

The vulnerabilities of the gas supply system of the Republic of Moldova in the context of its energetic security

Iulian VIȚĂ

Academy of Economic Studies of Moldova, Chișinău, Moldova
iulian_personal2007@yahoo.com

Cristina Elena NICOLESCU

National University of Political Studies and Public Administration, Bucharest, Romania
cristina.nicolescu@administratiepublica.eu

Abstract. *In the context of the current “volatile” equation of energy resources at the world, regional and local level, impacted by the decline of the “sovereign oil era” and by the shifting of the weight center on the use of gas, renewable resources and increased efficiency – considered a new type of energy resource, the topic of energy security gains enhanced weight in the governments’ working agenda, in particular for the states currently in a situation of major dependency on the energy resources of other countries, as is the case of the Republic of Moldova, almost completely energetically dependent on the import of natural gases from Russia.*

The paper at hand aims to emphasize the energy security vulnerabilities of the Republic of Moldova, state which, following the signing of the EU Association Agreement and the entering into effect of this document in 2016 should become, as the EU member-states, energy security supplier for the EU.

The methodology used is preponderantly qualitative and based on the analysis of official documents, key information, case studies, the analysis performed in this paper providing important information for the policy makers’ agenda for planning and management purposes and for energy sector in the Republic of Moldova, in considering its foreign policy-specific national interests.

Keywords: EU, energetic mix restructuring, global energy scenarios, energetic dependency, energy policy instruments.

JEL Classification: O3.

1. Introduction

From the perspective of the evolution of the natural gas market, both at the European level and within the R. Moldova, the first years of the 21st century started sinuous, due to the geopolitical tensions, the energy security option of the EU member states and of the R. Moldova experiencing turning-point moments, if we refer, in the least, to the three incidents between Russia and Ukraine in years 2006, 2009 and 2014.

The crises in Ukraine started a real confrontation of the Russian-European relations, leading to the deepening of the global systemic crisis at the end of year 2014 and the damage to the support pillars of the old system: *international currency, financial markets, western alliances, the USA, world governance, democracy* etc. (GEAP no. 9, 2015).

At present, the national and regional gas system presents an apparent relaxation after surpassing the critical situations created as a result of the sudden changes of natural gas supply and demand, and here we refer to the scarcity or the demand shocks in this energy sector.

The globalization of the gas trade and of the diversification of the gas supply sources induce apparent benefits and world stability of gas supply security for consumers, since the real cause of the expansion and intensification of this energy resource is the widening of the geographic area of the repercussions of the shocks between demand and supply, which, in the past, used to be limited to single regions (IEA, 2016a).

Therefore, the analysts conclude than an analysis of the gas security in a region, for instance, in the Republic of Moldova, taking into account the impact of a single variable, namely gas as independent fuel in an individual region, such as Russia, is a wrong approach (Ibidem).

The consequences of R. Moldova's gas dependency in matters of national security must be analyzed in a wider context, that of the world energy system. In the period 1970-2015, the system was molded by four groups of key-factors: *the population and the growth of the labour force; the new technologies and productivity; the environmental priorities; international governance and geopolitical relations* (World Energy Council, 2016: p. 15). In the period 2014-2060, there is a series of uncertainties which will influence the future energy world: *pace of innovation and productivity; priority given to sustainability and climate changes; selected action instruments – balance between the use of markets and of state policy; evolution of international governance and geopolitical change* (Idem: p. 23).

At the end of this new road called by the specialists *The Great Transition*, the socioeconomic and political context will be characterized by a *low population and labour force, a series of new strong technologies, a greater appreciation of the planet's environmental limits*, as well as by a *change of the economic and geopolitical power towards Asia* (Idem: p. 20).

The paper at hand with holds for analysis one of the key-factors incident to the evolution of the global energy system in the two periods mentioned before, 1970-2015,

respectively, 2014-2060, namely, the *influence of the evolution of international governance and geopolitical changes* on the consequences of R. Moldova's gas dependency in matter of energy security.

2. The crepuscule of the black gold era and the transition to gas and renewable energies

A decisive factor contributing to the development of the gas energy market and to the increase of this resource's proportion in the energy mix (GEAP no. 9, 2015) is the change of paradigm regarding the *supremacy* of oil. We are facing a strong decline of the "era of sovereign oil", due to the depletion of oil, actually anticipated by several states which were able to rapidly adopt alternative energy strategies, such as the shale gas or renewable energies⁽¹⁾, which led to the emergence of new forms of power in the sphere of international relations, a new governance, because we are witnessing a systemic change (GEAP no. 9, 2015).

