Hajiyev, Nazim; Mansura, Manafova; Sverdlikova, Elena et al.

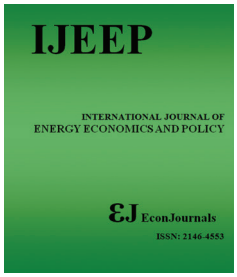
Article

Oligopoly trends in energy markets : causes, crisis of competition, and sectoral development strategies

International Journal of Energy Economics and Policy

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: Hajiyev, Nazim/Mansura, Manafova et. al. (2021). Oligopoly trends in energy markets : causes, crisis of competition, and sectoral development strategies. In: International Journal of Energy Economics and Policy 11 (6), S. 392 - 400. https://www.econjournals.com/index.php/ijeep/article/download/11634/6141. doi:10.32479/ijeep.11634.



International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2021, 11(6), 392-400.

Oligopoly Trends in Energy Markets: Causes, Crisis of Competition, and Sectoral Development Strategies

Nazim Hajiyev[1]*, Manafova Mansura[1], Elena Sverdlikova[2], Roman Safronov[3], Tatyana Vityutina[4]

[1]Department of Economics and Business Administration, Azerbaijan State University of Economics, Baku, Azerbaijan, [2]Department of Economic Sociology and Management, Lomonosov Moscow State University, Moscow, Russia, [3]Department of Physical Education, I.M. Sechenov First Moscow State Medical University, Moscow, Russia, [4]Department of Economics, Finance and Humanities, Financial University under the Government of the Russian Federation, Kaluga, Russia. *Email: nazhajiyev@rambler.ru

Received: 23 June 2021 **Accepted:** 15 September 2021 **DOI:** https://doi.org/10.32479/ijeep.11634

ABSTRACT

Uncertainty in the markets associated with COVID-19 created the need for choosing the optimal model of energy markets. At the current stage of energy markets development, oligopoly tendencies tend to prevail. The article discusses the problem of choosing an effective energy market model, using the example of the electricity market. The competitive energy market of the European Union (finalized with the adoption of the Third Energy Package) was chosen as the basic model, with which the energy markets of the Russian Federation and Azerbaijan are compared. The basic indicators of the EU market were defined and compared with similar indicators for the Russian and Azerbaijani markets. The article explored the main tendencies as well as deadweight losses for Russian and Azerbaijani markets. Recommendations for improving the competitiveness of the markets are developed. The study showed that the level of market competitiveness was directly associated with the economic security of the energy market. The ways of increasing market liberalization in Russia and Azerbaijan were proposed. The proposed gradual liberalization of electricity markets involves the transition from a closed monopolistic to an open competitive electricity market, changing the institutional structure, the search for new and effective mechanisms of interaction between the buyer and seller of electricity. It also creates an opportunity to improve the quality of electricity supply, increase the investment attractiveness of the sector at large, and reduce the cost of electricity.

Keywords: Degree of Competition, Electrical Power, Energy Markets, European Union, Market Model
JEL Classifications: D43, D47

1. INTRODUCTION

The economic development of the country is impossible without energy resources, so the supply of quality energy resources becomes a lever of state management and an instrument of geopolitics. In today's dominant technological paradigm, the energy sector, based on carbon sources, occupies a key place in the structure of the national, international, and global economic system, despite advancements in green energy. Energy resources are unevenly distributed. A shortage of certain types of resources is attributed to the variation in energy market policies of different countries.

Unequal development of the energy, oil and gas sectors encourages governments and the international community to improve the use of energy resources and invest in promising energy projects. At the same time, fluctuations in world oil and gas prices strengthen the role of world leading countries, which demonstrate the advantages of technological progress and highly competitive business frameworks. It should also be noted that the role of unconventional energy sources is increasing in the global energy balance. Contradictions in the global energy sector are intensified by the fact that the interests of importing, exporting and transit countries may be different.

The volumes and dynamics of energy consumption have traditionally been determined by the locations and volume of industrial oil and gas production, determined by the exploration, extraction, processing, and transportation technologies. Previously, the global carbon energy market was characterized by a certain stability, which resulted from the long-term consistency in the scale and dynamics of energy consumption and efficiency. Today, the market is changing. Because of the COVID-19-induced fall in demand, energy markets faced a change in their institutional structure, a sharp decline in demand as well as increased importance and prevalence of energy diversification policies. In addition, the development of transport infrastructure and the transition of countries to energy-saving technologies were observed (BP, 2020; Florio, 2020; Ihle et al., 2020).

Recently energy markets have been influenced by a number of new, underestimated factors: economic, political, resource and technological. This requires a rethinking of new realities and analytical assessments of the prospects for the development of the global energy market.

