

REVIEW OF THE DOCTORAL DISSERTATION

By Mr. Feyruz Mustafayev, M.Sc.:

„The Potential Role of Renewable Energy in Providing Energy Security of Azerbaijan”

Preliminary remarks

Feyruz Mustafayev's doctoral dissertation is the subject of proceedings for a doctoral degree at the University of Gdańsk, the Faculty of Economics, in the field of social sciences, the discipline of economics and finance. The doctoral dissertation was written under the scientific supervision of Prof. Przemysław Kulawczuk as the promoter.

The evaluation of the doctoral dissertation entitled: "The Potential Role of Renewable Energy in Providing Energy Security of Azerbaijan" is subordinated to the criteria of meeting the requirements of the promotion procedure to the doctoral degree in the scientific discipline of economics and finance. The aim of the review is to show that it is an expression of an original, creative and multidimensional solution to a complex problem on scientific grounds.

The dissertation has a volume of 202 pages, including 181 pages of the main text. It consists of six chapters preceded by an introduction and is divided into subsections. The main text was supplemented with an extensive list of references corresponding to publications and lists of tables, photos, and schemes.

1. The scientific content of research

The reviewed doctoral dissertation is the study of an economic issue that can be understood on several levels. The basic and most general issue that is considered in the work

concerns the role of energy as a factor of economic security. The author justifies the importance of this basic problem in the state economy. In the conditions of an open economy, the issue of energy security is of a paramount and universal nature. It is a reference point in assessing the nature of global dependencies related to the contemporary situation of individual countries in the light of the economy, state, and society.

The importance of the issue of energy security is difficult to overestimate, also from the perspective of individual countries, such as Azerbaijan. The severity of an energy security problem can be measured by a variety of the risks arising from the disruption of any energy-driven economic processes. The demand for energy, the energy-mix structure, the concentration of consumption, and the scale of the deficit are the factors of particular importance and plays a critical role in periods of disturbances, wars, and economic crises. As a consequence, the phenomenon of energy security attracts attention as one of the basic categories, which up to now seems poorly studied in economic sciences. This area is therefore an attractive field for conducting scientific research.

Another, more concrete level of research and the second scientific issue, to which the author brings an interesting and fresh look, is the issue of economic analysis of the energy sector as part of the "green revolution". This issue in fact means the process of ecological economic transformation is associated with the change of the structure of consumption of conventional, i.e. traditional energy sources, to renewable energy sources. According to the experience of the EU, most of the countries analyzed in the dissertation, those highly developed and developing, are confronted with the problems of energy transition and energy security. For these reasons, the economics of renewable energy, as well as the issue of energy security, can be considered now as the new research areas and specialties of high importance in the discipline of economics and finance.

The third dimension of the research, which brings significant content to the procedure for awarding the doctoral degree, is the very detailed analysis of the energy transformation issues examined in the specific conditions of Azerbaijan as a state, economy, and society. The example of Azerbaijan can be treated as the dominant example in the course of general considerations of energy security. In this dimension, we can find the precise questions and the research hypotheses that allow us to look at the energy transformation in a more clear and unambiguous way.

According to the author, Azerbaijan, as a case study of the energy policy, has got the special values for scientific analyses and considerations. Azerbaijan is an example of an economy that has significant oil and natural gas reserves that exceed its internal demand.

Belonging to the traditions of extraction, industry, and export of traditional energy resources which have paid a dominant impact on the structure of the entire economy. The balance of renewable energy resources in the form of solar energy, wind, and water energy is also favorable. As a consequence, the oil and gas exploitation largely shapes the branch structure of the economy, the absorption of employment, and state revenues. Undoubtedly, the substitution of traditional energy factors and their replacement with unconventional sources can have serious consequences for the economy. The impact of reproducible energy sources on energy security should be considered a complex and multidimensional problem.

