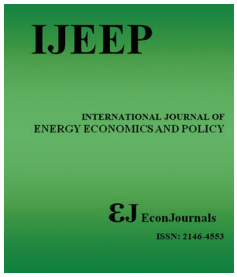

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Estimation of Economic Efficiency of Energy Security Strategy: The Case of Japan

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ABSTRACT

The article explores the economic efficiency of energy security strategy in Japan, as one of the most unique system of providing effective measures for energy security in short and long-term perspective. This analysis based on the evaluation of the Japanese energy portfolio and the Energy Trilemma Index rankings and balance score of Japan. It was identified the main threats for Energy Security in Japan and the main suggested activities of the Japanese government for solving these threats of Energy Security. As a result, it was presented the matrix of pairwise comparisons of the qualities of suggested national activities of Energy Security of Japan. Finally, it was identified the main strengths and weaknesses of Energy Security Strategy of Japan in the modern stage of development.

Keywords: Energy Security, Japan, Energy Industry, Energy Portfolio, Energy Trilemma Index
JEL Classifications: Q4, O3

1. INTRODUCTION

The world energy market, as an integral part of the world economy, is the subject of modern global changes - Oil prices downfall, and the statements of OPEC and other organizations about a decline in oil production - It is a cause of overestimation of the issues of the energy security policy in the world. Therefore, the experience of overcoming the crisis phenomena of the past became the interesting issue for investigation nowadays, particularly, the global energy crisis of 1973, which is one of the most memorable events in the history of energy and foreign policy.

Nowadays, the formation of energy security strategy for the country became one of the most important issue of its national security in long-term perspective. The energy security strategy should be created on the basis of estimation of the world examples of sustainable energy security programs which monitoring the possible future risks and threats for the national security of the country.

The purpose of this research is to estimate the economic efficiency of Energy Security Strategy in Japan, as one of the most unique system of providing effective measures for energy security in short and long-term perspective. In this research we provide some evidence and calculations of the relevance and efficiency of the suggested activities of Energy Security Strategy in Japan.

The achievement of Japanese national policy in the field of energy security is constantly discussed, but the most part of these achievements is indisputable. Firstly, it is a creation of national system of stable energy supply which provide the successful economic development of the country for a long period of time. However, the Japanese government has to solve emerging serious problems in the context of changing international economic environment.

Nowadays, Japan is trying to create a system of partnership with other developed countries, neighbor-countries in the region in the frameworks of selecting forms of cooperation in the aspects of Energy Security Strategy. This country has a change in its foreign policy from the period of "competition for energy resources" to the period of "energy cooperation."

2. ECONOMIC ASPECTS OF ENERGY SECURITY STRATEGY

The constant level support of energy security is the important element in the sustainability of the system of social, economic and ecological conditions in the country. This system determines the quality of human life, and at the same time, it reflects the level of the efficiency of administration governance. It is presented a model of the relationship between the components of the system of government (Figure 1).

The current economic conditions have a direct impact on living standards and at the same time it forms a proportional range of income inequality and the average levels of energy consumption for various social groups. Thus, a society formulates its own needs in the adequate levels of income and material supply for the production, and as a result it provides the purpose of the general economic development of the country.

Besides, the relations of ecological and economic systems are presented by bilateral links. The current condition of environment pollution generates the limits of sustainable economic development, and it also determines the condition of public health, the condition of the natural resource base, as well as the conditions of the raw material access.

Therefore, the government requires a coordinated governmental system of management and constant control of energy security. It is presented a diagram of the main elements of such system (Figure 2).

During the implementation of the integrated system of the governmental energy security measures, it is conducted the analysis of all available data about the most probable emergency situations in case of any problems of operating process and possible terrorist activities. The procedural plan of actions includes creating of regularly updated energy consumption limits and standards of energy conservation. As a result of situational analysis, it is necessary to calculate all types of risks which connected with the energy security of the country.

Thus, the research of the concept of energy security leads to the conclusion that this concept is incorporated into the economic security of the system, which is determined by the national security of the country.