The system analysis of the world energy market has allowed to define the fundamental law of its development related to globalization – multidimensional diversification (Aizenberg et al., 2017; Guo et al., 2020; Newbery and Greve, 2017). The diversification is manifested in two ways: the quantitative growth of the energy market scale and diversity of its geographic, type, subject, and institutional structure; and profound qualitative changes in its proportions (for instance, between hydrocarbon and renewable energy types in their global supply and demand). An example of a competitive energy market is the EU market. After the implementation of the Third Energy Package, the EU energy market has forbidden companies to both sell and transport gas and electricity, which contributes to increased competition, the entry of new players into the market, and, consequently, lower energy prices (Guo et al., 2020).

Purpose of the study is to identify and assess the mutually opposing phenomena in the context of oligopoly in the energy markets.

The research objectives are:

- To determine the basic indicators of the competitive market using the EU energy market as an example
- To determine the same indicators of the energy markets for the Russian Federation and Azerbaijan
- To identify trends for the energy markets of the Russian Federation and Azerbaijan
- To determine deadweight losses in the case of a monopolistic market in the Russian Federation and/or Azerbaijan
- To develop recommendations for improving the competitiveness of the markets.

The object of the study is the formation of the global energy market.

The subject of the study is the objective prerequisites, factors, and mechanisms of diversification of the world energy market during the global energy crisis.

The choice of the energy markets of Russia and Azerbaijan is explained by the fact that the energy systems of these countries are characterized by the wear of funds and require investment, which, in turn, requires increased openness and transparency of markets.

2. LITERATURE REVIEW

Transformation of the world energy market occurs amid intensification of globalization processes through the development of information technologies, ecologization, and implementation of Industry 4.0. These processes led to a rapid increase in labor productivity while reducing the energy intensity of production (Söderholm, 2020).

Energy market, like any other market, provides the following models of organization: regulated monopoly, single buyer (purchasing agency), competition on the wholesale market and competition on the retail and wholesale market (free market) (Ji et al., 2019; Mengelkamp et al., 2019). Examples of a monopoly are the state company Électricité de France in France and 10 regional companies in Japan Independent power producers provide separate projects in the areas of generation, transport, distribution, and sales of electricity (Kriechbaum et al., 2018). Examples of a single buyer market are South Korea and China. They have under 10 companies, each generating up to 10% of the total capacity (Mengelkamp et al., 2019). In China, there are also territorial (city) companies, which are independent private power producers. Electrical grids are owned by state energy companies, which also carry out planning, development, and dispatching control operations in their areas. The competition in the wholesale market model envisages the existence of distribution and sales companies, which monopolistically distribute energy in the territories assigned to them.

The competition in the wholesale and retail markets model includes the following (Aizenberg et al., 2017; Borowski, 2020):

- Day-ahead market that operates on the principle of the exchange. The indicative price of electricity determined at the exchange guides all the participants who enter into contracts in other market segments and submit their bids today for tomorrow
- Bilateral contracts market which entails the conclusion of direct contracts between suppliers or producers and consumers on free price terms
- Balancing market that operates to balance supply and demand for electricity in real time at the highest prices.

The goals of transformations and reorganizations that are implemented in electric power sectors around the world are different. First of all, they are determined by the state of the electric power industry at the time of the reform, the economic situation of the country, as well as the amount of investment in electricity supply. Therefore, it is always advisable to highlight the goals and priorities, which are determined by the state during the reform, such as (Borowski, 2020):

- The reduction of electricity tariffs for consumers by improving the efficiency of the industry (UK, Argentina, and Australia)
- The need to attract investment to improve the efficiency and growths of the industry (Brazil and Argentina)

- The smoothing of differences in electricity prices in different regions of the country (USA, Norway, etc.)
- The preservation of a unified energy system and prevention of a reliability decline in energy saving.

At the same time, COVID-19 pandemic changed energy markets significantly (Shaikh, 2021). Thus, the growth rate of energy consumption and energy production in the world market decreased notably, although in absolute terms a slight increase is registered (Shaikh, 2021). The slowdown is associated with the fact that the world economy has been affected by several prolonged quarantines. For example, during the implementation of full-scale restrictive measures, there was an average decrease in countries' energy consumption by 25% (BP, 2020). Because of the restrictions, which influenced the global energy sector, consumption of petroleum products, oil, and coal has decreased (International Energy Agency, 2020b; IRENA, 2020). These restrictions include:

- The closure of borders and the ban on the movement of people between countries and within countries reduced the use of individual and public transport for local, intercity, and international travels (from 10% to 80% depending on the country). Consequently, the fuel demand for road, rail, and air transport decreased, which together constituted about 60% of the consumption of petroleum products
- Complete or partial factory closures, which reduced energy consumption. Since in developing countries, heat and power generation is dominated by coal, the global decrease of coal consumption was the second largest after oil (by 8% on an annual basis)
- Quarantine measures led to a decrease in demand for other types of energy, including gas (by 2%) and renewable energy, which is less dependent on demand (International Energy Agency, 2020a).

