both geologic and non-geologic factors. Key positive non-geologic factors facilitating this kind of production in the United States and Canada that cannot be replicated elsewhere are the right of private ownership of underground deposits, which is a strong incentive for their development; the existence of many independent operators and supporting contractors with critical experience from various technological stages of production; and the availability of water resources to use in hydraulic fracturing.

For the time being, Poland presents the most disappointing illustration of the difference between technically and economically recoverable shale resources. The country has some of the most important proven reserves of technically recoverable shale gas in Europe. However, in May 2013, Canadian and U.S. companies refused to continue their studies and to engage in production in Poland due to the complex geology of shale fields and high population density in these regions – factors that increase the cost of production and make these deposits economically ineffective for mining. Thus, Poland had to give up its high expectations from the shale revolution that would make the country more independent of Russian energy supplies, and instead turned to more realistic projects to build a liquid gas terminal (2014) and a nuclear power plant (up to 2020).

After this clarification about a certain conditionality (in terms of actual production) in the stock levels of technically recoverable shale oil and gas, the lists released by the U.S. Energy Information Administration show the rankings of the top ten nations possessing these resources:

Table 1. Top 10 countries with technically recoverable shale oil resources.[16]

Rank	*Country*	*Shale oil (billion barrels)*
1	Russia	75
2	U.S.	58
3	China	32
4	Argentina	27
5	Libya	26
6	Australia	18
7	Venezuela	13
8	Mexico	13
9	Pakistan	9
10	Canada	9
	World Total	**345**

[16] Ibid.

Table 2. Top 10 countries with technically recoverable shale gas resources.[17]

Rank	Country	Shale gas (trillion cubic feet)
1	China	1,115
2	Argentina	802
3	Algeria	707
4	U.S.	665
5	Canada	573
6	Mexico	545
7	Australia	437
8	South Africa	390
9	Russia	285
10	Brazil	245
	World Total	**7,299**

The shale revolution, which to date is a fact only in the United States and Canada—the only place where economically significant amounts of unconventional energy resources are being produced—will have serious implications on the global energy market. Unconventionally produced natural gas has fundamentally changed the world market. Only five years ago the United States was expected to be a major importer of gas. Between 2000 and 2010, the country built infrastructure to reconvert to the gaseous state (regasification) over 100 billion cubic meters of imported liquefied natural gas (LNG) per year. In 2011, however, the United States imported just under 20 billion cubic meters of LNG.[18] Currently, efforts are being made to reconstruct unused regasification terminals in facilities for gas liquefaction in order to export LNG. The availability of large amounts of liquefied gas intended for the U.S. market has led to a significant fall in prices, with two main consequences: 1) Gazprom had to shorten the terms and lower the prices in its long-term contracts for supplies in European countries; 2) a number of these countries took steps to build terminals for liquefied gas as a policy to reduce their dependence on supplies through fixed grids.

Cheap natural gas is used in the U.S. to produce about 30 percent of the nation's electricity and to heat half of its households. The effect is that large amounts of coal, which had been used for this purpose, are being made available and appear on the world market at low prices. In Europe, this causes a distortion of the energy mix, and reduces the use of more expensive natural gas. In fact, the collapsed market of carbon emissions

[17] Ibid

[18] See http://e-vestnik.bg/14811.

does not impede the enhanced combustion of coal in Europe either, where gas stations (Belgium, Netherlands) are operating at a loss.[19]

The shale revolution in the U.S. has implications for global economic competition as well. For example, the price of natural gas for U.S. industry is one-fourth of the price in the EU, which harms the competitiveness of European companies.[20] The widening gap between the North American and European oil and gas markets highlights the competitive differences in crisis situations in exporting countries. The energy market in the U.S., unlike the EU, remained virtually untouched because of its growing autonomy from the political events in North Africa and the Middle East.

The most serious consequence of the shale gas revolution is the shift in the focus of the global gas market it is causing, from a market of producers to a market of consumers (the oil market is still dominated by producers). Several periods could be outlined in the producer-consumer relationship in the energy markets.[21]

The first one, starting with the discovery of oil in the late nineteenth century, was characterized by the dominance of (mostly Western) international oil companies in terms of energy resources and continued until 1970. The second period, which displayed greater control by the producing countries over their resources, was evidenced by the creation of OPEC in 1960 and the oil embargo of 1973. The third period began with the collapse of the Soviet Union, the spread of liberal values such as democracy and market economy, and the empowerment of liberal international institutions. Liberalization in the energy sector meant that energy was to a significant extent dependent on the logic of free markets. During the past ten years, however, the producing countries have been increasingly resorting to political considerations in their management of energy and have begun to apply the ideology of "energy nationalism." To these three we should add the fourth era, which has already started and is characterized by an excess of natural gas on the market and a focus on the user as the major figure.

Apparently, the contemporary global energy picture is going to change further. The peak of the international trade in energy resources, according to a number of evaluations, will occur around 2030. Today's dominant trend of resource globalization will be replaced by resource regionalization, while the fundamental focus is expected to be oriented towards domestic energy resources, including renewables. With resource regionalization, the share of technological and organizational globalization will grow. In this

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19 "Uncertainty Confused the European Energy Market," *Capital* (4 March 2013); available at http://www.capital.bg/politika_i_ikonomika/sviat/2013/03/04/2015507_nesigurnost_oburka_evropeiskiia_energien_pazar/?ref=rcmnd (in Bulgarian).