The evolutionary picture of oil demand and supply, of extractions, stocks, as well as price, often confirm the Gaussian curve of Hubbert's theory⁽²⁾ that of a limited productivity of the oil deposits, directly proportionally dependent on the necessary energy quantity and not on its economic cost.

Reaching the geological limits of this energy resource significantly depends on the changes of population's life-style impacting the global oil demand, on the governmental policies, on the introduction of the new technologies, on the oil price etc. For example, the discovery of new technologies, which did not exist in Hubbert's time, allowed the US to reach today record-productions of oil and gas, currently unbalancing the demand and supply market.

From the perspective of the oil consumption at the world level, year 2005 represented the inflexion point: the oil demand of the Old World (Japan, the United States and Europe) was exceeded by that of the New World (the rest of the world), an increase largely justified by the high oil demand in China.

The decade which followed deepened this gap, with 29.1% in year 2011 and with 36% in year 2012, year when the oil demand in Western Europe was lowest and reached the lowest level since the end of year 1994 (Badkar, 2012).

In what concerns the evolution of the oil price in the long run, in the period 1970-2011, it registered three peaks: the first, at the beginning of the 20th century, due to the incipient stage of demand; the second, in 1973, brought about by the OPEC⁽³⁾ embargo (First Oil Shock); and the third, recently (2008), as a result of the somber forecast regarding the short- and medium-term depletion of oil.

Starting with year 2014 and until the present, we are in a period of deflation of oil, triggered as a consequence of the *revolution of the hydraulic fracturing of oil clays in the US, of the re-commencing of production in Libya and of the OPEC "gambit"*⁽⁴⁾ of 27 November 2014 (Crânganu, 2015a).

The fundamental axioms of demand and supply (Angelescu et al., 2003: p. 104) help explain the sudden decrease of price. Thus, at present, the fierce competition for the market share between the American and the OPEC producers, doubled by a decreasing oil demand world-wide, led to a steep drop of oil price to the critical levels of year 2005.

Among the causes invoked by the theoreticians and practitioners for this phenomenon are (Saefong, 2016) *the tensions between Iran and Saudi Arabia, the slowing-down of the growth rate of China's economy and the decrease of the global stock exchange markets, the increase of oil stocks in the US*, as a result of the significant increase of the oil production at the international level.

To this list, we can add the cold war of the cheap oil started by the two historically allied states, the US and Saudi Arabia, which are thus trying to submit Russia and Iran to their geostrategic interests, the first for the open war against Ukraine, and the second for its nuclear program, which would have allegedly terrorist purposes. In this way, Russia and Iran could reconsider their aggressive foreign policies from the last years, which may lead to the removal of the dollar as the main exchange currency, leaving room for the Euro⁽⁵⁾. Still, Russia's oil production reached, in 2014, a post-Soviet record level, suggesting that this country's main source of income was not affected by the American and European sanctions or by the crashing of the oil price.

A substitution of the dollar with another currency would have important repercussions, both on the economies of the states closely connected to the American economy, and on the dollar. An extreme scenario consists in the fact that this decision could be used to counter-balance the American hegemony by certain states or world organizations (such as OPEC) or by one or two major creditors which would ask for the return of their debts in euro⁽⁶⁾.

Not least, some analysts consider that the current policy of Saudi Arabia to flood the market with low-price oil also derives from a possible overthrow of political regime in this state⁽⁷⁾, and the expropriated oil reserves which, in short, make more attractive an accelerated production of oil, and its rapid sale, by using small prices, than a balanced production and the maintaining of oil stocks which, at a later date, may no longer belong to them, due to expropriation.

Since the current mixture of economic forces, unequal as intensity, maintained by the variation of the oil demand and supply, generates global economic unbalances, measures were initiated, from the OPEC and non-OPEC oil producers, to stabilize the oil market, agreeing, through an agreement concluded in year 2016, the adjustment of prices, by diminishing production (Petrini, 2016).