The pricing model differs in the sectoral segments of the world market. For example, the oil markets are dominated by the exchange-based pricing model. Natural gas markets introduce both market-based and market-regulated pricing models. However, in both cases, pricing is linked to the price of a basket of energy carriers, or exchange prices for a basket of oil products. In addition, there is a time lag of 6-9 months, which reduces the volatility of prices. The markets for energy coal, thermal, steam coal, including pulverized coal injection, and coking coal combine the exchange and contract pricing models. In the consumer markets of energy resources, pricing differs depending on the influence of social, security, and structural policies (Valencia-Calvo et al., 2020). At the same time, due to the COVID-19 pandemic, the volume of global investment in the renewable energy sector decreased significantly. However, even before the pandemic, the level of investment in renewable energy and alternative energy end-use was insufficient to ensure the transformation of the global energy market.

One of the transformational processes in the global energy market is liberalization, which has covered the natural monopoly markets of gas and electricity. Liberalization, however, is an evolutionary stage of any sectoral energy market (Head and Spencer, 2017; Viscusi et al., 2018). The abandonment of the monopoly market was possible due to:

1. Development of the supply market
2. Separation of different market stages on the way from energy production to delivery, including equipment and infrastructure maintenance
3. Technical and technological ability to ensure competition
4. Political will.

The liberalization of energy market and the reduction of renewable energy technology costs make the consumer an active subject of its transformation and new actors emerge. For example, prosumers in the European market have the technical and legal ability not only to consume but also to sell energy to the grid and provide other services in the market. Consequently, households, energy cooperatives (for example, Community choice aggregators (CCAs) in Europe, the United States, Australia, Japan), and other actors are becoming competitors to powerful energy companies. The economic sense of these processes is that a competitive market is more efficient than a monopolized market, which is regulated by the state. Despite many advantages of market liberalization for consumers and society at large, there are issues of technical capability for balancing "peak loads," ensuring dispersed generation, and energy quality. Competitive organization of the energy market implies not only a change in the organizational form of market entities (corporatization and privatization), but also the proper technological level of the energy system. This technological level should ensure, first, the competitive conditions, and second, safety, availability, quality, and environmental friendliness at all stages of energy production and distribution. It implies appropriate investments in infrastructure and new business models in the energy market. However, the motivation of large energy companies to invest in new energy architectonics is not obvious, so a huge role belongs to government incentives (Amankwah-Amoah et al., 2021; Bublitz et al., 2019).

The problem of finding an optimal energy market model is multidimensional. Therefore, there is a need for further systematic study of objective reasons that hinder the process of creating an optimal model of energy markets and for the development of specific suggestions on how to overcome these issues.

3. MATERIALS AND METHODS

Globally, the Herfindahl-Hirschman index is used to measure the degree of market concentration. To assess the degree of monopolization, the authors use the EU energy market as a benchmark. First, European Union is one of the first global economic blocks, which successfully implements a common energy strategy, providing for liberalization of energy markets. Second, this market consists of countries that are net importers of energy resources (such as France and Italy) and countries that are net exporters (Norway).

Since the Third Energy Package was targeted at the energy market, the authors decided to focus on this sector. At the first stage of the study, the Herfindahl-Hirschman index was determined for Russia and Azerbaijan (both countries are net exporters).

During the second stage of the study, the Lerner index was determined for the gas and electricity markets of Azerbaijan and the Russian Federation to measure the deadweight losses (DWL) from the activities of monopolistic entities. The Lerner index is a measure of monopolist market power, equal to the relative excess of price over marginal costs, which is determined as follows (Viscusi et al., 2018):

$$DWL = \frac{(P_m - P_c)(Q_c - Q_m)}{2} \quad (1)$$

where P_m and Ps are prices for the monopoly and competitive markets; Q_c and Q_m are demands for the monopoly and competitive markets.

Since there is a problem with determining the competitive price, which requires information about the marginal costs of the sector, we used the mathematical scheme presented in (Viscusi et al., 2018), where the following dependence is obtained:

$$DWL = \frac{\mu \cdot d^2 \cdot P^* \cdot Q^*}{2} \quad (2)$$

where μ is the absolute value of market elasticity of demand, and *d* is the price-cost margin. For the calculations, the assumption was made that the elasticity is equal to one, and the margin is equal to the difference between the rate of return for the sector and the average for the sample (Viscusi et al., 2018).

At the third stage of the study, profiles were built for the Russian and Azerbaijani markets according to the security criteria of energy markets stated in the Third Energy Package. Then, a comparison with the EU countries was made.