20 European Commission President Jose Manuel Barroso, "Energy Challenges and Policy," European Commission Report to the European Council of 22 May 2013; available at http://ec.europa.eu/europe2020/pdf/energy2_en.pdf.

21 See Kirsten Westphal, "Energy Policy between Multilateral Governance and Geopolitics: Whither Europe?", *Internationale Politik und Gesellschaft* 4 (2006): 47; cited in Raphael Metais, *Ensuring Energy Security in Europe: The EU between a Market-based and a Geopolitical Approach,* College of Europe, EU Diplomacy Paper 03/2013; available at http://aei.pitt.edu/42924/.

new context, serious changes will occur in energy policy and in the behavior of the main players on the energy market.

Major Players and the New Energy Market

Under the old paradigm of energy security, major players in the energy market competed mainly in the geoenergy sector, while energy resources were used as a "playing card" to achieve geopolitical dominance.[22] Today, the key players are the same, but some of them have already changed positions in the market. The new entrant into the ranks of the major actors is Canada. It has proven huge reserves of unconventional oil and gas and has long-term contracts for export (until 2019) of shale gas from British Columbia to East Asia.[23]

The United States

The United States is undoubtedly the new energy leader. They have owned this position since 2009, when they supplanted Russia from the leading position in natural gas extraction. For the past forty years, following the oil crisis of the 1970s, energy security has been a major goal and a central organizational principle of the global strategy of the United States,[24] which is not only the world's largest consumer but also the largest importer of energy. In search of guarantees for the security of its energy supplies, U.S. foreign policy and military efforts were focused primarily on achieving stable access to the oil reserves in the Middle East.

In the past two decades, this strategic principle was modified into a commitment to global energy security. The world energy centers were the hubs where the United States concentrated their diplomatic and military efforts. There are numerous examples: sanctioning energy-producing countries such as Iraq and Libya; two major wars in the Persian Gulf; the fight against Al Qaeda, which is financed by the resources in the region to counter U.S. interests there; the attempts for Arab-Israeli peacemaking as part of the efforts to resolve the complex relationships in the region; and the commitment to protect maritime routes to Asia.

The North American shale revolution changed the picture. The immediate political effect was a reduction of U.S. dependence on oil supplies from politically uncertain regions in the Middle East and North Africa. Thus, the Middle East could be dethroned from its position of a central component in the United States' global strategy. The political discourse in the energy field is different now due to the emerging reality that transformed the United States from the world's largest energy importer into an exporter of energy resources. The year 2005 marked the peak of U.S. oil imports—60 percent of all

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22 For details, see Velichka Milina, "Energy Security and Geopolitics," *Connections: The Quarterly Journal* 6:4 (Winter 2007): 27-46.

23 See http://www.warandpeace.ru/ru/news/view/77747/.

24 Jon B. Alterman, "Paradigm Shift," *Middle East Notes and Comment*, Center for Strategic and International Studies (February 2013); available at http://csis.org/files/publication/0213_MENC.pdf.

U.S. domestic consumption was imported that year—while in 2012 it had already dropped to 46 percent. The reasons for this difference, of course, are to be found in increased energy efficiency and the economic crisis as well as in an increase of domestic production by 25 percent since 2008. The largest share of this increase is due to the extraction of so-called tight oil – oil that is produced by the same technology as shale gas. Expert assessments show that the volume of U.S. oil shale resources exceeds by several times the proven reserves of crude oil in Saudi Arabia.

Despite these projections, the United States still imports a greater share of its oil than in 1973, this time from providers with different geographical locations: 25 percent from Canada, 16 percent from the Persian Gulf, 11 percent from Mexico, and 9 percent from Venezuela.[25] Transforming Canada into a major exporter is quite a favorable circumstance for the security of energy supplies, as Canada is both a friendly neighboring country and the United States' largest trading partner.

Data on significant reserves in Canada as well as serious studies on the effective extraction of proven huge oil reserves in the sea territory of Brazil indicate an upsurge of oil production in the Western Hemisphere that is expected to bring a permanent rebalancing of oil in the world and will establish a new geopolitics of energy routes. Much less oil will come from the Eastern Hemisphere to the Western Hemisphere, and much more oil will flow from the Middle East to Asia. China already imports from the Persian Gulf more oil than the United States. The geography of the main countries currently exporting oil to the U.S. provides proof of the new trend of the regionalization of energy markets.

Regarding oil security, the U.S. has achieved impressive results; however, it is in the natural gas sector where we could speak of a real revolution. Strategies to export liquefied shale gas to Europe and other destinations at competitive prices are already being developed.[26] This would take both time and effort. New liquefaction facilities and terminals will have to be built so that the gas could be transported by ship across the Atlantic. For their part, European countries will also need to build LNG terminals, which do not seem a very quick solution, although the project is certainly possible with capital investment and favorable legislation.[27] Countries with such facilities will have more opportunities to diversify their sources of supply through export and import in different situations as well as through spot markets.

