



Problems of Legal Regulation for Use and Development of Renewable Energy Sources in the Republic of Kazakhstan

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ABSTRACT

Using of sunlight, wind, rain, geothermal heat as source of energy promotes improvement of the ecological situation, reduces emissions in the environment and helps to save natural resources. Actuality of the research is proved by that. The main aim of the article is research of the perspectives of development of the renewable sources of energy. We have proved that about 18% of the world consumption of the energy is received from the renewable sources of energy. 13% is received from the traditional biomass (wood burning).

Keywords: Wood, Environment Impact Assessment, Sours of Energy, Biomass Consumption, Energy Needs

JEL Classifications: Q48, I32

1. INTRODUCTION

Kazakhstan is one of the world leaders in diversity and number of mineral resources. As oil, gas, coal and other mineral deposits are most important components for the state economy and the regulation in these spheres is rather elaborated, the government historically paid less attention to the development of the alternative energy sources. For example, nowadays the majority of the electrical power plants in Kazakhstan are fired by natural gas, coal and oil-products. However, the last world financial crisis and comprehension of the necessity of being less relying on energy resources as well as reducing the impact on the environment made the state government focus on creation of favorable conditions for use of renewable energy sources (RES) (Cherubini et al., 2015).

The main direction of the state policy in Kazakhstan will become organization and holding of “EXPO-2017” in Astana as part of the suggested topic “Energy of the Future” which is focused on the ways of seeking quality changes in energetics, including first of all development of alternative energy sources and new ways of its transportation. Its name and content almost

coincides with the name and recommendations of the report of the United Nations Secretary-general consultative group on energetics and climate change - “energy for sustainable development” (Popp et al., 2014).

In the address of the President of Republic of Kazakhstan - the National Head N.A. Nazarbayev to the Kazakh people Dated 14 December 2012 Strategy “Kazakhstan - 2050” it was said that in the new political course of the established state it is necessary to develop alternative energy sources and actively integrate the technologies using solar and wind energy. One of the prioritized directions of electricity development and solution of environmental problems of Kazakhstan is currently use of renewable energy resources and implementation of the programs of energy- and resource-saving (Dincer, 2000).

In accordance with the strategic plan of the RK development up to 2020 the share of RES in the total volume of electricity consumption should amount to 1.5% by 2015 and over 3% - by 2020. The share of use of alternative energy sources in the total volume of electricity consumption is <1%. Considering the

necessity of the environmental problems solution, one of the prioritized directions of the electricity development will become use of renewable energy resources (hydro-energy, wind and solar energy), unused potential of which is quite significant in Kazakhstan.

Significant investments into electroenergetics amounted to 50 billion USD by 2030 and about 100 billion USD by 2050 will allow creating the employment opportunities for people with scientific, engineering, technical and constructing specializations. Significant share of these investments - up to 50% - will fall at alternative energy sources, so new jobs will be created in the high-technology sector of renewable energetics (The Concept of Transition of the Republic of Kazakhstan to 'Green Economy, 2013).

According to the data of Research and Development Establishment "Kazselenergoproekt", Kazakhstan leads the world in the potential of wind-energy resources per capita. In the territory of 50,000 sq. km (2% of the total area of the Republic of Kazakhstan) annual average wind speed exceeds 7 m/s. The potential of only these territories is enough to produce 1 tn kWh a year, which by many times covers the needs of the country for electricity. The most perspective regions for development of wind energetics are Western, South-Eastern and Central Kazakhstan. Especially notable is the wind potential of the Dzungarian Gate and Shelekty Corridor. In these regions annual average wind speed is equal to about 7 m/s and 8 m/s respectively. Annual electricity generation only for the Dzungarian Gate may be equal to 4400-4500 MW/h.

