

State support mechanisms and the leading renewable energy projects: a Russian experience

Galina Chebotareva

Academic Department of Energy and Industrial Management Systems

Ural Federal University

Mira str. 19, 620002 Yekaterinburg

Russian Federation

e-mail: galina_ch90@mail.ru

Abstract The importance of alternative energy development calls for the application of leading government-backed plans to stimulate this sector. However, the existing political uncertainty and sometimes ineffectiveness of state support increase the risks of renewable energy (RES) projects and, as a result of that, hinder the development of this industry. Therefore, it appears highly relevant to assess the soundness of the current government-sponsored policies on renewable energy development. This paper presents the main types of specific risks that are typical for renewable energy as well as the results of quantitative assessment of the profitability factors of renewable energy projects. The paper employs an energy-specific logit-model as its main methodical approach. On the basis of the model, the calculations were carried out using Russian RES projects as a case study. The projects are included in the priority areas of the sector development and constitute main types of state support. The results and calculations reveal the risk dynamics at the stages of the life cycle of RES projects that help to evaluate the effectiveness of state measures to support the sector. The results and outcomes of this paper are of practical importance and might be used for improving the existing approach to risk assessment in the RES market as well as in the development of a concept of competition in the global energy market.

1 Introduction

In general, it appears that the state support is still needed to stimulate the development of renewable energy in new markets, especially in countries that do not urgently need alternative energy resources. This issue is also very relevant to the Russian energy market. Experts disagree on the effectiveness of existing state support mechanisms for renewable energy. Thence, now there is a “conflict of two restrictions” (Dyatlov 2017). On the one hand, the development of renewable energy requires attracting new players to this market and increasing the production of special energy equipment. This is possible thanks to an increase in the number of selected RES projects of up to 15 GWh and above. On the other hand, it will lead to an excessive burden on consumers. Now the main tool to stimulate RES in Russia is the selection of projects and the provision of contracts for capacity supply; while capital expenditures (CAPEX) are refunded by charging higher tariffs (Kondyukova et al. 2018). As a result, consumers consider state support to be ineffective, demanding that it be discontinued, and investors need new mechanisms of state stimulation (Konova et al. 2012).

Therefore, there is a complex urgent task to conduct an applied study into the effectiveness of modern instruments of government support for renewable energy in order to see how they impact the level of risk in RES projects in general, as well as how the value of risk changes throughout various stages of RES projects.

The key result of the study is a theoretical generalization of the existing specific risks in renewable energy projects, as well as the study of its impact on the effectiveness of projects. The paper presents a practical assessment of the dependence of the risk value on various types of government support (including the absence of any funding and the implications of this scenario).

On the basis of the assessment, conclusions are made about the effectiveness of modern instruments of government support of the sector in Russia. The obtained results are of practical importance and will be used in the development of a methodical approach to risk assessment in RES projects, in assessing the effectiveness of new mechanisms of state stimulation of the sector. The results will also be integrated into the concept of studying competition in the global energy market (Oppong et al. 2016; Lisin et al. 2017; Lisin et al. 2018; Lai et al. 2015; Fouquet et al. 2008; Gitelman et al. 2017; Panepinto et al. 2017; Chebotareva 2018b; Talipova et al. 2018; Smaliukienė and Monni 2019).

2 Specific features of risks in renewable energy projects

Many earlier research studies and investigations (see e.g. Strielkowski et al. 2017; Rogalev et al. 2018; Chebotareva 2018a; Newbery et al. 2018; Mokhov et al. 2018; Dudin et al. 2019) clearly demonstrated that renewable energy is one of the most unconventional sectors in terms of assessing the effectiveness and risk of sector projects. Its specific nature is due to a number of reasons that have a direct impact on the ways of studying individual risks of RES projects. For example, a quantitative assessment (Chebotareva 2018a) showed that the market profitability of companies and projects belonging to the sector does not depend on the main financial indicators: including short-term and long-term liabilities, income, total and equity capital, operating profit, depreciation and amortization. The results of the qualitative assessment (Chebotareva 2018a) discovered that the effectiveness of RES projects is strongly influenced by such factors as:

- an insufficient number of qualified personnel in the industry
- high pace of development of traditional energy
- wrong choice of location for renewable energy facilities.

However, the most specific feature of the sector is reflected in the influence of political factors associated with a high dependence of investors on state support measures (Chebotareva 2017; Chebotareva 2018a; Liu 2018; Mittlefehldt 2018). Within the framework of the Dia-Core project in the EU countries (Dia-Core 2016; Ermolenko et al. 2016) the political risk is recognized as the most dangerous for the sector (Figure 1). It implies a high dependence of the sector on state regulation, political administration and state support for RES projects. Financial risks, in turn, naturally occupy one of the last places in this rating.