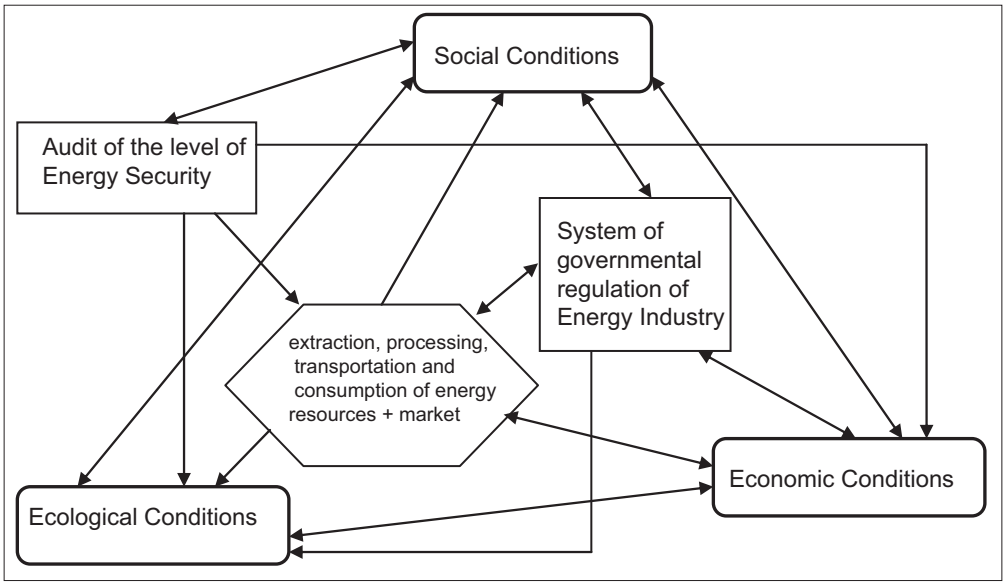
At the global level, the issues of energy security are handled by a number of international organizations, which deal with threats, and creating activities for solving global energy problems. Thus, at the present stage of the research of the energy security theory it became necessary to estimate the numerical values of risk.

3. NATIONAL POLICY OF ENERGY SECURITY IN JAPAN

In Japan, in the conditions of the absence of the own energy resources, it was an important factor of economic development in the late XIX century, when the country began to form its own heavy industry. At the same time, the logistics of energy delivery to the country influenced to the territorial structure of Japanese industry and the formation of the Pacific industrial zone in Japan.

The energy crisis of the 1970s showed the vulnerability of the energy industry in Japan, which has only one source of energy (Sato and Negishi, 1989). Nowadays, despite the measures for reducing the dependence of energy imports, Japan continues to be one of the most volatile countries in the world. For these reasons, energy security became the object of close attention of different organizations and agents - government, public institutions, economic agents and researchers.

Figure 1: Model of the relationship between energy security, energy consumption and the stability of economic systems in the context of sustainable development



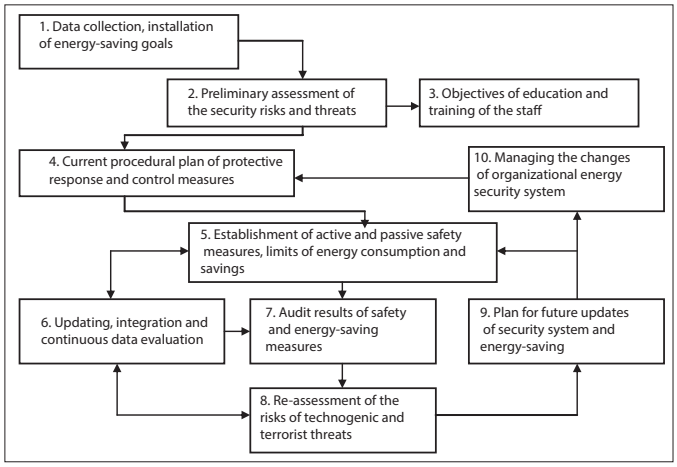
Source: Kalicki and Goldwyn, 2005, Korotcov, 2001

Japan is one of the largest importers of natural gas, coal, crude oil and refined petroleum products. This is due to very limited reserves of natural resources in the country, which cannot meet the demand for energy. The situation is exacerbated by the fact that after the earthquake in March 2011, almost all nuclear power plants had stopped (Kingston, 2012). However, from 2015 the nuclear power plants in Japan began restart one after another (Figure 3).