The fourth stage of the study included development of recommendations to improve the competitiveness of markets.

Data from state statistics and the websites of the largest energy companies were selected for the study.

4. RESEARCH RESULTS

In the first stage of the study, the Herfindahl-Hirschman index (HHI) for the EU countries was determined. Between 2012 and 2020, the concentration of national energy markets decreased in all the studied member states (from −5.7% in Latvia to −61.4% in Germany), contributing to its overall decrease in the EU-28 by 24.1%. The results of the calculations are presented in Table 1.

In 2020, the leader in supporting competition in the electricity sector was Germany (377.9), a country where energy market is not concentrated. The countries with moderately concentrated markets were Finland (1088.0), Poland (1541.8), and Austria (1600.6). The remaining countries had a high concentration of the energy market, with the highest levels in Latvia (9080.26) and Croatia (7304.97).

The Russian and Azerbaijani electricity generation markets are highly concentrated (Tables 2 and 3), indicating oligopoly characteristics. Three producers generate about 55% of energy in the Russian Federation, and five producers generate about 78%. At the same time, the entry threshold to this market is very high.

The Herfindahl-Hirschman indices for the Russian Federation and Azerbaijan are presented in Table 3.

At the second stage of the study, the Lerner index for Russia and Azerbaijan were defined (Table 4). In Azerbaijan, the key energy producer is the state company Azer Enerji, which provides about 100% of the energy generation. There is active cooperation with the EU initiated by Azerbaijan to reform the energy sector under the EU4Energy program (EU-Azerbaijan), as well as to harmonize legislation in the energy sector, and to exchange best practices (TAIEX).

A significant energy consumption in Azerbaijan comes from individual consumers (mainly housing and communal services). Indoor heating specifically reinforces the seasonality of demand for electricity. The problem of network wear and tear is also pressing.

Table 1: Herfindahl-Hirschman index (HHI) for EU countries (European Commission, 2021)

Country	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	1921.93	1787.77	1713.67	1709.57	1762.29	1832.94	1735.12	1647.87	1600.63
Belgium	6376.1	6086.42	5626.79	5140.12	4321.17	3578.94	3402.87	3146.06	3208.8
Bulgaria	4838.61	4787.31	4568.28	4507.93	3841.26	3222.46	3214.14	3210.43	3210.43
Czechia	5052.68	4899.3	4760.03	3973.33	3956.6	3964.94	3921.4	4061.1	4072.01
Germany	865.168	828.466	757.17	677.553	600.252	496.047	431.211	400.447	377.869
Denmark	1573.4	1547.05	1605.6	1428.86	1445.04	1320.92	1273.38	1260.76	932.982
Estonia	8894.68	8772.3	8464.62	8424.29	8321.29	8192.05	7602.45	6900.11	7134.23
Spain	1367.51	1217.45	1129.75	1078.68	1020.39	984.056	987.104	970.802	968.567
Finland	1317.34	132357	1334.05	1339.07	1334.64	1291.74	1263.98	1138.08	1087.98
France	7966.16	7708.42	7446.14	7098.87	6667.08	6557.04	6244.74	6011.71	5928.58
Croatia	9857.59	9849.37	9766.62	9394.87	9305.86	8706.35	8113.15	7544.78	7304.97
Hungary	2391.15	2352.84	2283.25	2228.03	2021.31	2142.68	2123.74	2123.74	2123.74
Italy	1692.26	1497.63	1477.77	1349.53	1023.38	911.234	877.905	835.707	814.858
Lithuania	6836.01	6677.26	6677.26	5411.71	5195.59	5397.63	5055.44	5055.44	5055.44
Latvia	9203.32	9203.32	9327.01	9280.7	9280.7	9212.53	9174.85	9080.26	9080.26
The Netherlands	1179.87	1076.31	1042.14	1081.63	1070.77	1003.61	1000.35	915.926	949.551
Poland	1864.73	1835.12	1807.54	1778.17	1807.43	1803.71	1718.08	1677.46	1541.77
Romania	2065.4	2067.8	2079.89	2072.84	1974.82	1657.32	1462	1373.61	1367.48
Sweden	2814.2	2801.79	2721.21	2616.3	2519.1	2469.48	2385.67	2329.7	2079.41
Great Britain	945.023	936.395	922.456	876.086	863.736	866.599	829.697	733.056	706.186