The development of unconventional gas production is being used by the U.S. as an instrument of foreign policy through the Global Shale Gas Initiative (GSGI), which was

[25] Daniel Yergin, "Opinion: America's New Energy Security," *Wall Street Journal* (12 December 2011); available at http://online.wsj.com/article/SB10001424052970204449804577068932026951376.html.

[26] Robert D. Kaplan, "The Geopolitics of Shale," *Stratfor Global Intelligence* (19 December 2012); available at www.stratfor.com/weekly/geopolitics-shale.

[27] The U.S. Congress was discussing a bill in December 2012 to give NATO allies access to gas supplies. Its approval will place NATO allies on an equal footing with trade partners according to U.S. legislation ensuring licenses for export of liquefied natural gas from the U.S.

launched in April 2010 by the U.S. State Department.[28] The aim is to promote the new production technology in countries that wish to identify, develop, and utilize their unconventional natural gas resources. Under this initiative, the United States has established partnerships with China, India, Poland, Ukraine, Jordan, and other countries. The objectives of this collaboration are to encourage the use of U.S. technology and win market shares in other countries; build alliances with strategic partner countries and reduce their dependence on energy imports from other countries; and promote the use of natural gas as a clean fuel and increase support for efforts to address climate change. The shale revolution has defined new positions for the U.S. on the global energy markets that they will have to master.

Russia

Russia is by far the biggest loser under the new conditions in the energy market. They portend an end to its position as an energy superpower in which the "energy card" was its monopolistic geopolitical weapon. The shale boom is bad news for Russia and, although Gazprom tried to ignore it for a long time, it is now a factor that must be taken into consideration in Russia's national policy while the country is trying to maintain its presence as a major player in the global energy markets.

For Russia, the consequences of the shale boom are direct and indirect. The ten-year contract for supplies of liquefied natural gas from Gazprom to the U.S. has been terminated. The development of the vast "Shtockman" gas field in the Barents Sea—a USD 40 billion project as part of this contract—has been suspended.

Currently, Russia is facing relatively low competition on the European gas market, as it exports natural gas in large quantities to the West and tries to use its supplies destined for Central and Eastern Europe as a tool to wield political influence. It exports over 60 percent of the natural gas used in countries such as Austria, Bulgaria, Czech Republic, Estonia, Finland, Latvia, Lithuania, Poland, Slovakia, Moldova, Turkey, and Ukraine.

However, Russian dominance is no longer unchallenged. The amounts of liquefied gas available on the market have pushed Gazprom to reduce contract prices because of the possible alternative that many European countries (Finland, Latvia, Lithuania, and Poland) may choose to build their own LNG terminals. In addition, the time when the U.S. will export liquefied shale gas to Europe is not that far off.[29]

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[28] Frank Umbach and Maximilian Kuhn, "Unconventional Gas Resources: A Transatlantic Shale Alliance?" in *Transatlantic Energy Futures: Strategic Perspectives on Energy Security, Climate Change and New Technologies in Europe and the United States*, ed. David Koranyi (Washington, D.C.: Center for Transatlantic Relations, Johns Hopkins University–SAIS, January 2012), 207-228; available at http://www.bpb.de/system/files/dokument_pdf/Transatlantic-UG-Kuhn-Umbach 1211.pdf.

[29] In March 2013, a twenty-year contract was signed for U.S. shale gas supplies to the U.K. starting in 2018. See Fiona Harvey, "US Shale Gas to Heat British Homes Within Five Years," *The Guardian* (25 March 2013); available at www.theguardian.com/environment/2013/mar/25/us-shale-gas-british-homes-five-years.

Russian energy valences may realistically decrease due to the efficient development of proven substantial deposits of unconventional gas in Germany, Ukraine, the United Kingdom, Hungary, Lithuania, and Romania. Even forecasts in this direction were yet another factor that unfavorably affected Gazprom, causing changes in the long-term contracts for supplies of natural gas in Europe.

The shale boom has had an impact on the non-European markets for Russian energy resources as well. On the one hand, China has discovered significant proven shale gas formations in its inner provinces, and on the other hand a number of countries in East Asia are signing supply contracts with Canada.

Which are the viable and winning policies for Russia to preserve its role on the global energy stage under the current dynamic geoenergy circumstances? The first and most crucial one is the modernization of Russia's national energy complex. With the approach of the era of "smart" energy, Russia needs to give up wasteful production methods and use of energy resources as soon as possible.

The depletion of most of the major exploited fields draws attention to Russia's reserves of unconventional hydrocarbon resources. The latest example refers to the ongoing studies by Exxon Mobil and the Russian state company Rosneft of deposits of "Bazhenov" oil in Western Siberia. These are perhaps the world's largest reserves of what is the equivalent of shale gas in the oil industry – i.e., oil from Bazhenov rocks.[30]

Russia has the largest proven technical deposits of unconventional oil. However, these huge potential reserves do not mean that a shale oil revolution will happen in Russia similar to the one in the U.S. The main reason is that Russia's technological capacities lag far behind those in the U.S. The presence of many competing firms engaged in the search for effective technologies for the extraction of unconventional oil and gas in the U.S. resulted in the birth of a new generation of high-tech and inexpensive drills, as well as new technologies such as horizontal drilling. In Russia, this sector is still in the hands of a few powerful players, most of which are closely connected with the state.