The potential of hydro-energetics in Kazakhstan is about 30 billion kWh/year. Exactly this direction is being currently developed most actively in our country. The reason, except for natural potential, is relatively low cost of electricity generated by a hydro-electric power plant. It amounts to about 11-14 tenge per kW. Speaking about the natural potential of hydro energetics one may note that the most favorable conditions for construction of a hydro-electric power plant can be found at the rivers of Southern Kazakhstan. But in general out of 2000 rivers of the republic about 5%, i.e., about 100 rivers are suitable for construction of small hydro-electric power plants.

Natural and geographic location of Kazakhstan provides wide opportunities for generation of solar energetics. The potential of solar energy approaches about 2500-3000 solar hours a year, while the energy of solar irradiation is equal to 1.300-1.800 kW/m²/year.

A significant fact of solar energetics development in Kazakhstan is presence of the largest reserves of silicone (85 million tones), which is the basis for transformation of solar energy into electricity.

The objective of the research is study of legal aspects of use and development of RES in the Republic of Kazakhstan and definition of the position and role of RES in the legal system. Through investigation of the drawbacks of legal provision the conceptual conclusions for improvement and elimination of the barriers in the development of "green energy" will be made.

2. METHODS

Use of RES is currently relevant for the state due to a number of reasons. Development and improvement of RES in the Republic of Kazakhstan are caused by the necessity in formation of a new energetic model, diversification of the technological base, replenishment of energy deficiency and solution of the world environmental problems. The world demand for RES is constantly growing. By 2050 increase in their share in the global energetic balance is forecasted by 35%. Almost all developed countries are currently developing and implementing the programs connected with the alternative energetics. It is attractive due to non-depletability of the resources, independence of the world market prices for energy carriers and also, which is significant, due to the fact it is environmentally compliant. The main advantages of RES - non-depletability and environmental compatibility - have served the reason for active development of renewable energetics abroad and rather optimistic forecasts regarding its perspectives in the nearest decades.

Efficient and rational use of renewable resources and energy in the Republic of Kazakhstan necessary for:

- Sustainable development and maintenance of the country competitive ability;
- Reservation of irreplaceable natural resources, decrease in the anthropogenic pressure on the environment and greenhouse gas (GG) emission reduction;
- Introduction and wide use of the best low-waste and resource-saving technologies in industry and agriculture;
- Improvement of social and economic as well as ecological situation in the regions and cities of the Republic of Kazakhstan due to pollution abatement and improvement of the access to the energy resources.

So, the main reasons causing development of RES are ensuring energetic and environmental safety, preservation of the environment, entering the world markets of RES, conservation of existing energy resources for future generations as well as increase in the consumption of raw materials for non-energy use of fuel.

In short, today use of RES has become an important and obligatory direction of the future energetics development. That's why efficient legal regulation is necessary. And Kazakhstan has all the necessary resources in this sphere. While considering the deficiency of electricity in the country, especially in the southern regions, wider application of alternative energy sources is becoming especially important. Inefficiency in the electric power supply centralization in the conditions of vast territory of Kazakhstan, occupying 2.7 million sq. km and low density of population (5.5 per/sq.km) caused significant losses of its energy at transportation. That's why use of RES will allow decreasing the costs for provision with electricity of remote settlements and significantly economizing on construction of new electricity transmission lines.

Besides, legal study of use and development of RES is necessary for efficient model of the green technology development.

For development of any economy sectors it is insufficient to have only ambitious strategies and capacities. It is also necessary to have a model of state and legal regulation. Only in case of complex state and legal regulation Kazakhstan may achieve the set tasks for use of RES. The RK legislation in the sphere of renewable energetics is currently of a formal nature and requires legal study. The applicable legislation of the Republic in the sphere of RES though stipulates certain measures in development of RES, but does not stipulate complex measures for each subject of relations in the renewable energy (Kumar et al., 2017).