Of course, a new peak of the oil Price depends on the *observance of this agreement, on the increase of the US oil production and on the preservation of the dollar's supremacy as the international currency.*

However, recently, the adjustment of the oil supply appreciated as possible solution to the price-demand-supply equation is affected by the United States' transformation into a *swing producer*⁽⁸⁾ through its revolutionary development of the shale gas, today the US having no more storage space for the surplus of hydrocarbons (Crânganu, 2015b).

Therefore, we are facing the world governance system of the oil market – OPEC quite “damaged” (GEAP no. 9, 2015) and the United States – OPEC couple, which inverted their role in year 2015. However, in the future, the emerging economies (China, India etc.) will positively and considerably influence the demand of this resource, at the world level, at the opposite point of the impact degree being the oil demand of the European countries, which will decrease and will have an insignificant impact.

3. World energy scenarios and their influence on the gas demand of R. Moldova

The constraints on the world energy balance (and for which, currently, its oil and gas component represents the greatest challenge) non-exhaustively presented in the previous section, as well as the inefficiency of the incident governmental policies of the main actors with influence on it, induce an increased degree of uncertainty in the energy security decisions of the states highly-dependent on other states for their energy.

The energy-dependent states choose short-term solutions taken from the experience of other countries, most time without the foreseen long-term impact and without being able to closely follow their own geostrategic interests.

A relevant example in this sense is the R. Moldova, a state whose energy security is greatly influenced by the situation of total dependency on the import of natural gas from Russia. In addition, the market of the R. Moldova for natural gas and electricity is currently dominated by Gazprom⁽⁹⁾, and its current energy situation depends on the supply with natural gas and electricity from or through the Transnistria region, which implies a complex set of corporative relations, in which are included the interests of the Republic of Moldova, of the Transnistria region and of the Russian Federation (Emerson and Cenușă, 2016: pp. 133-136).

R. Moldova is making significant efforts to modernize its energy system, still inefficient and dependent on the imports of natural gas and electricity. In year 2016, the *Association Agreement* (AA) between the R. Moldova, on the one hand, and the EU, the European Atomic Energy Community and their member states, on the other hand, entered into effect, including in the AA the energy clauses from the *Partnership and cooperation agreement concluded with the European Communities and their member states*.

By means of this approach, the R. Moldova undertook the continuation of its efforts regarding the establishment of a common energy market with the EU⁽¹⁰⁾ and, implicitly, the implementation of a regulatory and institutional framework aligned to the common EU energy policy, where the regulatory core is *Energy Package III*, which presupposes a liberalization of the electricity and natural gas market (Marcotilo, 2015: pp. 3-4).

Despite the fact that the Association Agreement is a step considered by the specialists as a unique opportunity to solve the existing problems within the energy system of the R. Moldova, the Transnistria authorities strongly oppose the enforcement of AA, which will prevent a convergence of economies on the two sides of the Nistru.

The clauses vary from the insufficient understanding of the Agreement to the strong economic and political dependency on Russia, due to the five key-particularities of the regional economy: *major dependency on the imports from Russia; high current account deficit financed, directly and indirectly, by Russia; the regional economy depends more on the internal demand, preponderantly supplied by Russia; the budget of the region is strongly exposed to the liberalization of foreign trade; the region is close to depleting its foreign currency reserves, the “Transnistria ruble” being strongly supported by Russia* (Lupușor, 2015: p. 5).

Recently (February 2017), the authorities in Transnistria restated their desire to belong to the Russian Federation, declaring that they do not want to pay Transnistria’s gas debt to the Russians, in value of 5.8 billion dollars, because they consider themselves part of the “Russian world” and Russia’s vision on the energy model should be derived from this perspective⁽¹¹⁾.

The implementation deficiencies of *Energy Package III* are major and must be decisively corrected; in the contrary case, the R. Moldova will not align to the standards of the European Energy Community: *lack of transparency of biddings, possibility of offshore companies to take part in the tenders, lack of independence of the regulatory authority in matters of energy – the National Agency for Regulation in the Energy field, possibility of ANRE members to hold stock within the companies ANRE regulates (lack of sanction for the conflict of interests) etc.*

Taking into account the current geopolitical conditions, the balance of the world energy, as well as the constraints imposed by Russia on the economy of Moldova, the question arises naturally: *what will be the evolution of the energy market in R. Moldova in the context of the Great Transitions 2014-2060?*

The emergence of *innovative analysis techniques*, possible to apply to the study of public problems, as is the case of *simulation*, allows a significant progressive leap for the analysis of public policies, in general, and in particular for the analysis of the energy policy, simultaneously satisfying the need of the decisional factors to analyze these problems from a *multidimensional and systemic perspective*.