The tragic events in Japan of March 2011 led to the redistribution of the energy resources. Thus, if until 2011 the share of nuclear energy was amounted to about 27%, by 2015 its share has slipped to 1.8% of the total produced energy. Thus, it was increased the consumption of coal, gas, oil and oil products.

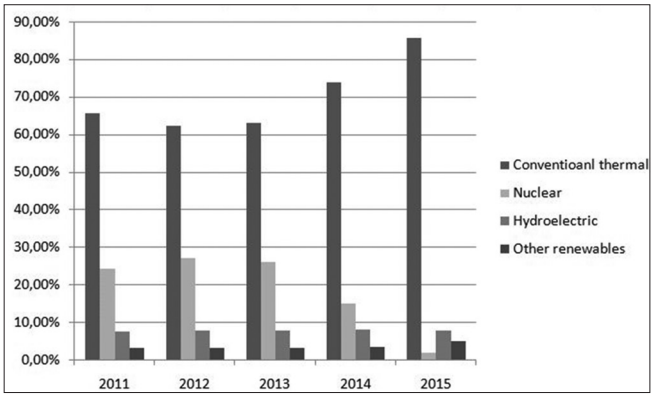
Nuclear power was the cheapest source of energy, and the process of closing the nuclear power plants increased consumption of other sources which has resulted in the growth of consumer prices, the increase in public debt of Japan, as well as increased dependence on imported fossil fuel, which affected the energy security of the country. However, in 2016, it is predicted that the nuclear power generation's share will expand to 6.4%.

Figure 2: The elements of governmental system of management and control of energy security



Source: Korotcov, 2001, Aoki and Dore, 2002, Kalicki and Goldwyn, 2005

Figure 3: Diversity of electricity generation in Japan



Source: Energy in Japan, 2010, World Energy Outlook, 2015, The Statistical Handbook of Japan, 2013, Li, 2015

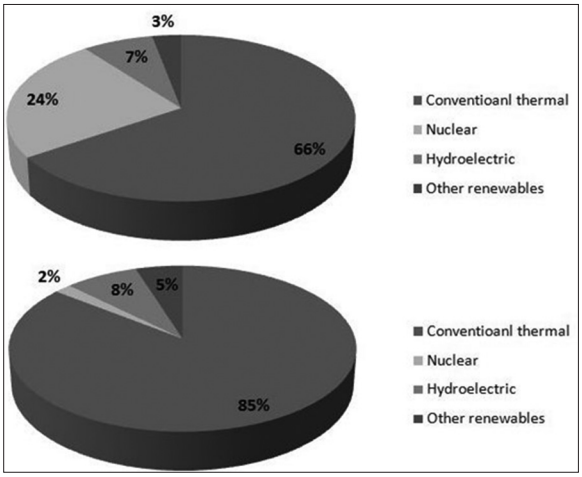
It is obvious to investigate the dynamics of changes in the energy portfolio of Japan (Figure 4).

However, despite the forced imbalance in the energy portfolio, the availability of electricity for the population of Japan remained at a consistently high level. In addition, Japan has been and remains one of the most progressive countries, which continue to develop not only energy-saving technologies, but also alternative renewable energy sources.

The lack of balance can be clearly identified by the graph that displays the results of the analysis of the Energy Trilemma Index, which based on three pillars: Energy security, energy equity and environmental sustainability (Figure 5).

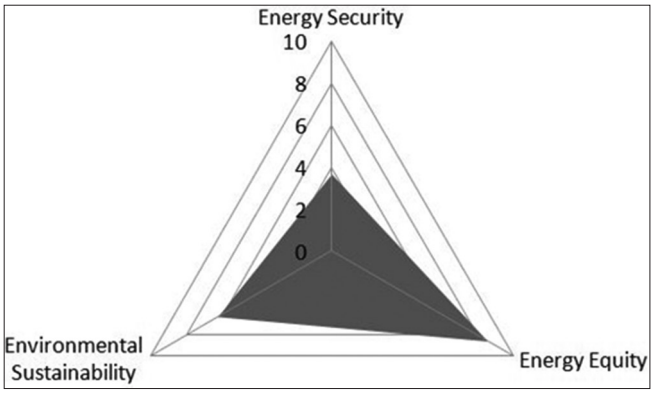
Energy Trilemma Index was prepared by the World Energy Council. The Index rank measures overall performance and the balance score highlights how well a country manages the trade-offs between the three competing dimensions. The rankings are based on a range of databases that capture both energy performance and the context of that energy performance.