Scientific problems of state and legal regulation of RES are considered by the scientists in various branches of the Republic of Kazakhstan and foreign countries. One of the active scientific researchers is a western scholar Adrian Bradbrook (Bradbrook and Wawryk, 2002). He belongs to the category of scientists who considers the issue of RES in the sphere of legal policy, while there are also authors supporting the idea of energy law, who asserts that state regulation of energetics should be concluded within energy law (Hasanov, 2017). There is also a Kazakh scientist who considers the issue of RES in the aspect of environmental law, and as the sphere of RES belongs to economic sector, here we should consider the relevant issues of state regulation of economy (Tikhomirov, 2000) and define the mechanisms of state influence (Gubin, 2005).

Also study of the legislation governing the sphere of energetics provokes interest among the Kazakh scientists, legislative provision of use of RES should be within the terms of environmental law (Yerezhepkyzy, 2015).

Use and development of RES in the Republic of Kazakhstan is currently governed by the Law of Republic of Kazakhstan dated 4 July 2009 No. 165-IV “Concerning Support of Use of RES” (Concerning Support of Use of RES, 2009).

This regulation stipulates certain legislative measures of green technology development. However, what is the role of RES in the legal system? The applicable legislation is not able to answer it yet. Besides, it is also necessary to reconsider legal mechanisms for implementation of the standards of the applicable legislation considering economic and geographic location of the country. The bases of the responsibility institute have not yet been defined in case of violation of the RES legislation.

3. RESULTS

Renewable energy resources is a numerate and quantitative text covering subjects of proven technical and economic importance worldwide. Energy supply from renewables is an essential component of every nation’s strategy, especially when there is responsibility for the environment and for sustainability.

Notably, the legislation of the Republic of Kazakhstan does not use term ‘alternative energetics’, but there is term “RES” instead of it. However, the concept of alternative energetics covers wider specter in comparison with RES.

Effectively understanding the barriers to renewable energy is not a one-dimensional problem that can be explained by any one of technological, social, political, or economic barriers.

The most suitable kinds of alternative energy sources from the perspective of the RK provision with the necessary conditions for its generation is wind, solar and hydro-energetics. Theoretic wind potential of Kazakhstan is equal to about 1820 billion kWh a year, the potential of hydro-energetics is estimated as 30 billion kWh a year, while potential of solar energetics - in 2.5 billion kWh a year (RES).

Biomass is considered to be one of the main renewable sources of energy of the future. Today it provides 14% of the consumption of primary energy. It is the most important source of energy for three quarters of the population in the developing countries. Population increase, increase of the energy consumption for one person and depletion of resources will lead to the rapid increase in demand on the biomass in the developing countries. On the average, biomass in the developing countries provides 38% of the primary energy (90% in some countries). Most likely that biomass will remain important source of energy in developing countries during the 21st century (Lopamudra and Ullash, 2017).

Consumption of the biomass increases fast in the developed countries, too. Biomass is used intensively in some of the developed countries. For example, Sweden and Austria provide 15% of needs of the energy in the primary energy sources at the expense of the biomass. Sweden plans to increase consumption of the biomass in the future accompanying increase with closing nuclear and thermal power plants, which use fossil fuels (Guerrero-Rodríguez et al., 2017).

In general, the issues of transmission and consumption of electrical and thermal energy are regulated by Law dated 9 July 2004 No. 588-II “Concerning electroenergetics.” The provisions in the sphere of support of the RES use were for the first time legally documented in Law No. 165-IV RK dated 4 July 2009 “Concerning Use of RES.” Particular issues in the sphere of the RES use are also regulated by other legislative acts, such as Land Code, Administrative Offense Code as well as the legislation in the sphere of regulation of natural monopolies’ activities and other regulatory acts. In particular, at design and creation of a RES site, the investor should follow general standards in the sphere of regulation of architecture and construction of the site, because the requirements to the process of construction of the site generating the energy from the RES are not specially developed.

