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Hasan Dinçer
Serhat Yüksel *Editors*

Sustainability in Energy Business and Finance

Approaches and Developments in the Energy Market

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Creation of Energy Risk Insurance System

Laura Baitenova, Lyailya Mutaliyeva, Natalia Sokolinskaya, and András Vincze

1 Introduction

The importance of creating a system that protects people's energy risks in banking institutions was recognized at the end of the last century. In the Decree of the head of state, the Bank of the Russian Federation was instructed to speed up the formation and launch of the fund for insuring the financial assets of Russian banks to protect project funds (Qiu et al., 2020). Now, energy risk insurance (or the energy risk insurance system) is an important, relevant, and mandatory system, due to the efficiency of which the stability of the economy in the state is ensured (Zhou et al., 2021). The most vulnerable and fragile, especially in times of crisis, is the work of economic market agents, the efficiency of monetary and credit institutions, as well as other intermediaries whose functions are significant for the formation and improvement of the state of the economy and objects of economic activity (Fang et al., 2021).

The most urgent problems are those related to providing financial protection to creditors, especially small companies and individuals, whose behavior can lead to

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confusion, destruction of the fragile balance of the entire system, and bankruptcy. An important condition for the operation of any banking system is the presence of trust in it on the part of projects. Just insurance of energy risks in various banking organizations and in the state inspires projects with confidence that in case of any unforeseen situations, they will be able to return either the entire amount of funds invested in the bank, or at least part of the amount, but not lose everything that was given to the bank for storage and accumulation.

Of course, payments to projects in the event of bank bankruptcy are made at the expense of special funds created by banks with the active participation of the government and the state. For the most part, energy risk insurance is aimed at protecting small projects that do not have any opportunities and means to own information about the bank. Those projects that do not have sufficient information about the bank, deposits, and various financial processes are usually unable to study, monitor, or analyze the offers of competing banks to assess their level of reliability due to a lack of incoming information.

It is worth considering that the obligation to insure energy risks appeared on the territory of Russia relatively recently. This point is explained by the fact that in Soviet times there was no need for such an organization, all banks were officially considered state-owned banks at that time, and the state itself, in turn, gave guarantees that the funds invested by citizens were safe. The energy risk insurance, working not only in Russia, but also in other countries, was able to prove its usefulness, efficiency, and sufficient level of quality, which was also proved by the assistance of the system and its representatives to the fact that various elements of credit resources, that is, citizens 'money, are involved in this section.

Everything listed above also explains not only the importance, but also the relevance of the research work. The object of research is the peculiarities of formation of energy risk insurance. The subject of the research is both economic and financial relations, as well as natural rules of operation of energy risk insurance of citizens with non-profit banking organizations in Russia. The purpose of the study is to identify both positive and negative aspects of the operation of the energy risk insurance system, as well as to determine the prospects for the operation of energy risk insurance in the future.

Methodological basis of the study. During the research and its formation, private scientific and general scientific methods and sources were used. Also, when creating the work, we used an analysis of the works of researchers and scientists in the relevant fields. One of the main (theoretical) implications of this study is its results, which expand and enrich the understanding of the formation of insurance protection of financial energy risks of citizens.

2 Literature Review

As for the practical significance of this work, it is an opportunity to use recommendations, suggestions, and conclusions in the subsequent work of banking institutions to improve the overall performance of insurance coverage. In any modern state, there is a well-developed mechanism that protects money (Conteh et al., 2021; Denisova et al., 2019; Huang et al., 2021a, 2021b; Mikhaylov, 2018a, 2018b, 2022; Mikhaylov et al., 2019; Meynkhard, 2019, 2020; Nyangarika et al., 2019a, 2019b).