In this geoenergy context, it is obvious that with its existing tools Russia will not be able to keep its role as an energy superpower. If the country hopes to remain a key player in the energy resources market, it will have to change the parameters of its energy policy, both inside and outside the country. Now, it will have to fight for consumers' interest in its energy supplies in times of increasing competition and falling prices.

With regard to the European energy markets, Russia's winning strategy should take into consideration the following basic unfavorable factors:

- Long-term stagnation of demand in EU member countries
- Consumption growth is expected only in Turkey
- Reduction of gas consumption in the European countries of the CIS, particularly due to high prices of resources

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[30] According to the most optimistic assessments, these reserves total 143 billion metric tons. This means 1 trillion barrels, or four times the reserves of Saudi Arabia, or enough to satisfy world consumption for thirty years.

- Continuous price conflicts
- Gradual increase in the requirements imposed on suppliers (third energy package of the EU)
- The volume of Russian supplies will remain stable until 2020 (within the framework of current contracts)
- Increase of supplies while preserving existing price correlations will be insignificant (mainly for non-EU countries).

There are serious risks as well as potential for Russian energy policy in the Caspian region. The most important risks are connected with:[31]

- Final energy disintegration of the post-Soviet space (infrastructure, energy flows, exchange of investments)
- Rise of political and military influence of other countries (China, Iran, Turkey, EU, U.S.)
- Militarization of the region
- Increase of environmental issues.

Given these risks, effective policies could be focused mainly on establishing a new joint energy space with multi-agent governance and use of intelligent systems, procurement of innovative energy equipment and services, and common initiatives for environmental improvement in the Caspian region.

Many expectations for market enlargement are connected with North Eastern Asia. This region holds long-term potential for the markets in Japan (20-35 billion m^3/year, due to the disaster in Fukoshima) and the Republic of Korea (10-16 billion m^3/year).[32]

China is crucial for Russia's future role as an energy supplier in the region. But the prospects are ambiguous. By 2025, the country will not be in need of Russian gas, and afterwards it will probably meet its demands through its investment projects/contracts in other energy regions or from own production. Under these circumstances, in order to occupy an important position in the Chinese energy market, Russia will have to resort to price dumping. However, its options are quite limited, due to the increasing cost of Russian gas.

As for the prospects of energy exports to other regions in the world, the realities are not promising. Traditionally, Russian policy relies on fixed energy routes; this, however, makes reaching potential new markets either inefficient or geographically impractical. At the same time, for a number of objective reasons (climatic, geological, investment,

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[31] A. M. Belogorev, "Energy Problems in the Caspian Region: Risks and Potential for Russia," Fifth Caspian Energy Forum, 25 April 2012, http://www.energystrategy.ru/ab_ins/source/Belogoryev_Caspian_25.04.12.pdf (in Russian).

[32] V.V. Saenko, "Russia's Long-term Energy Strategy in the Asia-Pacific Region," Eight International Conference on "Energy Cooperation in Asia: Risks and Barriers," Irkutsk, 21-23 August 2012, http://www.energystrategy.ru/ab_ins/source/Saenko_Irkutsk_21-23.08.12.pdf (in Russian).

etc.) the production of liquefied natural gas from Russia's major fields—Vladivostok, Yamal, Shtokman, and Sakhalin—is very costly and ultimately futile.

In general, changes in the technological and geoenergy environment of Russian energy policy outline the following restrictions in the formation of Russia's future effective energy strategy:

- Regionalization of gas markets limits the potential for access beyond Europe, CIS, and North Eastern Asia
- Due to the high costs, Russia is not able to take advantage of the globalization of the liquefied natural gas markets
- Europe is not able to continue being a driving force for growth; the key goal is to keep what has been achieved on the market
- Russia has at its disposal no more than five to six years to manage to settle on the Asian market; by 2020, the large consumers (Japan, China, and India) will have negotiated arrangements for their required energy resources.

New trends and developments in global energy suggest that Russia will gradually say farewell to its role as an energy superpower. The challenge to Russian politicians and energy planners is huge. They will have to modernize Russian energy policy on the fly, so that Russia will be adequate to the upcoming age of neo-industrial energy.

The European Union

The European Union is the participant in the global energy market that is making the greatest efforts to create energy security policies, but is generating the most inefficient results. The main reason lies in the very mechanisms of making energy policy in the EU. On the one hand, as an integration organization in which member states have delegated sovereignty to the supranational European institutions, the EU produces numerous directives and regulations regarding a common energy security policy in all its dimensions, from energy diplomacy to the protection of critical energy infrastructure. On the other hand, however, these directives and regulations always have a loophole for individual policies and actions of member states under a shared understanding that, since this is an area of vital national interests, and one of the most important dimensions of national security, members will always have difficulty arriving at a consensus solution, and therefore it is in the interest of the Union to allow space for national policies. As practice shows, such policies are often in conflict with the common European energy interests.