Nowadays, for execution of Law of the Republic of Kazakhstan ‘Concerning Support of Use of RES’ the following regulations are adopted:

Order of the energy minister of the Republic of Kazakhstan Dated 31.03.2015 No. 256 “Concerning Definition of Accounting and Finance Center on Support of the RES”;

- Decree of the Government of the Republic of Kazakhstan Dated 27 March 2014 No. 271 “Concerning Approval of the Rules of Definition of the Fixed Tariffs”;

- Decree of the Government of the Republic of Kazakhstan dated 12 June 2014 No. 645 “Concerning Approval of Fixed Payment Tariffs;”
- Order of the Energy Minister of the Republic of Kazakhstan dated 11 February 2015 No. 74 “Concerning Approval of the Rules of Monitoring the Use of RES;”
- Order of the Energy Minister of the Republic of Kazakhstan Dated 20 February 2015 No. 117 “Concerning Approval of the Rules of Definition of the Nearest Point of Connection to the Electrical and Heat Networks and Connection of the Sites Using RES;”
- Order of the Energy Minister of the Republic of Kazakhstan Dated 20 February 2015 No. 118 “Concerning Approval of the Rules of Definition of the Tariff for Support of RES;”
- Order of the Energy Minister of the Republic of Kazakhstan Dated 2 March 2015 No. 164 ‘Concerning Approval of the Rules of Centralized Purchase and Sale by the Accounting and Finance Center of Electricity Produced by the Sites Using RES’;
- Order of the Energy Minister of the Republic of Kazakhstan Dated 2 March 2015 No. 163 ‘Concerning Approval of the Standard Agreements of Sales by the Accounting and Finance Center of the Electricity from Energy-Producing Organization Using RES according to Fixed Payment Tariffs and the Tariffs not Exceeding the Level of Transfer Prices Set in the Approved and Agreed with the Authorized or Local Executive Body Technical and Economic Substantiation of the Construction Site Design on Use of RES, Sale by the Accounting and Finance Center to the Conditional Users of Energy produced by the Sites on the Use of RES.’

Besides, the Republic of Kazakhstan is a participant of the United Nations Framework Convention on Climate Change (UNFCCC), ratified in 1995. In accordance with the UNFCCC Kazakhstan has the obligations on execution of the programs connected with the GG emission abatement, causing global warming. One of the ways of GG emission abatement is replacement of traditional energy sources such as oil, coal and gas by RES such as hydro, wind and solar energy, the resources which are the wealth of Kazakhstan.

In Law of the Republic of Kazakhstan ‘Concerning Energy Saving and Increase in the Energy Efficiency’ dated 13 January 2012 the main direction of state regulation in the sphere of energy saving and increase in the energy efficiency are defined, such as: technical regulation in the sphere of energy saving and increase in the energy efficiency; implementation of the balanced tariffs policy and price formation in the sphere of generation and consumption of energy resources; stimulation of energy saving and increase in the energy efficiency, including use of energy saving equipment and materials; implementation of state control over the efficient use of energy resources; promotion of economic, environmental and social benefits of efficient use of energy resources, increase of the social educational level in this sphere; ensuring statutory compliance in the Republic of Kazakhstan regarding energy saving and increase in the energy efficiency (Energy Saving and Increase in the Energy Efficiency, 2012). 21 March 2013 President N.A. Nazarbayev signed the Law

of the Republic of Kazakhstan “Concerning Ratification of the Charter of the International Renewable Energy Agency (IRENA)” (Concerning Ratification of the Charter of the (IRENA, 2013). IRENA, being the expert center in the sphere of renewable energy technologies supports the states-participants, provides them with its experience for development and practical implementation of the policy regarding the use of renewable energy, provides assistance in all the issues of renewable energy and helps them to gain the benefits from the efficient development, exchange of experience and technologies.

It is also notable that at this moment at the legislative level there are obstacles for successful integration of RES into the single electro energetic and thermal system and the market of electrical and thermal energy. Particularly, the main problem is maladjustment of technical, market rules and the system of the model agreements to the characteristics of RES. In this regard it is necessary to implement complex improvement of regulatory acts, including without limitation improvement of the rules of electricity supply networks, the rules of functioning of the balancing market of electric energy, the rules of rendering the services by the system operator, organization and operation of the market of systemic and supplementary services, the rules of organization and functioning of the wholesale market, as well as improvement through the approval of the model agreements with the system operator and the operator of the centralized trading the electric energy and other subjects of the electricity market considering the technological and other specifics of the sites in the RES use.