Table 2: The share of Russian power companies in the total power generation, %

Company	2017	2018	2019	2020
RusHydro	0.235	0.237	0.249	0.254
Inter RAO	0.196	0.198	0.208	0.212
EuroSibEnergo	0.117	0.118	0.124	0.127
OGK-2	0.108	0.109	0.115	0.117
Irkutskenergo	0.078	0.079	0.083	0.084
Mosenergo	0.077	0.078	0.081	0.083
Unipro	0.067	0.068	0.071	0.073
Enel	0.056	0.057	0.060	0.061
TGC-1	0.042	0.042	0.045	0.045
TGC-2	0.015	0.015	0.016	0.016
TGC-14	0.004	0.004	0.004	0.005
Quadra	0.004	0.004	0.004	0.005
Total share of the three largest companies	0.548	0.553	0.581	0.592798
Total share of the five largest companies	0.734	0.741	0.779	0.794

Table 3: The Herfindahl-Hirschman indices for the Russian Federation and Azerbaijan

Country	2017	2018	2019	2020
Russian federation	10710.1	10247.2	10287.1	10113.1
Azerbaijan	11251.7	11341.8	11334.7	11231.4

Table 4: The Lerner index for the Russian Federation and Azerbaijan

Country	2017	2018	2019	2020
Lerner index				
Russian federation	0.76	0.77	0.75	0.77
Azerbaijan	0.73	0.72	0.74	0.75
DWL, $ million				
Russian federation	1735.9	1782.1	1825.1	1841.1
Azerbaijan	1341.5	1411.1	1321.2	1212.1
% of GDP				
Russian federation	1.7	1.8	1.7	1.9
Azerbaijan	2.2	2.2	2.4	2.5

Between 1996 and 2010, the following market transformations took place:

- Creation of OJSC Azer Enerji, which even today provides 100% of power generation. The owner of the company's shares is the state
- Withdrawal of the combined heat and power (CHP) plants from the jurisdiction of the state and their transfer to municipal ownership
- Privatization of the small hydropower plants.

Azerbaijan is a strategic partner of the EU in the field of energy supply. In 2009 Eastern Europe Energy Efficiency and Environment Partnership (E5P) was established. Since 2011 the EU has been implementing the so-called pilot programs to support regional energy policy in the following areas:

- Improvement of the country's energy security by changing the market model
- Adaptation of the best European practices in energy market management
- Implementation of energy efficiency technologies both for individual facilities and for the industry as a whole by modernizing the equipment
- Changing approaches to industry statistics
- Implementation of technologies that ensure long-term stability and security of trade and non-discrimination in the industry
- Creation of an attractive investment climate in the industry.

At the third stage of the study, the authors proposed an approach to assessing the economic security of the energy market, combining the following indicators:

- The easiness of connecting to the power supply system
- The concentration of the electricity generation market
- Market share of the largest electricity producer
- Total number of electricity sellers
- The level of household consumer switching
- The level of cross-border interconnection
- Volatility of electricity prices
- The share of electricity costs in the average wage of household consumers
- The level of trade markup of electricity suppliers
- The share of transmission and distribution losses, the quality of electricity supply
- Electrification level of the population.

Data source – European Commission (2021), Global Energy Institute (2020), UNEP Collaborating Centre for Climate and Sustainable Energy Finance (2018), Viscusi et al. (2018), and World Energy Council (2020). The ranges for the indicators' values were determined by the formula: (max value–min value)/10 (Table 5).

The fourth stage of the study involved making recommendations to improve the competitiveness of energy markets. The priority areas, in this case, are:

1. Market digitalization. It contributes to a strategic goal of creating a competitive energy market that is open and adaptive to new entrants. Market digitalization includes using advanced market modeling tools and Smart Grid technologies
2. Market integrity and transparency. They are aimed at creating conditions to prevent any manifestations of abuse and manipulation in the energy market
3. Stimulation of rational investment behavior is focused on monitoring the investment behavior of market participants and improving the efficiency of pricing
4. Promoting consumer participation enhances consumer participation in the market by ensuring their access to information on existing offers, as well as the provision of customized electricity services
5. Development of digital competencies is aimed at ensuring continuous advanced education and training for energy market specialists.

One of the main factors of energy market security in the medium and long term is the formation of a market structure that can support self-organization of technological management systems in multi-agent environments. Such self-organization should be based on new technologies for resource generation, transmission, consumption, and storage.