Figure 4: Dynamics of the changes of diversification in the energy portfolio in Japan, 2011 and 2015



Source: Energy in Japan, 2010; Yichong, 2011

Figure 5: Energy Trilemma Index rankings and balance score, Japan, 2015



Source: Benchmarking the sustainability of national energy systems. Energy Trilemma Index, 2015

Balancing the three core dimensions of the Energy Trilemma (energy security, energy equity and environmental sustainability) is a strong basis for prosperity and competitiveness of individual countries.

In 2015, Japan received the total rank 32 among 130 countries and the total balance score marked ABC (A - For the energy equity, B - For the environmental sustainability, C - For energy security). Japanese rating fall by 9 points compared to the previous year.

The government of Japan in July 2015 has approved the goal to diversify the energy portfolio of the country until 2030. It was set rather ambitious targets were set: 20-22% of generated energy must account for nuclear power, 26% have to take the coal, 27% of liquefied natural gas (LNG), 3% oil and 22-24% renewable energy. As can be seen from the figures, the government has planned reduce the role of oil as fuel, intends to strengthen the share of renewable energy, as well as revive nuclear energy. However it is not clear how many nuclear power plants will be able to switch on again.

The energy crisis of 1973s helped to realize the main problematic issues of energy security in Japan. After this period, the Japanese government made some important steps for future formation of energy security strategy. Firstly, it was created a law about the necessity of creation of the oil reserve system. This system consists of two main elements: Governmental reserves and reserves of private companies. Secondly, from the 1970s Japan became a vast national program of energy saving. Thirdly, after the period of global crisis Japan began to implement a variety of programs about nuclear energy.

The official doctrine of energy security in Japan based on the stable legal framework. The key laws regulating relations in the energy sector are the following: "About electricity" (1964), "About regulation of the oil market" (1974), "About provision of oil reserves" (1975), "About the development of alternative energy sources" (1980), "About the establishment of Japan Oil, Gas and Metals National Corporation, JOGMEC" (2002) (JOGMEC Annual Report, 2015).

However, there is one of the most important law concerning Japanese energy system, "About energy policy" (2002). The purpose of this law is to determine the long-term system of measures to ensure the sustainable development of economy and society of Japan. According to this law, the government policy in the sphere of energy supply formulated by the government in the Basic Energy Plan, which should be reviewed every 3 years in accordance with the changing situation in the energy sector. Article 2 of this law creates the goals of national energy security strategy: Increase energy independence and diversification, stability of energy industry.

Basic Energy Plan takes into account the accumulated experience of Japan in the sphere of energy security. It is declared that energy is the basis of the active development of the country, and therefore, the most important object of protection is the energy supply in the amounts which is necessary to ensure the human life and domestic economic activity.

Basic Energy Plan is a strategy for the long period, and it based on a rigorous research of the energy balance of Japan.

Obviously, Basic Energy Plan is dedicated not only to the issues of energy security, but the development of the whole energy sector of Japan. In this aspect, the different researchers and administrations have the same opinion about the issue that the main basis of energy strategy of Japan is energy security. Thus, the researcher Katsuta Tadahiro from the Civil Nuclear Information Center highlighted that from three principles of the so-called "E" strategy (economic growth, environment, energy security) New Energy Basic Plan is mainly based on the energy security (Katsuta, 2009).

It is outlined in the report of the Ministry of Economy, Trade and Industry of Japan, that nowadays the governmental attention has shifted to the energy security: "In response to increased intension in the global energy market, Japan should realize a new energy strategy, focused on energy security."