Despite support of the RES by the government, development of RES in Kazakhstan is restrained by a number of reasons, e.g., as follows:

First is lack of opportunity to index fixed payment tariff in accordance with the devaluation. So, to support the investors the state is obliged to purchase the total volume of RES by fixed payment tariff during 15 years providing the ability to annual indexation considering the inflation. However the legislation does not stipulate the indexation of the tariff depending on the significant changes of the exchange course of national currency relating to the foreign currency (currencies), while the main problem that will be face by the companies planning to build RES sites, in the necessity in acquisition of the basic equipment for foreign currency and application of borrowed funds (up to 80% from the cost of the project), including EBRD, IFC, ADB etc. for the project implementation.

Second is the lack of the guarantees in timely and regular payment by the AFC of the cost for acquired energy generated by RES (the issue of the AFC borrowing capacity). Particularly, the main concern of the investors is expressed by the question - who is going to pay if the volumes of RES reach 10% and more from the total volume of the generated energy. In this regard according to the majority of the investors partial solution of the problem is possible though inclusion into the tariff for RES support of the expenses for formation of the AFC reserve fund that will be used only to cover the cash deficiencies and debts of the AFC

before the energy - generating organizations using RES, emerged as a result of failure to pay or payment delay on the part of the conventional consumers for the supplied electricity generated by the RES use sites.

Third, except for fixed payment tariff, another tariff of the RES support is stipulated according to which the AFC realizes the electrical energy generated by RES further to the traditional electrical power plants. Alongside with that the applicable legislation does not allow including the expenses for acquisition by the traditional electrical power plants of expensive electricity generated by RES sites. In this regard, such consumers require legal regulation of inclusion of the expense of the conventional consumers from acquisition of RES at definition and correction of the cap rates for electrical energy.

Forth is the lack of the standard in the land legislation which would regulate the registration of a land parcel in a protected environmental zone. Due to specifics of RES and an opportunity to use hydrodynamic and geothermal energy (heat of soil, ground waters, rivers and water bodies) as alternative energy sources it is necessary to regulate the issue of provision of a land parcel for an energy-producing enterprise (Kapitonov et al., 2017a; 2017b).

3.1. Energy Capacity

When scientists consider the energy potential of the biomass, they include to it all forms of material with the plant origin, which can be used for receiving energy: Wood, herbal and cereal crops, forestry and cattle breeding waste etc. Since biomass is solid fuel, it can be compared to the coal. Heating value of the dry biomass is about 14 MJ/kg. Heating value of the coal and lignite is 30 MJ/kg and 10-12 MJ/kg. At the time of formation (harvesting) biomass contains a large amount of water, from 8% to 20% in the wheat straw, 30-60% in the wood, up to 75-90% in the manure of farm animals and 95% in the aquatic hyacinth. In contrast to this, humidity of coal is in the range from 2% to 12%. Energy density in the biomass at the stage of origin is lower than in the coal because of that. On the other hand, biomass has advantages in the chemical composition. Ash content of the biomass is lower to a degree than ash content of the coal. Moreover, ash content of the biomass does not contain heavy metals and other pollutants and can be used as fertilizer.

Usually biomass is erroneously ranked as low-grade type of the fuel and because of that, its usage is not reflected in the statistical reports. But it provides better flexibility of the energy supply because of the large quantity of fuel types, which can be obtained from it. Energy of the biomass can be used for the production of the thermal and electrical energy by burning in the modern devices - from the miniature domestic boilers to the multi-megawatt power plants, which use gas turbines. Systems that use biomass for energy purposes provide economic development without the increase of the GG emissions, because biomass is neutral to the CO² emissions since its production and use carried out in the reasonable way (Figure 1). There is a growing recognition that use of the biomass in the big commercial systems based on sustainable, accumulated resources and waste products can improve management of natural resources in general (Tables 1 and 2).