Proof of the controversy that is built into the very foundations of the common energy policy of the EU are the provisions in the Lisbon Treaty, which represented a culmination of efforts for greater cooperation between member states in the energy sector.[33] The treaty specifies four main objectives of energy policy in the EU:

- Ensure the operation of the energy market
- Guarantee the security of supplies in the EU
- Encourage energy efficiency, energy saving, and the development of new and renewable forms of energy
- Promote the interconnection of energy networks.

In compliance with Article 122 (1) (TEFU), these goals shall be achieved in the spirit of cooperation. This solidarity clause is an attempt to institutionalize the concept of enhanced European cooperation on energy security issues. At the same time, there are provisions for decision making on energy issues by unanimous consent. For example, Article 194 (2) and (3) of the Treaty provides that solutions proposed by the EU to introduce a common system of energy taxation, or to promote the use of a specific energy technology over others, be subject to a unanimous vote by the member states, which actually effectively gives each of them the right to a veto on these proposals.

The fact that the treaty encourages enhanced cooperation at the EU level while confirming the individual rights of member states recognizes the historical contradiction within the ideology of the EU energy policy that encourages the tendency of member states to put their own national interests above those of the community. Article 2 (C) of the Lisbon Treaty makes it clear that energy is an area of shared responsibility, but in practice it supports the unanimity of the EU on general problems of energy policy (by qualified majority), while maintaining the central role of member states regarding the specifics of this process (by unanimous vote).

This basic dichotomy in decision making in the European energy policy explains its poor performance and the fact that it is a "common policy" only *de jure*, but not *de facto*. The issue is particularly relevant in the context of the radically changing terms and conditions of energy markets, where the EU's energy policy must continue to ensure energy security and economic competitiveness of the Union to prevent negative effects on climate change.

The shale revolution has already changed the European energy market before it has produced even one molecule in domestic shale fields. The main effects have been the change in Gazprom's contractual policy, opportunities to supply liquefied natural gas at competitive prices, the availability of large quantities of coal at low prices, potential for production of shale resources in Europe (Estonia produces more than 90 percent of its electricity from bituminous shale, and is now the most shale-dependent country in the

[33] For details, see Frank Groome, "From Contradiction to Cooperation: A New Legal and Diplomatic Foundation for Energy Policy in the EU," *Journal of Energy Security* (19 April 2012); available at www.ensec.org/index.php?option=com_content&view=article&id=343:from-contradiction-to-cooperation-a-new-legal-and-diplomatic-foundation-for-energy-policy-in-the-eu&catid=123:content&Itemid=389.

world).[34] The European Union could not avoid the impact of shale gas on its climate change policy. Set by Brussels in 2007, the goal for the reduction of carbon emissions was defined due to the continuous increases in fossil fuel prices, which strengthens the business arguments to invest in renewable energy. However, as natural gas prices fall around the world, it is pointless to invest in expensive subsidized forms of renewable energy. If the support for renewable energy continues, it is likely that due to its high prices European businesses will switch to environmentally harmful coal, and the EU will make a step back.

In the old paradigm, especially after the gas crisis of 2006, the main problem of European energy security was diversification, security, and reasonable prices for natural gas supplies. In other words, reduction of its high level of dependence on Russia for its natural gas supply.

As early as November 2000, the European Commission warned in a "Green Paper" that over the next twenty to thirty years, up to 70 percent of the energy consumption in the Union would be from imported resources (the level currently stands at 50 percent). The production of EU energy is expected to fall from the current level of 46 percent to 36 percent in 2020. Imports of resources will cost around EUR 350 billion, i.e. EUR 700 for each EU citizen. Moreover, the profile of gas imports in the EU remains undiversified. 84 percent of gas is imported from three countries: Russia (42 percent), Norway (24 percent), and Algeria (18 percent).

Member states have different portfolios of suppliers of gas and routes, and those with more developed gas markets pay less for imports. The average price limit for gas supplies in the U.K., Germany, and Belgium is around 35 percent lower than the price in countries that rely on a limited number of suppliers, such as Bulgaria and Lithuania. Because of inefficient infrastructure links with the remaining part of the EU, countries in Northern and Eastern Europe feel like "energy islands."

Furthermore, Europe, which is a major potential user of energy from the Caspian region, has fallen into double dependence: first, on the traditional Russian supplies, and second, on the supplies from Central Asia and the Caspian region that are controlled by Russia. Nearly one-third of total EU imports of gas actually arrive in the EU through Russian pipelines and as a result of Russian gas swaps with the countries from Central Asia and the Caspian region.[35] In this context, the key problem for the EU and its member states regarding energy security remains its almost total dependence on Russia for its supplies of natural gas.

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[34] Gary Peach, "Estonia's Shale Oil Market: How the Small Country Is Hoping to Revolutionize the Energy Sector," *Huffington Post* (30 May 2013); available at www.huffingtonpost.com/2013/05/30/estonia-shale-oil-drilling_n_3357830.htm.