It is also supported by the plan of Japan Federation of Economic Organizations (Keidanren), which main idea is the energy security of the country, and this plan was designed to support the realization of Basic Energy Plan of the government (Energy in Japan, 2010).

The importance of energy security is constantly emphasized by the Japanese government. The problems of energy security are constantly discussed, and some researches criticized the ideas of the Basic Energy Plan.

In this regard, the important aspect of Japanese energy policy is the compatibility of energy security and developed energy market.

A lot of Japanese researchers consider that the existence of competitive markets is vitally important for the efficient functioning of the energy security system. Creation of the open, predictable tax regimes and administration guidance can reduce the level of uncertainty, and therefore, contribute to the adoption of more balanced investment decisions and improve competitiveness and efficiency.

It allows to provide more accurate answers with the guidance of market economy about the problematic issues of energy supply. The supporters of liberalization consider that the successful overcoming of the oil crises of the 1970s was possible through the effective action of the market economy. Since that period, they emphasized the importance of market regulators for improving energy efficiency and increase resource productivity (Tanignti, 1999).

Japanese energy security system is characterized by specific features which based on the attitude of Japanese society to the aspects of this problem.

Firstly, when we speak about energy production, almost every developed countries consider that mining of energy resources from nature is a campaign with high level of risk which required considerable government support. However, Japanese society has exciting approach for the risk of mining industry. In Japan, it is considered that the main share of the profits bring not mining

operations, but processing of primary energy resources (Kikkawa, 2009).

Secondly, a phenomenon of energy resources supply is that Japan, like other Asian countries, buys oil in the Middle East at a higher price than European countries and the USA. The price difference, which is called the "Asian premium" can reach several USD per barrel.

The overcharge level of energy price for Japan set not only in oil but also in the LNG, which selected by the country according to the formula "take-or-pay," which means regular purchase of fixed quantities of energy at regular intervals by the contract price which set up for the long period of time (15-20 years). Despite the fact that this type of supply is not convenient for the customer, the Japanese companies have adopted such conditions to ensure an uninterrupted supply of LNG and dampen disruptions in supply related to fluctuations in the world oil markets.

Thirdly, when we speak about the internal demand, the main advantages for energy security of the country is that there is no central heating in Japan, and the level of personal energy consumption is relatively low. It means that there is potential to reduce personal energy consumption, and the problem is only in the fact that the share of private consumption does not have a major impact on the whole energy system.

The important purpose of energy policy of Japan is a peaceful coexistence with other leaders of the world economy, whose interests are in conflict with the interests of Japan. This purpose is based on the understanding that the Japanese economy is a part of the global economic system, one of the centers in the East Asia (Kashiwagi, 2014).

The plan of Keidanren also contains a section about energy diplomacy, but in this case we can speak only about the expectations of Japanese industries from the national government in this area. According to the Plan of Keidanren the development of energy diplomacy should take place in two main directions:

1. Strengthening of the relations between Japanese energy industry and the countries with energy resources
    a. Agreement of free trade and economic partnership, participation in financial support system for developing countries.
    b. Partnerships with the Gulf Cooperation Council.
    c. Diversification of supplies and providing of resource independence.
2. Realisation of energy partnership in Asia
    a. Active cooperation with regional countries about the creation of the oil reserve system.
    b. Dialogue between Asian consuming countries on the issues of energy-saving technologies.
    c. Overcoming of common problems in the conditions of limited resources, etc.

The plan also contains the thesis that the development of technical and economic potential of the fuel and energy sector is a strategic tool of energy diplomacy of the country. In accordance with this policy aimed at providing energy security, Japan should strengthen the energy structure and make efforts to increase the technical capacity of energy development.

According to this research we make a number of key points of energy situation in Japan.

In the energy structure of Japan, oil has the leading positions, and it provides about half of the energy needs of the country. At the same time it is a variety selection of efforts to reduce oil dependency, in order to increase the reliability of electricity production. It is due to the enormous influence of the Middle East on this situation. For Japan, this region supplies about 90% of oil and it is a high level of dependence for Japanese energy security.

Japan is a leader in coal imports, which is used not only to produce electricity in the country, but also in manufacturing. The modern technologies help this country to use some power plants, but this type of waste from plants still heavily pollute the environment.