The basis of this system is, for the most part, that even if the bank goes bankrupt (or its license is revoked), the obligation to return money to projects will be transferred to a special organization. The main task of the system is to protect the personal and financial interests of even the smallest projects (Alwaelya et al., 2021; An & Mikhaylov, 2020, 2021; An et al., 2019a, 2019b, 2020a, 2020b, 2020c, Dooyum et al., 2020; Grilli et al., 2021; Gura et al., 2020; Mikhaylov, 2020a, 2020b, 2020c, 2021a; Mikhaylov & Tarakanov, 2020; Mikhaylov et al., 2021a, 2021b; Moiseev et al., 2020, 2021; Morkovkin et al., 2020a, 2020b; Mutalimov et al., 2021; Varyash et al., 2020; Yumashev & Mikhaylov, 2020; Yumashev et al., 2020; Zhao et al., 2021).

From the very beginning of its existence, insurance has been one of the most important methods of ensuring the need to compensate for damage in the event of unforeseen events (An et al., 2021; Danish et al., 2020, 2021; Dayong et al., 2020; Ivanyuk, 2018; Ivanyuk & Berzin, 2020; Ivanyuk & Levchenko, 2020; Ivanyuk & Soloviev, 2019; Ivanyuk et al., 2020; Lisin, 2020; Mikhaylov et al., 2018; Nyangarika et al., 2018, Uyeh et al., 2021).

Insurance as a process can be viewed from several points of view:

Economic: In this case, insurance is an economic relationship formed during the creation, distribution, and use of public trust funds necessary to compensate for losses, if they were received as part of an insured event. Refunds are made on a contractual basis (Bhuiyan et al., 2021; Candila et al., 2021; Dong et al., 2021; Dorofeev, 2020; Liu et al., 2021a, 2021b, 2022; Mikhaylov, 2021b, Mukhametov et al., 2021; Radosteva et al., 2018; Ranjbar et al., 2017; Rathnayaka et al., 2018; Saqib et al., 2021; Sunchalin et al., 2019; Udalov, 2021; Uandykova et al., 2020; Yüksel et al., 2021a, 2021b, 2021c).

Financial: In this case, insurance becomes an autonomous financial institution, which represents a whole complex of economic relationships, under which financial insurance funds are created (Mikhaylov, 2018c; Mikhaylov et al., 2019). In order to handle different financial risks, this situation becomes a necessity (Jun et al., 2021; Kou et al., 2021; Silahtaroğlu et al., 2021).

Legal information: Insurance here is a set of legal norms through which social relations are regulated, which are manifested during both the creation and use of insurance funds. Insurance can also be studied as a contract, a specific legal obligation, and a legal relationship (Melnichuk et al., 2020; Nie et al., 2020). Insurance is a certain type of legal relationship in which the insured person pays the insurance company a certain amount of money. In exchange for this, in the event

of an insured event, the insured person will receive compensation for possible financial losses from the insurer.

In such a relationship, the party–the insurer will have to bear the risk for some time for the consequences that negatively affect the property or life of the insured person (policyholder) in the event of insured events. Upon the occurrence of events, the insurer must pay the other party the insurance amount.

The energy risk insurance adheres to several fundamental principles in its education:

- Transparency in the implementation of activities (Li et al., 2020).
- Accumulative nature, which is achieved due to the constancy of contributions (Yuan et al., 2021).
- Mandatory participation (Liu et al., 2021a, 2021b).
- Reduction of the level and magnitude of risks for projects if banks did not fulfill their obligations in emergency cases.

3 Methods

If we adhere to the concept of formation of energy risk insurance, then certain relationships in energy risk insurance appear based on legal norms, and not because of the free expression of the will of the parties. Also, these relations develop based on legislation and end their existence since the same legislation. The relationships created in energy risk insurance are based on two principles—subordination and power, which means that the relationships related to the formation, distribution, and use of the energy risk insurance fund are property-based.

Today, insurance can be considered as both a social guarantee provided by the state and a source for investment. One of the key tasks assigned to energy risk insurance is to protect citizens 'funds placed by citizens themselves in banks. In many countries, there is a system for protecting the financial condition and interests of the population, which is perhaps the most important social task. Energy risk insurance is mandatory in any member State of the European Union. As an example, energy risk insurance operates on the territory of Brazil, the USA, Japan, as well as on the territory of the CIS countries-Armenia, Ukraine, Kazakhstan, and others.