Therefore, the author intends to prove **the hypothesis** that: “*The Development of the renewable energy industry accompanied with the increasing share of carbon-free electricity in total consumption can significantly increase the energy security of Azerbaijan and positively impact the economy*, thorough analyses of experiences of specially selected countries, estimated added value to the economy, the present stage of energy security and implications of green energy on it have been carried out”

The core of the scientific problem is to demonstrate the dependence of energy security categories on qualitative and quantitative factors shaping the production and consumption of renewable energy sources in a rational way. The issue of rationality subordinated to energy security should be confronted with the issue of economic operational efficiency. Both relational categories bring a variety of consequences for the environment and the economic output. Bearing in mind the complexity of both issues, the author used the method of comparative analysis by examining "best practices" in most advanced countries, like Austria, Norway, Portugal, Grece, and Croatia, which can be compared to Azerbaijan. (Ch. III and Ch. IV).

It follows that a comprehensive consideration conducive to the development of renewable energy requires a review of various external factors. The efficiency of the described cases of economies is built on the competitiveness conditioned by the particular environment, available technology, and individual infrastructure, while the energy security of these states is built on broadly understood relations enforced by cooperation with other entities. It bears in mind the relativity of various threats and the interdependence of the phenomena studied by the author.

Then, the question arises, whether, in the situation of Azerbaijan's energy self-sufficiency, its energy security built on the basis of renewable energy sources has a rational basis justifying incurring additional costs assuming the effective management of available conventional energy sources. How does the energy security policy shape *the Energy-mix* total

cost ?. The answer to these questions can be explained by the desire for a model of economic development for Azerbaijan after the period of the collective economy. It is supposed that renewable energy sources would be a strong impulse for economic transformation.

A valuable fragment of the dissertation, contains a synthesis of the Author's research are Chapter V and Chapter VI. Both chapters have practical and application value. They contain many valuable clues to determining the transition to renewable energy resources. The economic conditions for their exploitation in modern Afghanistan are outlined also. It can be said the dissertation contains an original program of modernization of the energy industry and changes in the economy as part of the economic development policy aimed at ensuring the energy security of the state.

2. Scientific value of the doctoral dissertation

In the assessment of the scientific value of the doctoral dissertation, one can see many values of varying importance. The fundamental value of this dissertation can be considered the contribution to the development of the economic theory of renewable energy resources. This is a specific and contemporary input for the newly created discipline concerning unconventional energy. This kind of energy seems inexhaustible, futuristic, and attractive as a subject of economic research. However, this does not mean that they do not cost anything. There is room for rational solutions concerning the available output in relation to the possibility of their economically justified exploitation. The exploitation requires a particular look for appropriate technology and involves significant investment outlays. High technology is controlled by the hands of multinational corporations which intend to benefit from the exploitation of free renewable energy. The amount of capital expenditure that can be allocated in solar and wind energy is also limited.

Such conditions require the Author to carry out an advanced cost-benefit calculation. Streams of these financial investments from various sources should be confronted with the obtained effects of renewable energy exploitation and correspond with safety parameters. Insufficient budgetary resources require openness to the involvement of foreign capital. This means that **energy security depends on the security of foreign investments**, which actually become decisive factors in the degree of use of these free goods.

Finally, the successful transformation depends on a scale of expenditures and time to change the traditional economy it into a structure based on renewable energy. It undoubtedly requires new energy infrastructure, development of local energy networks, adaptation of the

economy to the energy efficiency standards, as well as a change in consumption habits. As a consequence, the question arises whether the program of development of the national economy based on a growing level of renewable resources associated with the total energy demand of the society becomes more capital-intensive for the right part of the necessary investment outlays. However, compared with the green energy transition implemented in the European Union, it should be assumed that this kind of experiment seems difficult to implement in developing countries.

An important scientific value enriching and inspiring the development of the discipline of economics is taking up the issue of security as an economic category. The problem of energy security and the influence of renewable energy can be considered as a relative issue that depends also on numerous external conditions. An example of this phenomenon is **globalization's impact on energy security** entailing a chain of many other factors such as:

- the structure of world prices for individual energy sources,
- local production capacity of traditional and unconventional energy sources,
- geographical concentration of energy demand,
- substitution (flexibility) of energy sources, etc.
- the required technology and infrastructure for transport and processing,
- investment opportunities determined by capital resources,
- profitability (rentability) of output projects.