The gas energy supplied to the country in the form of LNG. The main gas suppliers of Japan are the countries of the Asia-Pacific region. We identify that there is no development of the gas line network in the country, and it is a problem for such highly technologically developed country as Japan.

Nuclear power energy of the country was one of the main suppliers of electricity in the internal market until 2011. It is allowed to generate a huge amount of electricity at the lowest cost. However, after the great earthquake of 2011, there was a significant reduction of operating nuclear power plants, and the number of active nuclear reactors was reduced from 55 to 6. This situation has a negative impact on Japanese energy security and it demanded the significant investment in the import of energy resources.

The fundamental basis of energy security in Japan is threats monitoring system, which main task is the accurate definition of the processes that are potentially dangerous for energy security of the country (Table 1).

In 2014, the first time after the disaster with the nuclear power plant, the Japanese government highlighted the strategy of the development of the energy sector. And despite the fact that there is a rapid decrease in energy production of nuclear power stations in Japan, the government claimed about the point that the nuclear energy is still one of the most important source of electricity for long perspective. However, it is important not to forget about the risks and possible threats of the energy profile in Japan, where the nuclear energy has one of the most dangerous level of risk.

4. ESTIMATION OF ECONOMIC EFFICIENCY OF SUGGESTED ACTIVITIES OF ENERGY SECURITY STRATEGY IN JAPAN

For estimation of the activities which offered by the Japanese government for preventing the threats of energy security, in

Table 1: The main threats for energy security in Japan, 2015

Threats	Characteristics	Possible solutions
Natural disasters (hurricanes, earthquakes, tsunamis, etc.), and its effects	Japanese energy security is totally dependent on the nature	Creation a reserve of resources for generating energy, improving the level of nuclear safety
Accidents of technogenic type	The high level of possibilities of great accidents at nuclear power plants	Increasing the level of adaptation of power plants in case of the problem situation of energy security
The situation in the Middle East	The high possible level of political problems, the lack of stability in the political system, a lot of fragmentation in the level of economic development of the regions	The decrease of the level of dependence of Japan in the aspects of resources supply from this region, the development of additional logistic routes of resources delivery
The low level of investment in the development of energy complex of Japan	The economic crisis, the lack of financial capital in the industry, a low level of efficiency control	Formation of a favorable climate for investment, a legislative control system
Competitors in the field of energy raw materials supply (India, China)	Increasing the level of industrialization in developing countries, and therefore it formed a higher demand for energy resources	Assistance to developing countries in the formation of energy-saving systems

Source: Polichuk, 2010, Kim, 1986, Yanagisawa, 2013, Fundamental Law on Energy Policy Measures, 2002, Sisodia, 2005, Yasutaka, 2003

this research it is proposed to apply the method of pairwise comparisons. The specific feature of this method is a pairwise comparison of alternatives in order to determine the effectiveness of the methodology which necessary to introduce a set of proposed qualities of activities. After that it provided positive and negative evaluation of the suggested solutions.

For identification of the threats for energy security the Japanese government proposed several suggested activities for the formation of a new level of energy security in the country: A formation of strategic oil reserves; continuing the development of nuclear energy in manufacturing; development of scientific and technical progress in the energy field reformation process of the energy market in Japan; diversification of the energy provided to the regions; development of alternative sources of energy (renewable energy, wind energy); formation of energy-saving systems; decentralization of energy supply. Each of the suggested activities has its own positive and negative attributes, which is presented in Table 2.

According to the method of pairwise comparisons it is created a matrix of pairwise comparisons due to which it is possible to estimate the weight of a particular quality. The process of the weight estimation of the qualities are carried out by the algorithm of Saaty (Oshiganov, 2009), which is based on a comparison of alternatives of expert's evaluation which identify as one alternative may be more preferable then the others.

In this case, the most important qualities are assigned a mark "2," and the least important qualities – "0." In addition, the weight of each quality is defined by Formula 1:

$$V = \frac{S}{n^2}, \quad (1)$$

Where S - Sum of the marks of the qualities
n - Number of qualities.

In Table 3 it is presented the matrix of pairwise comparisons of the qualities which are mentioned below.