In general, it is possible to classify existing energy risk insurances in the world according to numerous criteria. A method for organizing energy risk insurance. In this classification, there are systems with positive guarantees, as well as systems with those guarantees that are not clearly expressed. The essence of such systems is revealed in the following names:

- Legal guarantee (usually they are also called insurance systems).
- General state guarantees (sometimes they are also called guarantee guarantees).

A characteristic feature of the first type is the existence of a procedure established at the legislative level concerning compensation for possible financial losses to

projects in the event of bankruptcy of a banking institution that is part of energy risk insurance. Clients of a banking institution will know in advance about the availability and amount of the insurance amount available to them in case of problems in the bank's operation. Such a system allows you to create confidence in projects that their money will be saved at the expense of predictability. Also, such a system allows you to accumulate free financial resources of a banking organization.

A characteristic feature of the second type of system is the lack of strict legislative regulation, which determines the methods and possible ways to protect energy risks. The possibilities for obtaining compensation, as well as the amount of this compensation itself, depend entirely on the current situation, as well as on the decision made by the state bodies that determine the terms, conditions, and amounts of payments. The basis of such a system is trust in the state on the part of citizens, which is also a characteristic feature of states that have centralized strict management and differs in the dependence of banking institutions on various structures of state activity.

Different countries have different ways of addressing issues related to the use of existing financial investment guarantee systems. For example, Australia and New Zealand do not have any insurance systems at all, but instead of insuring energy risks, these countries have established disclosure requirements, which strengthen economic controls. Organization of participation of banking institutions in insurance systems. Within the framework of this classification, it is possible to distinguish systems of mandatory and voluntary participation of banking institutions.

4 Results

Usually, "money transfer operations" are carried out in non-cash form, unless, of course, the bank has signs of insolvency. On the territory of Russia, the creation of energy risk insurance is associated with the need to:

- Solving the constitutional priority tasks of the state related to the protection of citizens 'rights and guaranteeing their peace of mind.
- Creating prerequisites for increasing the overall level of people's trust in banks.

Today, there are no systems of banking institutions that do not have the risk of facing a crisis, just as there is no energy risk insurance that could be suitable for all banks in the entire state. Both the formation and development of energy risk insurance in Russia took place in several different stages. The creation of energy risk insurance, as well as the development of the regulatory and legislative framework, took 10 years, and the process itself was quite difficult.

It is noteworthy that experts from the USA, England, and Switzerland were involved in creating such laws, as well as in forming proposals related to the protection of individual savings. For this reason, the domestic legislation of those years was based mostly on European and American practice. Due to the fact that banks in those years were just beginning to be created, and no one not only knew

about any bankruptcy, but also did not think about it, bank managers did not openly support this idea. But, even with this in mind, funds were still collected, although no one used them.

Ideologists who were at the origin of the formation of energy risk insurance recalled that this idea, as well as its promotion, was extremely difficult to move forward. But even at the beginning of the foundation's formation, everyone realized the importance of forming such a system, although at the initial stages, there were disagreements on some issues, especially regarding the financial content of the fund. Given the persistent and noticeable budget deficit, the high level of inflation, and the importance of correcting the economic situation in the country, issues related to restoring people's confidence in banks and in the banking system turned out to be important.

This very decree laid the foundation for energy risk insurance for the first time in Russia's history. The same decree also determined sufficient protection of the interests of physical projects, also indicating the protection of citizens 'savings with measures aimed at creating energy risk insurance as an analog of systems existing in other states. However, this work was never carried out. According to experts, this step, although it was taken, still violated the legislation in force at that time, as well as the charter of the Central Bank of the Russian Federation.

The draft decision on energy risk insurance has provided for one point. It is noted that if there is a shortage of funds in the insurance fund, state credit products are used in insurance cases. At the same time, there was a request to the Government to provide initial contributions to the funds being formed. Just all these steps became the most important stumbling block, which lasted for several more years.