[35] For more on EU gas dependence here and above see Maximilian Kuhn and Frank Umbach, "The Geoeconomic and Geopolitical Implications of Unconventional Gas in Europe," *Journal of Energy Security* (08 August 2011); available at www.ensec.org/index.php?option=com_content&view=article&id=320:the-geoeconomic-and-geopolitical-implications-of-unconventional-gas-in-europe&catid=118:content&Itemid=376.

All in all, none of the many potential solutions to resolve this key issue has been realized yet, from the construction of a southern energy corridor to the connection of the energy routes of the member states, which is the prerequisite for an integrated energy market. One of the main reasons is that investments in the energy sector are at historically low levels. According to the *Energy Roadmap 2050* produced by the European Commission, the transition to secure and competitive low carbon energy requires sustainable increases in investment in energy equipment, networks, transportation technologies, infrastructure, and efficient buildings. These higher investments are valued as equal to 1.5 percent of the GDP on an annual basis for the entire period until 2050. By 2020, the EU will need investments of about EUR 1 trillion in order to guarantee security of supplies, diversification of sources, ecologically clean energy, and competitive prices in the framework of an integrated energy market.[36]

It could not be expected that the countries of the European Union will replicate the "miracle" of the U.S. shale boom to solve the problems of monopoly dependency and energy resource prices. The reasons are of a practical nature (geology, law, population density, environment, non-integrated energy infrastructure) and the reticent attitude of societies in many European countries with regard to the effects of current technologies for the extraction of shale resources. What could definitely be argued at the moment is that approaches to unconventional resources will vary considerably between member states, who will set their own priorities in the energy sector.

In the current situation in the gas market, which is marked by a decrease of consumption in the EU, a global gas glut, the decoupling of gas prices from oil prices, and falling prices for LNG in the spot market, the European energy security policy must be seriously reconsidered. It is hardly realistic to believe that the EU needs all of the fixed routes for natural gas that are under discussion. In search of efficiency, we must rely on the most economical gas pipelines and build the optimum number of regasification terminals. What is absolutely necessary for the European energy market is to link energy infrastructures in a general reversible network to ensure security of supplies and uniform prices within the Union.

China

China's economy has the fastest growing rate of energy consumption of any economy in the world. Along with India, it is a major player in the energy market whose presence and active role in the allocation of resources affects all other countries' decisions.

The shale revolution has had an impact on China's geopolitical positions. The decrease in the significance of the Middle East for energy supplies to the U.S. was followed by declaring a new geopolitical strategy in the Obama doctrine – the "pivot to Asia." This meant a concentration of forces and strategic partnerships in the Pacific region, where the growing influence of China is a fact. The United States announced the withdrawal of aircraft patrolling the Persian Gulf and the transfer of some of them to the Pacific. For China, this means that it will need to invest more resources for security in

36 *Challenges and Politics in the Energy Sector*.

the region and for sea routes (the Chinese fleet is already in the Indian Ocean), since 46 percent of its oil supplies come from producers in the Middle East, mainly Saudi Arabia, Iran, Kuwait, and increasingly Iraq.

The energy geopolitics of China continues to be oriented towards the Central Asian region, where it imposes the country's interests through an investment expansion that is displacing Russia from its traditional zones of influence. The exploitation of a pipeline from Kazakhstan and a gas pipeline from Turkmenistan guarantees secure supplies as opposed to sea routes.

Some of the resource sources for China are quite risky. The events in Libya caused serious losses in Chinese investments there. Iran continues to be a significant supplier of oil to China (third place) despite U.S. sanctions and diplomatic threats. Investments are increasing in Iraq, where the Chinese giant CNPC bought Exxon's share in the giant field West Qurna-1. The deposit is of strategic importance since it can provide direct supplies by sea to China via the port of Basra.

The geography of the supply sources for China is very broad. There are thirty exporting countries: 56 percent of the supplies come from the Middle East (Saudi Arabia has the largest share); 27 percent come from Africa; 13.5 percent from Asia and the Asia-Pacific region; and 3.5 percent from Latin America.[37] The China National Petroleum Corporation (CNPC), China Petroleum & Chemical Corporation (Sinopec), and China National Offshore Oil Corporation (CNOOC) are the national oil giants responsible for ensuring energy supplies to the country. They make huge investments in Africa, Brazil, and Central Asia. Part of the competitive advantage that helps them to dominate over other private oil companies includes "development activities" supported by the Chinese government. They vary from infrastructure construction and provision of development loans to building petrochemical refineries in return for the privilege to explore and buy energy assets. These investments not only provide stable energy supplies to China, they also help to maintain and increase its strategic influence throughout the world. The Chinese government also offers loans for exploration and production in exchange for ensuring ongoing oil exports. These loans have proven to be a trump card in tenders for energy contracts.[38]

With regard to natural gas, China is ambitious to diversify its energy mix by increasing its share from a modest 4 percent in 2010 to the still unimpressive 7 percent in 2020.[39] According to expectations, part of this will happen at the expense of production

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[37] Iveta Frolova, "Chinese Expansion in post-Soviet Space," *Geopolitics* 2 (2013); available at http://geopolitica.eu/spisanie-geopolitika-broi-2-2013/1413-kitayskata-ekspanziya-v-postsavetskoto-prostranstvo.