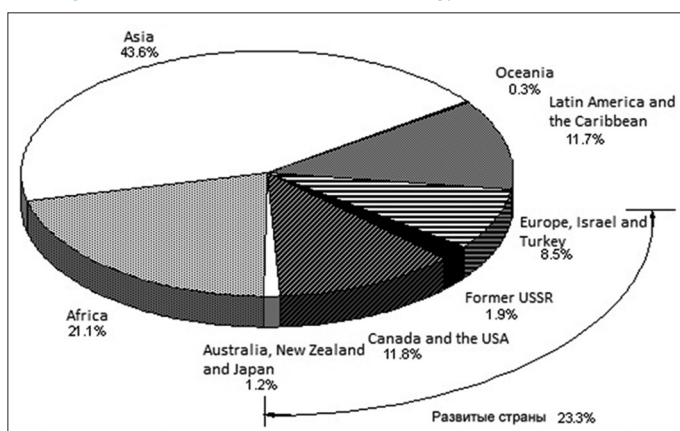
Table 1: Energy capacity

Type	Water content, %	MJ/kg	kWh/kg
Oak	20	14.1	3.9
Pine	20	13.8	3.8
Straw	15	14.3	3.9
Cereals	15	14.2	3.9
Rapeseed oil	-	37.1	10.3
Anthracite	4	30.0-35.0	8.3
Brown coal	20	10.0-20.0	5.5
Heating oil	-	42.7	11.9
Biomethanol	-	19.5	5.4

Table 2: Types of biomass

Type	MJ/m ³	kWh/m ³
Sewer gas	16.0	4.4
Wood gas	5.0	1.4
Biogas from manure	22.0	6.1
Natural gas	31.7	8.8
Hydrogen	10.8	3.0

Figure 1: The use of biomass as an energy source in the world



Fifth is the lack in the applicable legislation of the obligations of the network organizations to sign the agreement for connection with the RES producers. Such agreement is recommended for introduction as a separate document, particularly in connection with the fact that the existing model agreements for transition and dispatching do not reflect the technological specifics of RES. Also the agreement for connection protects the interests both the RES producers and the network companies and subsequently will be beneficial for the both of them. So, the agreement for connection concluded in advance (is suggested in 6 before the connection), on one part, will allow a network company to be timely informed on such connection and the specification and thus to prepare and execute the measures stipulated by the technical conditions for creation of technical ability to technologically connect the RES sites. The agreements for transition and dispatching are concluded already upon the fact of connection to the network and do not provide the parties with the opportunity to timely ensure the conditions of the connection.

Sixth is the complications in acquiring the borrowings from the foreign banks and financial institutions due to legislative limitations in the sphere of insurance and lack of the Kazakh insurance companies of the insurance experience for the RES infrastructure sites.

4. CONCLUSION

The international experience shows that the countries using RES on wide scale, has strategic state policy for efficient use of renewable energy. According to our opinion development of the standards on the RES is first of all the result of development of environmental and energy policy of the country. Energy law of the Republic of Kazakhstan should be defined as a complex branch in the legal system.

As the research has shown the renewable energy legislation represents an independent structure. It means that the legislation of the Republic of Kazakhstan in the sphere of RES consists of the following elements:

- Constitution;
- International regulations;
- Regulatory acts;
- Subordinate laws.

This structure is the prerequisite to the definition of the RES standards positions in the legal system.

For development of use of RES in the Republic of Kazakhstan, first of all, it is important to have a good legislative base. The applicable RES legislation consists of a certain hierarchical structures. The main task of the RES legislation is creation of complex conditions of green technologies development. The problem is concluded in the fact that the legislator does not always consider the main mechanisms necessary for development of this technology. The applicable law on renewables has a great number of reference standards preventing from proper application of their provisions. Besides, there are no standards in the law that could influence the RES development. Although the measures of the RES development stimulation are defined, there are no mechanisms for their realization. It would be reasonable to define the legal method for stimulation of their addressees. For example, the standards of economic stimulation for the RES investors, the standards of support for the consumers, energy-producing organizations and energy-distributing companies.