Thus, the results of this research indicate that the most important quality of the suggested activities is "global feature" and the least importance has the quality of "easy solutions" and "reliability" (Table 3).

According to the algorithm of Saaty, we assigned the weights for the qualities of suggested activities, i.e. we check how the suggested activities are correspond to the required qualities (Table 4).

Based on calculations of Table 4 it can be proposed that best decision of the Japanese government is "Development of scientific and technical progress in the energy field." However, there are also some important activities, such as "Formation of strategic oil reserves" and "Formation of energy-saving systems." The weakest activities is "Decentralization of energy supply."

Thus, the suggested activities of the Japanese government can be estimated as well-presented and completed, we can sum up that these activities can help to improve the energy security of the country, but most of these activities requires a long process of realization.

The development of scientific and technical progress in the energy field had the highest mark due to the fact that after the disaster in nuclear power plant in 2011, Japanese scientists began to develop new techniques and technology, as well as to investigate new ways for innovation in the field of electricity. And this approach is declared by the Japanese government last decade, because of the obvious reasons, such as: The impossibility of closing all nuclear power plants in Japan, as well as high cost of alternative sources of energy. Therefore, for Japan, resource-dependent country, it is vitally important to reduce the cost of energy production by implementation of innovation.

5. CONCLUSION

Historically, only the industrialized countries dealt with the problem of "energy security," but nowadays it became a global problem, and a lot of researchers were trying to find an universal

Table 2: The main suggested activities of the Japanese government for solving the threats of energy security

Suggested activities	Positive attributes	Negative attributes
Formation of strategic oil reserves	Reliability of energy supplies Independence from politics Quick result Possible applications in different countries in the world	Failure to achieve self-sufficiency of the project (possible only at the expense of budget subsidies)
Continuing the development of nuclear energy in manufacturing	Solving the problem of lack of natural energy resources Reliable source of electricity in the short and long term perspective High level of environmental sustainability in comparison with heating energy	Long implementation period High risk of disasters
Development of scientific and technical progress in the energy field	Universal application development results (for great number of industries) Global possibility of applying the results of researches in the world Real opportunity to generate commercial benefits	The long period from development to implementation High risk of failure
Reformation process of the energy market in Japan	Lack dependence from the politics (the low level of politicization) Quick organization and reaction High level of organization	Possible indirect effects Unexpected results
Diversification of the energy provided to the regions	Easy solutions Reliability of energy supplies High level of organization of energy supply	Dependence from the politics (the high level of politicization)
Development of alternative sources of energy (renewable energy, wind energy)	Environmental sustainability Sustainable development in the long-term period	Lack of investment in the projects Costly maintenance of power facilities Lack of reliability in deliveries Possible seasonal production cycles
Formation of energy-saving systems	Universal application development results (for great number of industries) Global possibility of applying the results of researches in the world Practicality Fast reaction Ability to self-sufficiency	-
Decentralization of energy supply	Distribution of energy facilities in all regions of Japan Increasing the level of electricity supply	-

Source: FY2012 Annual Report on Energy, 2013, Jamasb, 2001, Tanigti, 1999

Table 3: The matrix of pairwise comparisons of the qualities of suggested activities of Energy Security in Japan

Quality	Quality								S	V	Rating
	ES	GCB	G	R	U	ENS	SD	ADP			
ES	1	0	0	2	0	0	0	0	3	0.047	5
GCB	2	1	2	0	2	2	0	2	11	0.172	2
G	2	0	1	2	2	2	2	2	13	0.203	1
R	0	2	0	1	0	0	0	0	3	0.047	5
U	2	0	0	2	1	2	2	0	9	0.141	3
ENS	2	0	0	2	0	1	2	0	7	0.109	4
SD	2	2	0	2	0	0	1	0	7	0.109	4
ADP	2	0	0	2	2	2	2	1	11	0.172	2

ES: Easy solutions, GCB: Ability to self-sufficiency, real opportunity to generate commercial benefits, G: Global feature, R: Reliability, U: Universal feature, ENS: Environmental sustainability, SD: Sustainable development in the long-term period, ADP: Absence of dependence from the politics (the low level of politicization)

key for its solving since the 1970s with the beginning of the trends of the concept of "sustainable development," where economic growth correlates with the environment. In modern conditions, this concept of "E" becomes a practical issue with the appearing of another concept - "energy security." Thus, it was formed the concept of three "E," which creates a link between energy security, economic growth and environment.