[38] A. Malhotra, "Chinese Inroads into Central Asia: Focus on Oil and Gas," *Journal of Energy Security* (20 November 2012); available at http://www.ensec.org/index.php?option=com_content&view=article&id=387:chinese-inroads-into-central-asia-focus-on-oil-and-gas&catid=130:issue-content&Itemid=405.

[39] See "Why There's No Shale Revolution in China?" *DarikFinance.bg*, 25 January 2013, http://darikfinance.bg.

of its own shale gas,[40] even more so since according to the U.S. Energy Information Agency China ranks first in alleged technical reserves.

Geological studies have shown, however, that these gas formations are located much deeper than those that have been developed in the United States. Furthermore, the fields are in much more difficult terrain, and prospective reserves are located in mountainous areas or densely populated areas. This makes drilling for natural gas harder, and results in prices that would be approximately two to three times higher than those in the U.S.

Another barrier to the shale gas revolution in China are regulations. The state is the owner of the gas transfer infrastructure, and the market is also dominated by state players. This hampers competition and private investments that might bring development and effectiveness on the market (a problem similar to the one in Russia). The new energy context has presented China with new opportunities for its energy policy, and it will have to take advantage of them fully.

OPEC

OPEC is clearly among those players that are directly affected by the shale revolution. It is expected that the increase in oil production in the U.S. will have a serious impact on the market in general, and the Organization of Petroleum Exporting Countries must change their strategy under the new conditions.

The visible effect of the news about shale oil is the disagreement between the members of the cartel on what should their reaction be. The participants who are most dependent on oil prices suggest that production and supply be reduced in order to raise prices when they start to fall. Algeria, Venezuela, and Iran require higher oil prices to cover their internal costs and falling yields. Therefore, they are often in conflict with the Persian Gulf states led by Saudi Arabia, who have sufficient financial strength to withstand some decline in prices. African countries (such as Algeria and Nigeria) suffer most from the shale revolution, since their oil is similar in quality to the shale oil. It is they who will bear the heavy consequences from the shale revolution in the U.S.

Taking into account the expected production in the U.S. and Canada, it is estimated that by 2015 OPEC will be forced to cut its daily production by 6 million barrels in order to prevent a collapse in prices. The price issue is very important. For OPEC members, a “fair” price is around USD 100 a barrel. Lately, it has been based on the budgetary needs of the members of the cartel whose appetite for petrodollars increased significantly after the so-called Arab Spring. Hoping to avoid the fate of the leaderships in Egypt and Tunisia, the regimes in the Persian Gulf generously give gifts and subsidies in their countries. Saudi Arabia, for example, nearly doubled its budget because of such programs. Most Saudis are working for the bloated public sector, where wages are two to three times higher than those in the private sector. Another surprising fact is that Saudi Arabia ranks sixth in the world in crude oil consumption, ahead of major industrial countries like Germany, South Korea, and Canada. At the current rate of consump-

[40] In November 2009, China signed an agreement on cooperation with the U.S. regarding shale gas projects.

tion of energy resources, by the end of the decade Saudi Arabia will overtake Russia and India. To keep its system intact, the Saudi government will need to generate higher and higher revenues from oil sales. The history of Saudi Arabia is more or less the same as the history of the other members of the cartel. Iran, Iraq, Venezuela, and Nigeria also insist on higher oil prices.

The technology applied by the cartel is to reduce yield and cause a rise in prices until the so-called "fair price" is reached. The problem is that in 2004 the "fair" price for OPEC was USD 25 a barrel. Two years later, USD 50 was considered the "ideal price." Now it is USD 100. With the advance of U.S. shale oil, the organization obviously plans to go the same way: keeping prices high by controlling oil production. In the past four decades, the world GDP grew fourteen times, the number of automobiles increased four times, and the global consumption of crude oil doubled. However, OPEC, sitting on top of three-fourths of the conventional global reserves, has preserved its contribution to the market unchanged.[41]

According to BP analysts, however, the average price for a barrel will fall to USD 80 by the end of this decade. OPEC will at some point have to accept the fact that the time when it played the key role on the oil market is a thing of the past.

The New Paradigm

In the context of the old paradigm, energy security was directly related to energy independence. The idea was that if a country was self-sufficient in energy resources to a significant degree, and had an efficient (energy-saving) economy, this was supposed to lead to lower energy prices. The reality of oil prices in the U.S. after the shale boom proved that it was a utopia. The reason is that oil is a replaceable commodity whose price is determined on the world market. The price of a barrel of oil is more or less equal for each user, and when the price rises, it rises for everyone, regardless of where the supply of raw materials comes from.

Achieving energy self-reliance is practically impossible.[42] Even countries like Russia, Saudi Arabia, Venezuela, Brazil, and Canada, who are rich in hydrocarbon resources, import part of their energy as refined oil products due to insufficient capacity for refinement. This dependence could theoretically be eliminated with a little effort and investment in new plants, but this does not happen in practice. Out of the world's top ten economies, only two—Brazil and Canada—can theoretically reach complete energy independence. The others—e.g. China, Japan, and Germany—are poor in resources in

[41] Gal Luft and Anne Korin, "The Folly of Energy Independence," *American Interest* (July/August 2012); available at www.the-american-interest.com/article.cfm?piece=1266; and Gal Luft, "The Energy-Security Paradox," *The National Interest* (28 March 2013); available at http://nationalinterest.org/commentary/the-energy-security-paradox-8281.