In order to increase the energy efficiency and development of RES it is necessary to stipulate in the legislation the legal standards regarding the following aspects:

- Special tools for credit provision (renewable funds; credit lines);
- Funding by the third parties;
- Tax concessions for investment activities;
- Complex application of energy certification;
- presence of the programs and companies regarding informing, education and training.

REFERENCES

- Bradbrook, A.J., Wawryk, A.S. (2002), Government initiatives promoting renewable energy for electricity generation in Australia. *University of New South Wales Law Journal*, 25(1), 124-159.
- Cherubini, A., Papini, A., Vertechy, R., Fontana, M. (2015), Airborne wind energy systems: A review of the technologies. *Renewable and Sustainable Energy Reviews*, 51(11), 1461-1476.
- Concerning Approval of the Rules of Definition of the Nearest Point of Connection to the Electrical and Heat Networks and Connection of the Sites Using Renewable Energy Sources. Order of the Energy Minister of the Republic of Kazakhstan No. 117. Available from: <http://www.zakon.kz>. [Last accessed on 2015 Feb 20].
- Dincer, I. (2000), Renewable energy and sustainable development: A crucial review. *Renewable and Sustainable Energy Reviews*, 4(2), 157-175.
- Gubin, E.P. (2005), *State Regulation of Market Economy and Entrepreneurship: Legal Problems*. Moscow: Lawyer.
- Guerrero-Rodríguez, N.F., Rey-Boué, A.B., Reyes-Archundia, E. (2017), Overview and comparative study of two-control strategies used in 3-phase grid-connected inverters for renewable systems. *Renewable Energy Focus*, 19(20), 75-89.
- Hasanov, E. (2017), About research of features of legal culture on the basis of historical-literary heritage. *Information (Japan)*, 20(4), 2289-2296.
- Kapitonov, I.A., Korolev, V.G., Shadrin, A.A., Shulus, A.A. (2017), The role of small and medium-sized innovative enterprises in the solution of the import substitution task in oil and gas-sector segment of the Russian fuel and energy complex. *International Journal of Energy Economics and Policy*, 7(3), 137-145.
- Kapitonov, I.A., Voloshin, V.I., Zhukovskaya, I.V., Shulus, A.A. (2017), Small and medium-sized enterprises as a driver of innovative development of the Russian fuel and energy complex. *International Journal of Energy Economics and Policy*, 7(3), 231-239.
- Kumar, G., Sivagurunathan, P., Zhen, G., Kobayashi, T., Xu, K.Q. (2017), Harnessing of bioenergy from different mixed microalgae consortia obtained from natural ecological niches. *Renewable Energy Focus*, 21(3), 11-15.
- Lopamudra, M., Ullash, K.R. (2017), Performance analysis of a new high gain dc-dc converter interfaced with solar photovoltaic module. *Renewable Energy Focus*, 19(20), 63-74.
- Popp, J., Lakner, Z., Harangi-Rákos, M., Fácik, M. (2014), The effect of bioenergy expansion: Food, energy, and environment. *Renewable and Sustainable Energy Reviews*, 32(1), 559-578.
- The Concept of Transition of the Republic of Kazakhstan to 'Green Economy, Approved by the Decree of the President of the Republic of Kazakhstan No. 57788. Available from: <http://www.zakon.kz>. [Last accessed on 2013 May 30].
- Tikhomirov, Y.A. (2000), Legal regimes of state regulation of economy. *Law and Economy*, 5(4), 78-86.
- Yerezhepkyzy, R. (2015), Legislation in the sphere of renewable energy sources. *Herald of KaZNU: Collection of Legal Articles*, 1(73), 59-72.