Table 5: Profiles of energy markets' economic security in the EU (generalized indicators), Russia and Azerbaijan. RF: The Russian Federation, AZ: Azerbaijan

Criterion	Assessment									
	1	2	3	4	5	6	7	8	9	10
Easiness of connecting to the power supply system				RF AZ			EU			
Concentration of the electricity generation market						EU			RF AZ	
Market share of the largest electricity producer		EU		RF	AZ					
Total number of electricity sellers			AZ	RF				EU		
Level of household consumer switching	RF AZ							EU		
Level of cross-border interconnection							EU	RF AZ		
Volatility of electricity prices				RF AZ					EU	
Share of electricity costs in the average wage				RF AZ				EU		
Level of trade markup of electricity suppliers									RF AZ	EU
The share of transmission and distribution losses, the quality of electricity supply				EU					RF AZ	
Electrification level of the population							EU	RF AZ		

Competition in the market is important because it can stimulate efficient costs of supply. This is because retailers have an incentive to reduce prices in order to attract customers, and no retailer is able to control prices or make excess profits on a long-term basis. Simplification in the creation of a unified electricity market can be achieved through regional segmentation of energy markets. The need to ensure safe and economically efficient development and management of the electric power system requires increased coordination and cooperation between all participants of the domestic energy market.

Given that energy resources are homogeneous goods, suppliers compete also on the quality of services (in particular, customer service), which contributes to the marketing activities of suppliers, differentiating the contracts they offer to better meet customer needs. This is the result of the competitive tension between competing firms to attract and retain customers. Thus, a competitive market will have a high level of independent rivalry and, consequently, economic security.

5. DISCUSSION

Because of the COVID-19-induced uncertainty, it is very difficult to predict how markets will behave. Increasing the level of market competitiveness can help to reduce the negative effects of the pandemic on national economies. Although the EU market was chosen as reference for assessing the level of monopolization, it also has various contradictions:

- Indicative parameters defined in the form of directives often cannot be met even by the most developed EU member states due to lack of investment and technological capacity
- Different approaches of countries to the problem of liberalization of energy markets. The EU consistently pursues a policy of structural separation between producers, suppliers, and sellers of energy. However, this policy is supported and can only be implemented by some of the EU member states (e.g., the UK). France believes it is necessary to preserve large and vertically integrated monopoly companies because such companies attract more investment, are easier to manage and regulate, and are more competitive in the global market
- A joint and unified energy strategy for all member states could change national ratios between different energy resources of each individual member state, which have been stable for many decades
- Unification of energy legislation in EU member states will do little to help these countries in their activities in the world energy markets, where acceleration due to the depletion of energy reserves is observed.

In the process of selecting the model of the electricity market, it is important to consider the level of investment attractiveness of the country. The dynamics of foreign direct investments is characterized by volatility, the reasons for which are political instability, lack of significant changes (in particular, the judicial reform), high level of corruption, and slow pace of reforms. In this regard, both the Russian Federation and Azerbaijan are countries with high risks, which limits the inflow of investments. According to the International Energy Security Risk Index rating of the 25 most energy-intensive countries in the world, during 1995-2020, the index for Russia and Azerbaijan was on average 54% higher than the average index for the EU countries (Global Energy Institute, 2020). Consequently, these negative trends in the economies of these countries complicate, and in some cases make impossible, the activity of electricity market participants.

Energy trends are also reflected in the annual rating of energy sustainability of the world – Energy Trilemma Index, which is determined according to the indicators of energy security, social equality in access to energy resources, and reducing the adverse effects of energy on the environment (World Energy Council,

2020). Having analyzed the indicators of 125 leading countries with AAA indicators in 2020, the highest indicators are observed for such countries: Switzerland, Sweden, Denmark, UK, Finland, France, Austria, Germany, New Zealand, and Slovenia. In 2014, the absolute leaders were only two countries – Switzerland and Sweden. In 2020, the Russian Federation ranked 65th and Azerbaijan was 69th.

Another pressing issue for the economies of EU member states is the primary dependence on energy imports, which is the background for economic, diplomatic, and political problems related to energy security. All other things being equal, the greater the share of imported energy, the more acute are the issues of price increases, supply disruptions, or foreign political decisions for the state. Despite the fact that countries are dependent on energy imports, their energy system can often support overall economic growth through the sustainable development of energy efficiency sector. One of the most important indicators of energy efficiency is the GDP energy intensity. International experience shows that improving energy efficiency can reduce the growth of national energy demand and energy imports, thereby increasing the economic security of the energy market (Chen et al., 2020; Penkovskii et al., 2017).

Modern energy markets of the Russian Federation and Azerbaijan function with a large list of unresolved problems with liberalization and building of a competitive environment. The most debatable issue is the expediency of privatization in the electric power sector. The state faces the task of monitoring the scale and intensity of the privatization and ensuring timely intervention using a set of methods and tools. These tools help to establish reasonable proportions of public and private sector in order to level the negative effects of the market environment and support the dynamic development of the electric energy market in general and its individual subjects.