At the same time, in May 1994, on the 16th, the European Parliament adopted Directive No. 94/19 regulating the deposit guarantee system. A special feature of the compulsory insurance system is the participation of all banks in such a system, which thus becomes insurance members. The same system provides the same guarantees for projects of different banks.

However, even if all these advantages are considered, it is worth highlighting the weakening motivation, as well as the weakening desire of customers to search for a reliable bank. At the same time, banks 'costs increase due to payments to insurance funds, which ultimately increases the cost of services provided by banks. Such systems operate in Japan, Finland, as well as in the USA, Canada, and other countries.

As for the voluntary system, if it exists, banks have the right to participate in such a system or to opt out of it. Those banks that do not participate in energy risk insurance are less competitive in the market of products provided by banks. The lack of competition is related to the fact that customers treat banks that are not participants in energy risk insurance with less confidence, but risk making a deposit with a forecast for a higher level of income.

For this reason, it is necessary to attract clients to banks without guarantees using the most common method, namely by raising rates, which is useful for customers, but not useful for the bank, whose costs inevitably increase. Even if the membership

is voluntary, the authorities regulating the activity of banks and the possibility of joining still provide for certain restrictions on banking activities.

As an example, regulatory authorities may request a bank to provide insurance coverage, without which the bank is not granted a license to conduct certain operations. Also, if a bank does not have insurance coverage, it may not become a member of the association of banks. The state does all these actions to encourage banks to join the insurance system based on their own decision. The next classification is the amount of energy risk insurance guarantees. Here there are full size, limited, and discretionary sizes. Complete systems provide a reliable guarantee of payment on deposits, which also indicates the growing confidence of customers in banks.

Limited systems are defined as guaranteed provision of only partial coverage of customer energy risks. Most often, such guarantees are given only to small projects that are not very well oriented in the market environment. Naturally, large customers still have the motivation to choose the right banking institution.

5 Conclusions and Discussion

For commercial banking institutions, such a system makes it much easier to work with various small clients, and due to reduced fees, possible costs are reduced, while prices for services will not increase. However, this system has a small difficulty in determining the optimal amount of the amount that is subject to insurance. The following system, discretionary, is one of the types of limited system in which the insurance object expands during a crisis of the entire banking system. This system is the most flexible among the others.

Another classification is the degree of State participation. According to this classification, there are such types of insurance systems as public, private, and mixed. Most often, state systems are formed in the process of maintaining a system of mandatory energy risk insurance. In this case, insurance organizations are formed as state-owned, operating on a non-commercial basis.

The resources of this company are formed using state financial resources, as well as using contributions from banking institutions. This form is used to create insurance systems in the UK and the USA. Private energy risk insurances are formed and implemented at the expense of specialized organizations, whose activities are financed by financial contributions from participating banks. In this case, the state does not interfere in any way in these processes. Private energy risk insurances exist in Germany, France, and Luxembourg.

Finally, in mixed energy risk insurance, banks and the state are equally involved in creating resources for the insurance company. One example of such a mixed system is Japan, where the authorized capital has been operating since 1971, and it was created by the government, the state bank, and private banks, and in equal shares.

The last classification is the organization of financing cash payments or the method of accumulating funds. In this case, the systems may or may not have funding. Systems with financing are since specialized funds are created for payments of deductions for insurance. Funds are formed using regular contributions made by participating banks. Such a system has a fruitful effect on increasing trust, and in the event of an insured event, such a system also accelerates the transfer of funds as compensation. As for the system without financing, here the funds needed for compensation can only be found if necessary, such as the bankruptcy of a banking institution. This is a less preferable system, because in the event of a crisis, many banks come under attack, and it is very difficult to collect the necessary amount. Also, fundraising in this system is a long process, which causes panic among numerous projects. The goals of energy risk insurance based on the rapid elimination of the crisis and its consequences, as well as the formation of a stable system, cannot be achieved (Cheng et al., 2020; Haiyun et al., 2021; Zhe et al., 2021).