Looking towards year 2060, the World Energy Council presented in 2016 three world energy scenarios, simulated in critical uncertainty conditions, which were developed with partners Accenture Strategy and the Paul Scherer Institute. The exploratory (evolution) scenarios strengthen the ability of the politico-administrative decision-makers to define balanced policies, with consolidated legitimacy.

The scenarios were metaphorically named *Modern Jazz*, *Unfinished Symphony* and *Hard Rock* and were quantified using the Global Multi-Regional MARKAL Model (GMM)⁽¹²⁾. Each scenario describes the development of a possible future energy system at the global and regional level.

The GMM model contains 15 world regions. Major countries are modelled as separate regions: Brazil, China, the European Union⁽¹³⁾, India, Russia, and the USA. Aggregated regions include: Eastern Europe⁽¹⁴⁾ and Russia; South and Central Asia (excluding India); the developed far East (Japan, Korea and Taiwan); Australia together with New Zealand; other Latin America together with the Caribbean (excluding Brazil and Mexico); the Middle East together with North Africa; Canada together with Mexico; and Southeast Asia and the Pacific. For each region, scenario assumptions influence the dynamics of demand and supply technologies (cost, efficiencies, availability).

Two scenarios are successful, each with a different set of dominant tools, one that uses predominantly state directives (*Modern Jazz*) and the other predominantly markets (*Unfinished Symphony*). The type and application of technologies are the main differentiators across the scenarios: technologies that maximize comfort and benefits for individuals are contrasted with large-scale applications for the use and provision of public goods (World Energy Council, 2016: p. 29).

The third scenario, *Hard Rock*, explores the lowlands of weaker and unsustainable economic growth and investment driven by inward-looking policies. There is a patchwork of policies and new technologies that are predominantly the result of coping strategies from various groups and stakeholders (Ibidem).

The three scenarios use differentiated policy mechanisms and economic growth trajectories and reveal the following key features (Idem: p. 33. See more: pp. 30-31):

1. *Modern Jazz* (The outcome in 2060 is a world with a diverse set of resilient and lower-carbon energy systems): open economies; digital boost; consumer driven technology adoption; technology support; complex globalization; shifting hubs; growing global connections; free markets; enabling policies; new business models.
2. *Unfinished Symphony* (By 2060, the world has shifted to a resilient, integrated, global low-carbon energy system): intelligent growth; circular economies; local support; global mandates; unified action; strong global cooperation; regional integration; climate focused policy; global policy convergence.
3. *Hard Rock* (The outcome in 2060 is a fractured world, with a diverse set of economic, energy and sustainability outcomes): domestic growth and expertise; local content emphasis; lower GDP growth; energy security drives renewables; fragmented political and economic systems; power balancing alliances; security focused policy action.

In considering the results of these simulations, we aim to identify the vulnerabilities of R. Moldova's gas supply in the context of its energy security, taking into account the TPES evolution, as well as the evolution of gas in the structure of the energy mix at the world level, for the period 2014-2060, in all three scenarios, and as interest-areas withheld for

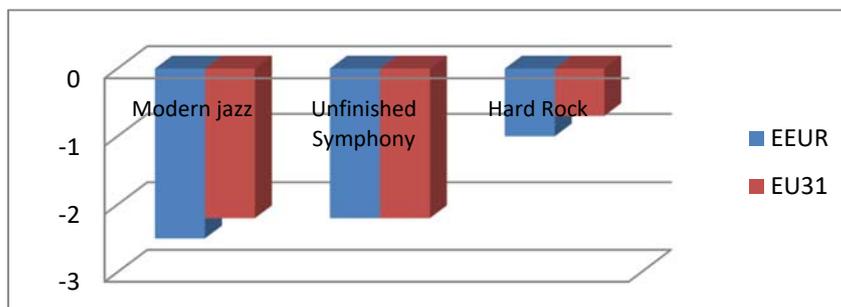
analyses there are: the aggregated area Eastern Europe (since Moldova is included by the GMM model in this region), Russia (due to Moldova's energy dependency on this state) and EU31 (due to the need to align Moldova to the EU energy policies, as a consequence of signing the Association Agreement, entered into effect in 2016).