Hence it can be said **the relativity and interdependence of factors ultimately determine the different levels of energy security**. This issue could create a set of separate problems extending the main goals of the dissertation worth for research.

3. Remarks of a polemical nature

It is natural that some questions arising from the dissertation remain without an extensive answer. At first, **the definition of energy security** is worth to comment. For the purpose of the dissertation, this term is defined as a *“non-stop supply of energy at an affordable price able to withstand possible risks and threats posed by natural, geopolitical and economic circumstances. Non-stop supply of energy implies the existence of enough resources and systems to generate power, and the ability to provide end-users (industries, households, etc.) with uninterrupted energy”*. (p. 29).

Then the total energy security risk seems to be a sum of the combined risks and threats. It has to consider stages of the process including exploitation, trade, transport,

consumption of traditional hydrocarbons as well as reproducible sources of energy. Ultimately, energy security is shaped by all factors at once. No doubt, taking into account the existing infrastructure and investment needs, the unconventional sources of energy as solar, hydropower, and wind, carry also **specific risks** which should be properly evaluated and considered in the current and future energy management strategy.

The author writing about energy security as a fundamental for the dissertation applies the analogy to the theory of risk without any doubts. **Both categories are not identical.** There are differences between risk and security seen on the basis of decision-making theory. The elimination of some factors reduces the scale of risk but does not ensure safety. In the case of security, this is a real phenomenon the trustees strive for constant enforcement. Risk, on the other hand, is an abstract misfortune measured in a statistical way.

The amount of risk burden is reflected in higher costs and lower profitability of business ventures. Security, on the other hand, is a prerequisite for normal functioning not affecting decisions. Energy security is the level of self-sufficiency of the country to the reported demand. Both categories should be considered as a result of relations between **different actors switched from competitive relations to cooperation.**

The problem of energy security is more complex than an account of a few selected factors of risk. Hopefully, the actual energy situation of Azerbaijan seems safe and stable. Respecting the level oil and gas deposits in Azerbaijan, the energy security is guaranteed for all combinations of internal energy demand. The dilemmas of additional costs of security at the high level of hydrocarbon exports, do not exist and seem not to be calculated as a real problem of the state policy. Consequently, the energy transition to renewables is not dictated by security reasons, but by the care for the natural environment or by an imitation of the global tendencies.

Questions for the Author:


1. The fascination with renewables like the pure solar and wind means that the risks associated with the energy transformation are not noticed. What are the most important dangers of energy transformation in this regard in the case of Azerbaijan?
2. How would the Author characterize the current energy security policy in the European Union?

The Final Conclusion

In the summary of the review, I would like to emphasize the high scientific values of the dissertation. The value of the research reliability is well exposed both in the conceptual layer as well as in the substantive content and the text. The author solved the scientific problem by demonstrating a good knowledge of economic theory and a methodology of research. The research is based on international sources of information from specialized research programs and statistical institutions. The dilemmas contained in the studied phenomena are of universal importance for specialists in the field of economic policy and management in various countries.

The scientific values demonstrated in the review allow us to express the opinion that the doctoral dissertation is an original and valuable scientific position. The author made the good exploration of the contemporary energy policy and management from the perspective of the state economy. Therefore, in my opinion, the doctoral dissertation seems to be very important thematically, valuable in scientific terms, and very promising as a prerequisite for further scientific development.

I conclude that the peer-reviewed doctoral dissertation by M.Sc. Feyruz Mustafayev entitled: "The Potential Role of Irenevable Energy in Providing Energy Security of Azerbaijan", written in the field of social sciences in the discipline of economics and finance, **meets the statutory criteria set for doctoral theses** in Article 13, paragraph 1 of the Act of 14 March 2003 on academic degrees and title and on degrees and title in the field of art (Journal of the Republic of Poland Laws of 2003, No. 65, item 595 from late. as amended). On this basis, I apply the dissertation to the Scientific Council of the Discipline of Economics and Finance of Gdańsk University for its **admission to public defense**.

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