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ICT Trade and Energy Transition in the BRICS Economies

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1 Introduction

Energy is increasingly recognized as a key component in the production process and its demand is growing exponentially globally. The traditional energy sources such as coal, oil, and natural gas (all of which are classified as non-renewable forms of energy) have a strong influence on the growth and prosperity of most economies (Ellabban et al., 2014). These energy sources are also accessible and continue to provide good options for powering automobiles. Despite the benefits of non-renewable energy sources, they have several drawbacks. Among the problems associated with the use of non-renewable energy sources is the increasing emission of carbon dioxide (CO_2), which primarily contributes to climate change.

Given the downsides of the natural energy sources, switching from the need for non-renewables towards the usage of renewable energy has been massively advocated, and most countries have responded to these campaigns by gradually moving their emphasis to these renewable sources (Asiedu et al., 2021). As per the International Energy Outlook, renewable energy demand has accelerated globally over the years with an anticipation that it will reach 50% by the year 2050.

Among the world regional blocs, the BRICS countries constituted by Brazil, Russia, India, China, and South Africa have experienced a rapid transformation with growth in the level of economic activities (Pathak & Shah, 2019). In the energy landscape, the BRICS bloc is also among the leading suppliers and consumers of energy in the world. To cite, the International Energy Agency (IEA) reported that the

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bloc's contribution to the overall energy supply in the year 2017 was estimated at 36.4%, placing it as the second-largest energy supplier after the OECD.

Aside from the contribution to the non-renewable energy base, the BRICS alliance is also emerging as one of the leading participants in the green energy sector, as some members in the bloc are rapidly substituting "dirty energy" sources with renewable energy. Per the United Nations (UN) report issued in the year 2018, China alone accounted for about 45% of the entire sum of green energy investment on a global scale. The report further established that the renewable energy investment by China, Brazil, and India labeled as the "Big Three" in the BRICS bloc amounted to over half of the total renewable energy investment globally. Considering the drive to achieving clean energy by the BRICS economies, it is of importance to investigate what factors influence the process of acclimating from non-renewables to renewable energy sources in the bloc. Hence, the aim of this study. The literature has outlined several factors as drivers of renewable energy consumption. Among these factors include economic growth (Alam & Murad, 2020), foreign direct investment (Polat, 2018), trade openness (Murshed, 2018a, 2018b), institutional factors (Chen et al., 2021), and many others.

Notwithstanding the calls for commitment for clean energy, technological impoverishment is commonly cited as a key roadblock to accomplishing the energy transition targets (Murshed et al., 2020). The trade of ICT goods is however expected to remove these technological constraints that have typically hampered the smooth energy transition processes of emerging economics. In this study, we investigate how ICT trade influences renewable energy transition employing BRICS economies. Further to exploring the possible impact of ICT trade on BRICS's energy transition, we examine whether the increase in openness to ICT trade simultaneously decreases CO_2 emission in the bloc. As far as we are aware, this research presents an initial attempt to address the influence of ICT trade on renewable energy transition with a focus on the BRICS countries.

The rest of this chapter is laid out as follows. The second part discusses the literature review. The method is given in Sect. 3. The fourth part highlights the findings and discussions, while Sect. 5 provides the conclusions and policy suggestions.

2 Literature Review

This part of the chapter is divided into different sub-headings, the first of which examines the theoretical basis of the study, and the second of which sheds light on the related empirical findings presented in the literature on ICT, trade-renewable energy linkage and ICT, trade-environmental pollution nexus.

2.1 Theoretical Background

The Heckscher-Ohlin model, which was further developed by Vanek (1968) can be used to comprehend the rational basis for easing barriers to trade. The theory illustrates how trade activities are carried out, particularly across countries with disparate features. The theory argues that countries with a high concentration of factor endowment receive a significant amount of investment from abroad (Ohlin 1933). Therefore, a country will strive to be a leading exporter of commodities that heavily utilize its bountiful factors while importing items that profoundly utilize its scarce resources. Following this theory, the removal of trade restrictions will accelerate the flows and transfer of ICT goods to locations or countries with substantially lower factor endowments in the production of these goods given their available resources. Increasing ICT trade openness will contribute to the creation of a solid ICT infrastructure which is expected to facilitate a smooth energy transition process through the successful implementation of renewable energy technologies.