Between 1971 and 2014, the world total primary energy supply (TPES) was multiplied by almost 2.5 times, increasing from 5523 MTOE to 13700 MTOE, and the proportion of natural gas in the energy mix increased from 16% to 21% (IEA, 2016b: p. 4). For the period 2014-2060, each of the three scenarios anticipates increases of TPES, but also of the proportion of natural gas, as follows:

- The Modern Jazz scenario anticipates an increase of the Primary energy demand with 25%, reaching in 2060 the value of 17013MTOE, and the proportion of natural gas in TPES will record an increase, in 2060, from 21% to 29% (World Energy Council, 2016: pp. 48-50).
- The Unfinished Symphony scenario anticipates an increase of the Primary energy demand with only 10%, which will reach in 2060 the value of 15085 MTOE, and the proportion of natural gas in TPES will record an increase, in 2060, from 21% to 24% (Idem: pp. 67-68).
- The Hard Rock scenario anticipates an increase of the Primary energy demand with 34%, reaching in 2060 the value of 18272 MTOE, and the proportion of natural gas in TPES will record an increase, in 2060, from 21% to 24% (Idem: pp. 85-86).

In the three scenarios, TPES per capita peaks before 2030 and the primary energy intensity of GDP⁽¹⁵⁾ experienced different annual percentage reductions in all 15 regions (World Energy Council, 2016: p. 91), and in the EU31, respectively EEUR (Eastern Europe and Russia) regions, the anticipated values are reflected in the figure below.

Figure 1. Primary Energy Intensity % p.a. (2014-2060)



Source: Own elaboration after World Energy Council, 2016: pp. 48, 68, 86.

In what concerns the evolution of gas in the structure of the energy mix, in the two scenarios, Modern Jazz, respectively Unfinished Symphony, gas will keep its second position, after oil, until year 2030 and the natural gas assumes a much larger role in Modern Jazz (World Energy Council, 2016: p. 94). In the third scenario, Hard Rock, energy security will determine the change of the weight center from the natural to the unconventional gas (Idem: p. 95).

The Modern Jazz scenario emphasizes a weakening of OPEC's and Russia's influence on the natural gas market, due to the increase of the export of Australian and US LNG, phenomenon which increases the flexibility of the energy sector and, implicitly, determines the emergence of "windows of opportunity" for the increase of the natural gas demand, almost half of this demand being assigned to Asia by year 2030, and in the period 2030-2060, 50% of the increase of natural gas consumption at the world level will be assigned to China and India. Thus, gas becomes the "star" energy resource, cheaper and "cleaner" (including in what concerns transport). In Europe (EU31, Eastern Europe including Russia) until 2030, an increase of approximately 14% occurs in the gas demand, compared to the level of 2014, followed by a decrease of 5% until year 2060 (compared to year 2030), when it will reach the value of approximately 894 MTOE.

Even though the modernization continues with respect to the manners of exploiting the unconventional resources of natural gas will lead to an increase in its production (a maximum around year 2040), subsequently, unconventional gas production declines rapidly, settling at 323 MTOE in 2060 (Idem: p. 50).

The Unfinished Symphony scenario reflects a slow evolution of natural gas due to a moderate economic growth, as well as to a strict regulatory framework regarding gas emissions. Until year 2030, in Europe (EU31, Eastern Europe including Russia) an increase of approximately 12.40% will be recorded in the gas demand, compared to the level of 2014, followed by a decrease of approximately 22% until year 2060 (compared to year 2030), when it will reach the value of approximately 720 MTOE. This decline is compensated on the Asian continent, where China and India register together almost 41% of the increase of gas consumption in the period 2030-2060, due to replacing certain primary energy resources with natural gas in certain sectors of activity at the level of these two states (World Energy Council, 2016: p. 64).