Despite this, the energy market will be sustainable in the long term only in the case of consumer involvement in the market environment. This involvement will ensure a constructive communication between stakeholders for mutual maximization of utility. Therefore, in the context of the transformation of the energy market, it is important to focus on new technologies and services that market participants expect from the network. Policies to promote competition should primarily focus on the ability of consumers to compare offers from electric suppliers and choose the ones that best suit them. Meanwhile, improved stakeholder understanding of market functioning must be accompanied by awareness of long-term energy issues and the importance of investing in advanced technologies. The importance of competition in the market comes from its ability to drive efficient supply costs. This is because retailers are motivated to reduce prices in order to attract customers, and no retailer is able to control prices or make excess profits on a long-term basis.

Given that electricity is a homogeneous commodity, suppliers also compete on quality of service (particularly customer service), which promotes suppliers' marketing activities, differentiating the contracts they offer to better meet customer needs. This is associated with competitive tensions between competing firms to attract and retain customers. Therefore, a competitive market has a high level of independent rivalry and, subsequently, economic security.

Increased competitiveness of the energy market gives the buyer the opportunity to choose the best supplier. For the state it provides flexibility in regulating the labor market and the system of social guarantees (like in Germany). The experience of Scandinavia and Germany, where prices for electricity supply have decreased, is also illustrative. On the other hand, the experience of California (USA), where there was a sharp jump in prices caused by freezing electricity prices for both consumer tariffs and the wholesale market, is also indicative. In this case, the state pricing policy turned out to be non-market and did not lead to a decrease in the final price of electricity.

6. CONCLUSIONS

The key elements of electricity market reform in both Russia and Azerbaijan are: improvement of the tariff policy and financial discipline, continuation of privatization, development of alternative energy, as well as efficiency and quality of solutions which depend on ensuring the independent status of the market regulator. The latter will contribute to a balanced approach in the formation of institutional framework for the state regulation.

The article identified trends in electricity markets from an international perspective. Emphasis was placed on the imperfections of the current system of institutional support for the Russian and Azerbaijani electric energy markets. For these countries, the electric power industry is the basic sector of the national economy, the basis of its structural transformations. Therefore, it most vividly demonstrates the problems of natural monopolies. Analysis of the situation in the COVID-19-affected electric power market showed that the existing market model failed to achieve effective competition among producers and suppliers of electric power and did not ensure effective operation under lockdown and quarantine restrictions.

Reforming the electric power sector includes a gradual transition from the current system to the wholesale electric power market model with bilateral contracts and a balancing market. This market model is the most widespread today. Changes should focus on increasing digitalization of the market, improving the integrity and transparency, facilitating rational investment behavior, promoting consumer participation, and developing digital competencies.

The study of contradictions in the regulation of electric power sector allows the authors to offer an adequate solution to the modern challenges of the theoretical and practical problem of improving the sector's state regulation. Such an improvement is necessary because electric power industry is a strategic branch of the economy and a natural monopoly. Foreign experience shows the absence of unified common approaches to the state management of this natural monopoly. However, there is a variety

of approaches to ensure, on the one hand, real access of consumers to goods and services, provided by natural monopolies, and on the other hand, effective, profitable operation of natural monopoly entities. Reforming the electric power industry is effective as long as the following requirements are met:

- Recognition of the electric power industry as an infrastructure sector, which is important for economic and social stability
- State monitoring of economic and social response to changes in the electric power industry
- Rational combination of market and state regulation mechanisms with the development of an encompassing legal framework for the electric power sector
- Ensuring the balance of interests of all stakeholders (producers and consumers; related fuel, energy, and power plant industries; population; regions; shareholders; owners; investors; etc.), taking into account geographical, economic, regional, cultural, historical, and other features when selecting the approach to reforms and determining the timing and pace of their implementation
- Maintaining the leading role of the state at all reform stages.

In an industry monopoly, or a natural monopoly, the direct producers of products (for whom a competitive market economy emerged and exists in all highly developed countries) cannot be subjects of the market, and, therefore, it is impossible to put into action the anti-cost mechanism. The analysis above does not show the categorical unacceptability of non-competitive relations in the energy sector for Russia and Azerbaijan. Similarly, it does not oblige one to copy the energy supply market model of a certain foreign country.

6.1. Limitations of the Study

- The use of traditional models (Herfindahl-Hirschman and Lerner indices) to describe markets under the COVID-19-induced uncertainty is not sufficiently theoretically justified
- The use of statistical data obtained at times of market stability prior to COVID-19 may impact the accuracy of modeling.

Opportunities for further research include the definition of methodical and methodological aspects of state regulation of relations between subjects of the energy market based on the institutional framework. Further work may also focus on the state's principles and roles in the electric power sector. It should take into account the experience of international institutions in the regulation of energy markets in order to improve the state regulation mechanism and form a strong system of relations between market participants.

REFERENCES

Aizenberg, N.I., Zorkaltsev, V.I., Mokryi, I.V. (2017), Investigation of non-stationary oligopolistic markets. Siberian Journal of Industrial Mathematics, 20(1), 11-20.