The problem of energy security determines the dependence of countries from sustainable energy supply, which is due to: Irregularity of natural resources' distributions; mismatching between the amount of energy production and necessity amounts of supply; inevitable depletion of natural resources.

The economic aspect of the problem of energy security is based on the concept that at every period of time humanity has such amount of resources which the operating economy allows to use. Nowadays, the national economies of the world have only such energy which is available from non-renewable sources.

Japan has the absence of its own reserves of energy resources, and the availability of foreign overseas energy resources has become the important factor in the economic development of the country in the late XIX century, it was the period of formation of heavy industry in Japan. In the middle of XX century oil began to dominate in the Japanese energy balance. By the beginning of the first oil crisis, when Japan faced with the problem of energy

Table 4: The correspondence of the qualities to the suggested activities of Energy Security in Japan

Quality	V	Suggested activities							
		Formation of strategic oil reserves	Continuing the development of nuclear energy in manufacturing	Development of scientific and technical progress in the energy field	Reformation process of the energy market in Japan	Diversification of the energy provided to the regions	Development of alternative sources of energy (renewable energy, wind energy)	Formation of energy-saving systems	Decentralization of energy supply
ES	0.047					+			
GCB	0.172			+				+	
G	0.203	+		+				+	
R	0.047	+	+			+			+
U	0.141			+					
ENS	0.109		+				+		
SD	0.109		+				+		
ADP	0.172	+			+				
Total	-	0.422	0.265	0.516	0.172	0.094	0.218	0.375	0.047

ES: Easy solutions, GCB: Ability to self-sufficiency, real opportunity to generate commercial benefits, G: Global feature, R: Reliability, U: Universal feature, ENS: Environmental sustainability, SD: Sustainable development in the long-term period, ADP: Absence of dependence from the politics (the low level of politicization)

security, this country has already became one of the world developed countries with highly competitive goods.

In the period of oil crisis it was created the basis of national system of energy security in Japan: Some important laws, realization of the program of the guarantee reserves of oil, energy savings, fuel diversification.

Nevertheless, nowadays Japan continues to be one of the most volatile country in the world. The share of imported primary energy consumption is about 85%, and the national energy industry is completely oriented to the importation of LNG, coal, oil and uranium. The analysis of the energy balance of Japan showed that during the process of globalization the volatile economy may have increasing influence of the events taking place in countries with reserves of primary energy, or logistical routes.

In the modern global environment, the Japanese government decided to modernize the strategy of energy security. In 2002, it was created the law "Principles of Energy Policy," and the government has developed the National Energy Strategy of 2006 and Basic Energy Plan of 2007, Concept of international energy security in 2010. The new governmental documents created the concept of "three E," however, it focused basically on energy security of the country.

Nowadays, the system of threats monitoring is responsible for energy security of Japan. It allows to predict the risks for the energy system of Japan in long-term period.

The energy security of the country based on the analysis of monitoring threats to the system, which allows to predict the risk for the national energy system. It was identified the main threats, which are: The tense situation in the Middle East; terrorism in the logistic routes of energy resources; increasing of the purchases of energy in China and India; natural and technogenic disasters.

Generally, the researching of the issues of energy security and main possible threats of energy security in Japan helped to identify the main directions of the improving process of energy security in Japan.

It was identified that in last decade, Japan has actively realized the strategy of energy security, simultaneously revising some of its aspects and making adjustments in the program conducted by government agencies. The implementation of this strategy has achieved significant progress, in particular the reduction of the total oil share in the energy balance of Japan, the active monitoring of new foreign sources, the increase of natural gas and new alternative sources of energy in the energy balance of Japan. Nevertheless, it is impossible to claim of a completely total formation of energy security strategy in Japan. The main issues, mechanism, main problems, advantages and pitfalls of modern energy security strategy of Japan can be discussed nowadays. However, the process of formation of the complete version of Japanese energy security strategy is at the high level of finalization.

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