The third scenario, Hard Rock, is characterized also by a moderate increase of natural gas as in the case of the Unfinished Symphony scenario, due to a weak economic growth and a diminishing of the trade exchanges, which will reflect in Russia's effort to stimulate supplies and in China's and NAM's effort to ensure their domestic demand until 2060, through investment in research and development, which will, however, bring about an increase in the gas price. In the first stage, 2014-2030, natural gas growth in TPES is led by NAM and Europe (EU31, Eastern Europe including Russia). In the following period, 2030-2060, gas growth slows substantially in TPES in EUR, and in what concerns the production of gas, MENA will surpass the US as the number one producing region in 2050 (Idem: p. 88). NAM, China, Australia and Argentina are assessed as the future main states producers of unconventional gas, which will have a proportion of 26% of global gas production in 2030, but which will subsequently experience a rapid decrease in the period 2030-2060, in the context of a decreasing energy demand (Ibidem).

4. Conclusions

The consolidation of the energy security represents a permanent strategic objective in the work agenda of the politico-administrative decision-makers of any state, but nowadays increasingly difficult to reach in the context of a growing population at the world level and of a decreasing accessibility to the primary energy resources, whose reserves quickly diminishing⁽¹⁶⁾.

In the context of the current imbalances the world energy system is facing, with major negative impact at the socio-economic and political level, the problematic of energy security becomes increasingly acute for the states in a high dependency situation on the energy resources of other states, as is the case of the R. Moldova, almost completely-dependent on the import of natural gas from Russia.

The evolution of the energy system at the international level is uncertain, the conclusions extracted following the analysis of the three scenarios on the basis of the computerized model, the MARKAL energy model, offering each state relevant information for the consolidation of its energy policy and security. This simulation model became a modern instrument increasingly frequently used in the energy public policy elaboration stages because it reduces the opportunity for controversy and political friction, while serving the needs of private as well as public sector constituencies with an interest in the major research, innovation and deployment needs of energy system transformation (Jordan and Turnpenny, 2015: p. 259).

The three scenarios, *Modern Jazz*, *Unfinished Symphony* and *Hard Rock*, emphasizes the main challenges of the energy system at the international, regional or local level. The scenarios confirm that the energy security depends on the evolution of the relations between the great powers and the international organizations, as well as on the mix of action instruments selected by each separate state, on state directives and markets. From the perspective of energy equity, in all three scenarios, national governments set out to achieve universal energy access, but by 2060, energy accessibility and affordability varies substantially across the three scenarios (World Energy Council, 2016: p. 105). In any of the three scenarios, natural gas remains a “star” resource, which confirms at present, the correct decision of gradually introducing gas in activity sectors where oil held the monopoly, such as aviation. The risk of increasing the gap between the discovery of new deposits and the gas production, to which is added the uncertain evolution of the demand for gas obtained through unconventional sources, which today offers certain states important positions as possible suppliers, will consolidate Russia’s position in the top of the first states providers of natural gas.

The conclusions drawn from the three scenarios must be approached by the politico-administrative decision-makers in considering the fundamental dimensions of energy security (Idem: p. 103): *energy supply and delivery security*, as well as the *adaptation capacity of its energy system* and all this information is necessary and relevant for local

and central administration bodies for planning and management purposes and for energy sector in R. Moldova.

The “volatile” global equation of the energy resources, strongly influenced by the decline of the “sovereign oil era” and by the closing in the following years of a substantial amount of coal-fired capacity which in coming years as a result of a combination of environmental policies and plants reaching the end of their life-time⁽¹⁷⁾ may induce shocks to the gas markets whose flexibility must be considered by the policy makers.

In this sensitive context, the vulnerabilities⁽¹⁸⁾ of the energy security⁽¹⁹⁾ of the R. Moldova are also accentuated by the fact that it lays at the tensed confluence between the need to align to the *EU common energy policy* (based on the market and legal regulations) and the geopolitical constraints derived from the belonging to a regional block where Russia manifests abuses of dominant position, of monopole, on the gas market.

Following the signing of the Association Agreement, R. Moldova will have, the same as the EU member states, to become a supplier of energy security for the Union (Neguț et al., 2008: p. 6), adopting adequate measures at the national level. A fragility of the energy security will negatively reflect on its economic development (also based on the efficient consumption of energy resources), which will prevent the R. Moldova (state aspiring to the statute of EU member), to reduce its economic gap related to the level imposed by the accession criteria to the great European family.

What options does the R. Moldova have, as a country with an energy intensity of its economy higher than the OECD average and EU countries in the neighbourhood?⁽²⁰⁾ Even though the solutions depend on the political option of energy security of the government of R. Moldova, they must fall in line with the efforts made until the present by this state, on developing the renewable energy sector and increasing the energy efficiency.