Amankwah-Amoah, J., Khan, Z., Wood, G. (2021), COVID-19 and business failures: The paradoxes of experience, scale, and scope for theory and practice. European Management Journal, 39(2), 179-184.

Borowski, P.F. (2020), Zonal and nodal models of energy market in European Union. Energies, 13(16), 4182.

BP. (2020), Statistical Review of World Energy. Available from: https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2020-full-report.pdf.

Bublitz, A., Keles, D., Zimmermann, F., Fraunholz, C., Fichtner, W. (2019), A survey on electricity market design: Insights from theory and real-world implementations of capacity remuneration mechanisms. Energy Economics, 80, 1059-1078.

Chen, X., Shi, Y., Wang, X. (2020), Equilibrium Oil Market Share Under the COVID-19 Pandemic. United States: arXiv preprint arXiv:2007.15265.

European Commission. (2021), Indicators for Monitoring Progress Towards Energy Union Objectives. Available from: https://www.ec.europa.eu/energy/data-analysis/energy-union-indicators/scoreboard_en.

Florio, M. (2020), Biomed Europa: After the Coronavirus, a Public Infrastructure to Overcome the Pharmaceutical Oligopoly. United States: Working Paper CIRIEC No. 2020/08.

Global Energy Institute. (2020), International Index of Energy Security Risk: Assessing Risk in a Global Energy Market. Available from: https://www.globalenergyinstitute.org/sites/default/files/2020-04/iesri-report_2020_4_20_20.pdf.

Guo, H., Chen, Q., Zhang, Y., Liu, K., Xia, Q., Kang, C. (2020), Constraining the oligopoly manipulation in electricity market: A vertical integration perspective. Energy, 194, 116877.

Head, K., Spencer, B.J. (2017), Oligopoly in international trade: Rise, fall and resurgence. Canadian Journal of Economics/Revue Canadienne D'économique, 50(5), 1414-1444.

Ihle, R., Rubin, O.D., Bar-Nahum, Z., Jongeneel, R. (2020), Imperfect food markets in times of crisis: Economic consequences of supply chain disruptions and fragmentation for local market power and urban vulnerability. Food Security, 12(4), 727-734.

International Energy Agency. (2020a), World Energy Balances. Statistics report. Overview 2020. Available from: https://www.iea.org/reports/world-energybalances-overview.

International Energy Agency. (2020b), World Energy Prices. Overview. Available form: https://www.iea.blob.core.windows.net/assets/ea2f7700-2b1e-4611-a5dd-64917e356043/Energyprices2020.pdf.

IRENA. (2020), Post-COVID Recovery: An Agenda for Resilience, Development and Equality. The International Renewable Energy Agency. Available from: https://www.irena.org/publications/2020/Jun/Post-COVID-Recovery.

Ji, Q., Li, J., Sun, X. (2019), New challenge and research development in global energy financialization. Emerging Markets Finance and Trade, 55(12), 2669-2672.

Kriechbaum, L., Scheiber, G., Kienberger, T. (2018), Grid-based multi-energy systems-modelling, assessment, open source modelling frameworks and challenges. Energy, Sustainability and Society, 8, 35.

Mengelkamp, E., Diesing, J., Weinhardt, C. (2019), Tracing local energy markets: A literature review. It Information Technology, 61(2-3), 101-110.

Newbery, D.M., Greve, T. (2017), The strategic robustness of oligopoly electricity market models. Energy Economics, 68, 124-132.

Penkovskii, A.V., Stennikov, V.A., Khamisov, O.V., Mednikova, E.E., Postnikov, I.V. (2017), Search for a market equilibrium in the oligopoly heat market. Energy Procedia, 105, 3158-3163.

Shaikh, I. (2021), Impact of COVID-19 pandemic on the energy markets. Economic Change and Restructuring, 4, 3378.

Söderholm, P. (2020), The green economy transition: The challenges of technological change for sustainability. Sustain Earth, 3(1), 6.

UNEP Collaborating Centre for Climate and Sustainable Energy Finance. (2018), Global Trends in Renewable Energy Investment 2018.

Available from: http://www.iberglobal.com/files/2018/renewable_trends.pdf.
Valencia-Calvo, J., Olivar-Tost, G., Morcillo-Bastidas, J.D., Franco-Cardona, C.J., Dyner, I. (2020), Non-smooth dynamics in energy market models: A complex approximation from system dynamics and dynamical systems approach. IEEE Access, 8, 128877-128896.
Viscusi, W.K., Harrington, J.E., Sappington, D.E. (2018), Economics of Regulation and Antitrust. United States: MIT Press.
World Energy Council. (2020). Energy Trilemma Index. Available from: https://www.trilemma.worldenergy.org.