2.2 ICT, Trade Openness-Renewable Energy Nexus

ICT trade and the use of renewable energy resources are not well studied in the literature. In spite of this, numerous studies have documented how increasing trade openness drives the usage of renewable energy, particularly in emerging markets. Given the notion that ICT products trading volume forms a fraction of the entire trade amounts of nations, the extant studies on the trade openness-renewable energy adoption can give a better idea and the perception on the link between ICT trade and the issue of renewable energy demand.

On the trade openness renewable energy consumption nexus, Murshed (2018a, 2018b) looked into the impact of trade openness on the energy transition process of some selected Asian countries over the period 2000–2017. Applying the two-stage least squares technique, the results demonstrated that a boost in trade increases the use of renewable energy in the studied countries. Using a sample of 25 countries in the OECD bloc, Alam and Murad (2020) analyzed how trade openness and some other factors facilitate renewable energy consumption. Employing different panel estimation methods, the authors revealed that renewable energy consumption is significantly triggered by an increase in trade openness. In the instance of Malaysia, Lau et al. (2018) examined the factors influencing renewable energy usage for the years 1980–2015. The findings showed that in the long term, trade openness negatively motivates the consumption of renewable electricity. Uzar (2020), in a cross-country study involving both advanced and developing countries, examined the factors driving renewable energy consumption. The conclusions of the ARDL approach revealed that trade liberalization had no considerable influence on

renewable energy use. Employing data of countries from Sub-Saharan Africa, Asia, Latin America, and the Caribbean Islands, Murshed (2018a, 2018b) noted that enhanced trade on average inhibits renewable energy utilization. Using yearly data spanned 1971–2015, Shakouri and Khoshnevis Yazdi (2017) analyzed the correlation between openness to trade and energy usage in South Africa. With the ARDL approach, the researchers evidenced that the variation in energy demand is influenced by trade openness, and a two-way interaction exists between trade openness and demand for renewable energy. Basu et al. (2020) explored the effect of trade openness and other factors on the share of renewable energy in India. The study reported that a surge in trade facilitates the implementation of renewable and energy-efficient technologies. Applying the vector error correction model, Lin et al. (2016) scrutinized the motivators of renewable electricity demand in the case of China. Evidence from the analysis showed that the level of openness to trade impedes renewable electricity demand. Using a sample of South Asian countries, Murshed (2020) examined the impact of ICT trade on energy transition. The findings of the study depicted that ICT trade boosts the usage of renewable energy while simultaneously increasing the percentage of renewable energy in the final energy demand. Wang and Zhang (2021) analyzed how free trade affects renewable energy using a sample of 186 countries across the globe. The study suggested a direct influence of free trade on renewable energy in economies classified as high- and upper-middle-income, albeit with an inverse impact on lower-middle-income nations.

Notwithstanding the deficient empirical studies on the influence of ICT trade on renewable energy transition, some studies have acknowledged the significance of ICT infrastructure in leveraging the uptake of renewable energy sources. Stallo et al. (2010), for example, opined that the adoption of sophisticated ICT products can augment existing processes to enhance power generation from renewable energy sources. Ahmed et al. (2017) affirmed that the growth in the ICT sector facilitates energy transition through the use of ICT products which aids in energy conservation.

2.3 *ICT, Trade Openness-Carbon Dioxide (CO_2) Emission Nexus*

Given the second objective which is to examine how ICT trade contributes to CO_2 emission, we review the literature on the influence of trade openness and ICT on CO_2 emission. For the impact of trade on emission levels, Managi et al. (2009) assessed the environmental outcome of trade openness using data of developing and developed economies over the period 1973–2000. The authors showed that trade improves environmental quality in OECD economies and increases CO_2 emission in countries that are not in the OECD region. Similarly, in the OECD