R. Moldova must reduce its dependency on the import of gas from Russia and must focus on the development of local energy resources, for example, renewable resources, which currently enjoy favourable conditions (legislative, economic and fiscal etc.) in R. Moldova and which would allow a significant increase of the electricity production in this country (21).

Other measures which must be taken into consideration refer to the establishment of gas reserves, in order to attenuate the disturbances of the demand and supply, the diversification of the energy resources used, investments in technology and research, the expansion of the limited institutional capacity of the local authorities, which lack a *clear mandate for the appointment of regional energy managers, which results in limited identification and implementation of the energy efficiency measures at the local and regional level* etc. (Energy Charter Secretariat, 2015: p. 27).

Notes

- (1) See, for example, the case of USA, Germany, and China. In January 2007, the White House announced the resuming of the shale oil and gas drillings, energy resources estimated at 50000 billion dollars. Germany intends to reduce its dependency on nuclear energy and pass to renewable energy resources by 2022. China is preparing for a fleet of fully electrical vehicles, thus increasing the world fleet of fully electrical vehicles.
- (2) Geophysicist Marion King Hubbert elaborated a theory according to which the graphical representation of the oil production of an underground deposit is similar to Gauss's curve, the maximum being reached when half of the oil has been extracted. The theory was confirmed for the overall oil production of the USA with the occasion of the oil crisis of 1973, but also for other oil-producing countries. However, today it is considered wrong.
- (3) Acronym in the English language – the Organization of the Petrol-Exporting Countries. It was established in 1960 and, at present, the organization counts 12 members (oil-producing countries), out of which the most influential is Saudi Arabia, which is also the greatest oil producer at the world level.
- (4) In November 2014, Saudi Arabia gave up, after four decades, the control of the oil price by the increase/decrease of the quantities produced. Practically, OPEC allowed the free markets to decide the price of oil, even with the risk of flooding them with supra-production.
- (5) Russia, through its intention to create an alternative banking system, by means of BRICS, and Iran through its attempt to sell oil using the Euro as payment means.
- (6) See more (Perkins, 2007: p. 249).
- (7) See more oilprice.com, *Why Saudi Arabia Continues to Pump Crude at Record Levels*.
- (8) By *swing producer* is understood a supplier or a small group of oligopoly-type suppliers of a merchandise. They control the global deposits of the merchandise, have high production capacities and have the ability to influence prices and markets by decreasing the supply.
- (9) Gazprom is an energy company from Russia, the largest natural gas producing company in the world, which holds the monopole of the Russian extraction and production of natural gas.
- (10) Obligations already undertaken by the R. Moldova through its accession as member with full rights, in 2010, to the *Treaty for the establishment of the Energy Community*. Thus, in year 2011, R. Moldova agreed, from the political point of view, to transpose Energy Package III, which, among other things, requires the creation of a single, independent authority for the regulation of the energy market.
- (11) Declaration of the president of Transnistria, broadcast by the portal-news agency EurActiv.ro, Autoritățile de la Tiraspol nu vor să plătească pentru gazul rusesc: „Suntem parte a lumii ruse”, 2017.
- (12) GMM is a tool used to quantify and enrich the scenario storylines developed by the World Energy Council. GMM is a technologically detailed cost-optimization model that has been developed by the Energy Economics Group at the Paul Scherrer Institute (PSI).
- (13) EU28 together with Iceland, Norway and Switzerland.
- (14) Albania, Armenia, Belarus, Bosnia and Herzegovina, Georgia, Macedonia, Moldavia, Serbia, Turkey, Ukraine.
- (15) Energy intensity is the representative indicator regarding the efficiency of energy use at the national level and it represents the gross domestic consumption of primary energy, related to GDP. Primary energy intensity = TPES/GDP, GDP= Gross Domestic Product.