[42] Gal Luft, "Energy Self-Sufficiency: Reality or Fantasy?" *Journal of Energy Security* (21 November 2012); available at www.ensec.org/index.php?option=com_content&view=article&id=394:energy-self-sufficiency-reality-or-fantasy&catid=130:issue-content&Itemid=405.

terms of their needs, which predetermines their dependence on energy imports. The radical solution is to change the paradigm, to not focus on energy self-sufficiency but rather on the reduction of the strategic importance of oil for the economy, and particularly for transport.

A 2009 book by Anne Korin and Gal Luft titled *Turning Oil Into Salt* elaborates on the popular idea that, just as salt exerted a significant impact on world history for centuries, given its role as the only effective mode of food preservation (salt wars were waged), today petroleum plays a strategic role due to its essential function as a transport fuel.[43] The solution is similar to the story of salt—oil must become a regular commodity through opening fuel competition. Just as it does not matter what kind of energy is used for the production of electricity, transport vehicles and the fuel distribution system must be open to a diverse mix of fuels. This is in the spirit of the upcoming neo-industrial age where some steps have already been made, even though this is still in the early stages – electrical vehicles, hybrid electric cars, methanol, etc.

It is important that the new paradigm highlight the understanding that the depletion of hydrocarbon resources is not imminent. This used to be a basic explanatory model in the context of the old paradigm, where innovations in energy were expected to occur with the decline of the hydrocarbon era. The shale revolution has confirmed the understanding that technological developments will create new opportunities for the efficient extraction of previously "frozen" hydrocarbon resources. A relevant example is the announcement by the Japanese state-owned Japan Oil, Gas, and Metals National Corporation (JOGMEC) on the successful extraction of gas from methane hydrate, known as "burning ice."[44] This is the first major breakthrough after decades in which researchers had tried to arrive at a method for the commercial production of this gas that exists in the sea depths in quantities sufficient to meet the demands of mankind for centuries. Since such black swans, or strategic shocks, cannot be predicted, the philosophy of innovative thinking in the energy sector needs to be changed, and environmental and highly efficient technologies must be implemented, such as the systems for Integrated Gasification Combined Cycle (IGCC), also called "clean coal." IGCC is a gasification process used for the conversion of coal and other heavy fuels into high-energy fuels, also called "synthetic gas," or "singases" for short. These gases are then purified and used in efficient combined cycle systems for the production of power. Another example of high technology is Carbon Capture & Storage (CCS), a method for capturing and storing carbon dioxide. It involves capturing CO2 emissions from large industrial plants—such as power stations, refineries, and chemical plants—and their safe storage underground.

NATO is also in the process of changing the paradigm of energy security in the context of its responsibilities. The current paradigm includes fuel efficiency and responsi-

[43] Gal Luft and Anne Korin, *Turning Oil into Salt: Energy Independence Through Fuel Choice* (Charleston, SC: BookSurge Publishing, 2009).

[44] "Japan Starts the Production of 'Burning Ice'," *Capital* (18 March 2013); available at www.capital.bg/politika_i_ikonomika/2013/03/18/2024927_iaponiia_zapochva_dobiv_na_goriasht_led/.

bility for the security of important energy routes. What is new is the turn to high technologies to achieve the objectives of energy security. A good example is the introduction to NATO of the Microgrids system, which is defined as a tool to improve the stability of the power system.[45]

Microgrids are an example of NATO's contribution to energy security, and could be defined as an integrated energy system consisting of distributed energy resources and multiple electrical loads operating as an independent autonomous grid, in parallel, or "isolated" from the basic electrical grid. Microgrids have two important overlapping features from a military perspective: diversity of sources (natural gas, diesel, oil, wind, solar, methane, etc.) to produce electricity for military bases (both at home and under severe conditions during operations), and continuity of service separate from the main electrical grid.

Revolutionary changes in the facts and circumstances of energy security call for a paradigm change that must be reflected in energy security policy. These changes must be in line with new energy technologies and the changing assessments of resource deposits. We are now on the threshold of the transition to a post-industrial, "smart" energy system, which means "smart" grids, alternative energy sources for transport, decentralizing energy, integration of energy into the techno-sphere, accompanied by increases in energy efficiency. All of this will provide for lowering the geopolitical and environmental risks and will create new opportunities for the end user.

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[45] M. Hallett, "Microgrids: A Smart Defense Based NATO Contribution to Energy Security," *Journal of Energy Security* (20 November 2012); available at www.ensec.org/index.php?option=com_content&view=article&id=390:microgrids-a-smart-defense-based-nato-contribution-to-energy-security&catid=130:issue-content&Itemid=405. P. Asmus, "Why Microgrids Are Inevitable," *Distributed Energy* (September–October 2011); available at www.distributedenergy.com/DE/Articles/15471.aspx.

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