- ⁽¹⁶⁾ We refer to the certain data related to these stocks. However, there is also the abiotic theory, which states that oil is not a fossil fuel, but it is continuously produced inside the earth, through the physical/chemical/geologic processes at high depths.
- ⁽¹⁷⁾ For example, projections from the IEA point to a fall in coal-fired generation capacity in Europe of between 27% and 45% by 2030 (IEA, 2016a: p. 11).
- ⁽¹⁸⁾ Physical, economic, geopolitical and geostrategic, social risks, associated to environmental protection (See more on these risks in Neguț et al., 2008: pp. 6-8).
- ⁽¹⁹⁾ In (Neguț et al., 2008: p. 4), by *energy security* is understood the provision of the consumption necessary, under the aspect of accessibility (to new supply sources) and availability – respectively, of the long-term guarantee of continued deliveries. From the *consumers' perspective*, energy security means the geographical diversification of the demand, the use of a wider variety of energy resources and predictable, stable and as low as possible energy prices.
- ⁽²⁰⁾ However, it has to be noted that in the 2000-2013 period, the primary intensity of Moldova decreased significantly from 0.48 to 0.21 toe/th.2005 USD ppp. (Energy Charter Secretariat, 2015: p. 27).
- ⁽²¹⁾ For example, approximately 48% of the natural gas imports could be reduced by using the biomass resources (Caisin et al., 2015: p. 97).

References

- Angelescu, C. et al., 2003. *Economie: manual universitar*, 6th edition, Economica Publishing House, Bucharest.
- Badkar, M., 2012. *Chart of day: New World Oil Demand Blasts Past Old World*. available online at: <<http://www.businessinsider.com/>>, date: 13.02.2017.
- Caisin, S. et al., 2015. *Surse de energie regenerabilă*, Bons Offices, Chișinău.
- Crânganu, C., 2015a. *Deflația petrolului. Cauze și consecințe*, available online at: <<http://www.contributors.ro/reactie-rapida/defla%C8%9Bia-petrolului-cauze-%C8%99i-consecin%C8%9Be/>>, date: 10.02.2017.
- Crânganu, C., 2015b. *Noua matematică a petrolului. Cum se rezolvă ecuația preț-cerere-ofertă*, available online at: <<http://www.hotnews.ro/>>, date: 10.02.2017.
- Emerson, M. and Cenușă, D., 2016. *Aprofundarea relațiilor UE – Republica Moldova. Ce? De ce? Cum?*, Rowman & Littlefield International, Ltd., USA.
- Energy Charter Secretariat, 2015. *In-Depth Review of the Energy Efficiency Policy of Moldova*, Spotinov Print Ltd., Brussels.
- GEAP, No. 9, 2015. *Crisis sistémica global 2015 – Petróleo, divisas, finanzas, sociedades, Oriente Medio: ¡La gran tempestaden el puerto de Occidente!* available online at: <<http://geab.eu/es/>>, date: 12.02.2017.
- International Energy Agency (IEA), 2016a. *Global Gas Security Review. How Flexible are LNG Markets in Practice?*, available online at: <<https://www.iea.org/publications/>>, date: 11.02.2017.
- International Energy Agency (IEA), 2016b. *Key World Energy Trends. Excerpt from: World energy balances*, available online at: <<https://www.iea.org/publications/>>, date: 11.02.2017.

- Jordan, A. and Turnpenny, J., 2015. *The Tools of Policy Formulation. Actors, Capacities, Venues and Effects*, Edward Elgar Publishing Limited, UK.
- Lupușor, A., 2015. *Implementarea Acordului de Asociere în regiunea transnistreană: misiune posibilă?*, Expert Grup, R. Moldova.
- Marcotîlo, I., 2015. *Sectorul energetic în contextul Acordului de Asociere cu UE: oportunități de modernizare* (notă analitică), Expert Grup, R. Moldova.
- Perkins, J., 2007. *Confesiunile unui asasin economic*, Litera Internațional Publishing House, Bucharest.
- Petrini, V., 2016. available online at: <http://www.economica.net/prețul-petrolului-se-indreapta-spre-cea-mai-mare-crestere-procentuala-anuala-de-dupa-2009_130936.html#ixzz4YCrj2HMn>
- Saefong, M., 2016. *3 key reasons oil's caught in a death spiral*. available online at: <http://www.marketwatch.com/>, date: 11.02.2017.
- World Energy Council, *World Energy Scenarios*, 2016.
- *** 2015. *Why Saudi Arabia Continues to Pump Crude at Record Levels*, available online at: <<http://oilprice.com/Energy/Crude-Oil/>>, date: 11.02.2017.
- *** 2017. *Autoritățile de la Tiraspol nu vor să plătească pentru gazul rusesc: „Suntem parte a lumii ruse”*, available online at: <<http://www.euractiv.ro/>>, date: 15.02.2017.