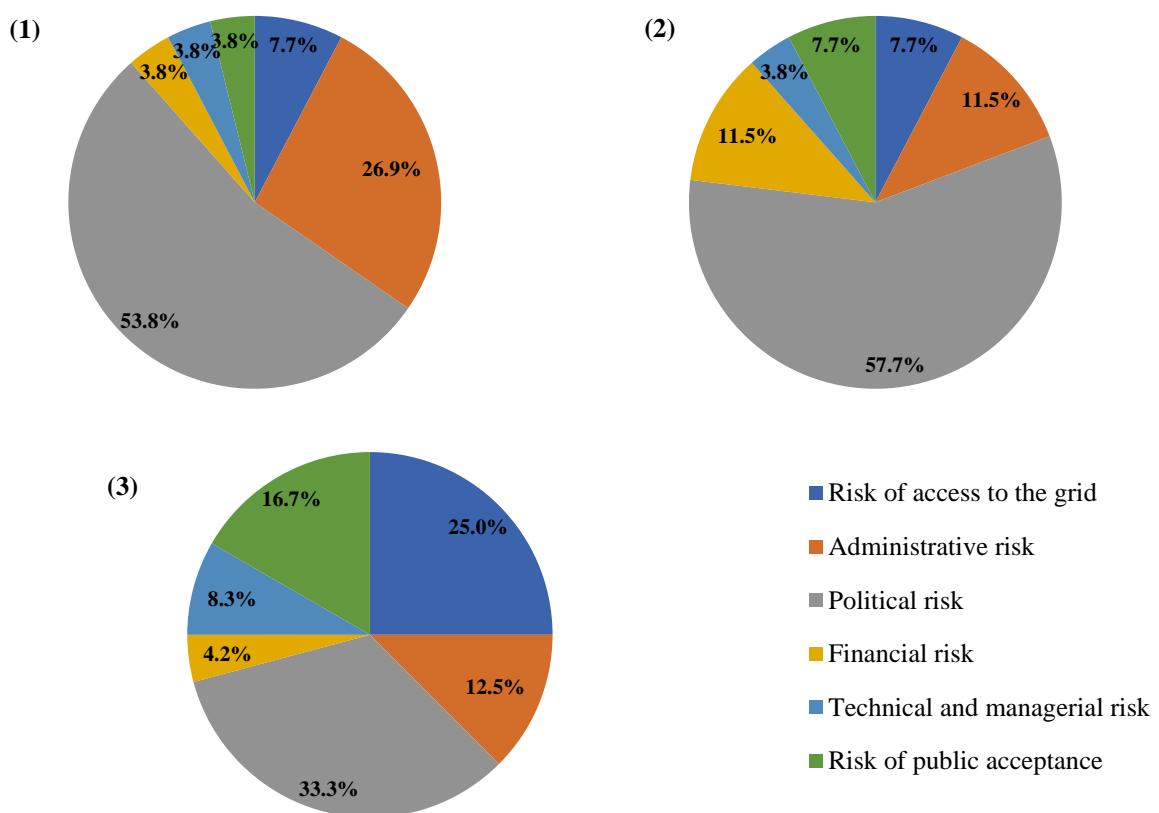


Fig.1. Rankings of RES risks by the level of hazards (EU countries): first (1), second (2) and third levels (3)
Source: Ermolenko et al. (2016)

A number of other studies (Campatelli et al. 2015; Chioncel et al. 2017; Dia-Core 2016; Ermolenko et al. 2016) also confirm that some of the most dangerous risks in renewable energy are the risks caused by a combination of different political factors:

- Risks of sudden changes in the strategy of RES development and schemes of its support

- Financial aspects of investors' dependence on state programs
- Regulatory risk

3 Assessment of risk level in renewable energy projects

The study of the level of risk of RES projects is based on a globally recognized approach: assessment of the forecast *logit*- model (Mokhov et al. 2018; Sorland et al. 2015; Khaidarshina 2009), taking into account the specific characteristics of the energy sector (Khaidarshina 2009; Xie 2018; Li 2017).

A total of 25 RES projects in the most priority areas of renewable energy development in Russia (Energy bulletin 2014; Resolution 2013) were selected as research objects: wind, solar and hydro power. Initially, all projects are divided into three main groups depending on the measures of state support: lending, subsidies and absence of any state support. The initial information for the analysis is based on the data of the official websites of the projects (Investing.com 2018), as well as that of the administrator of the energy market trading network (see AtsEnergo 2018).

According to the results of the calculations the following findings are obtained (see Figure 2 that follows).

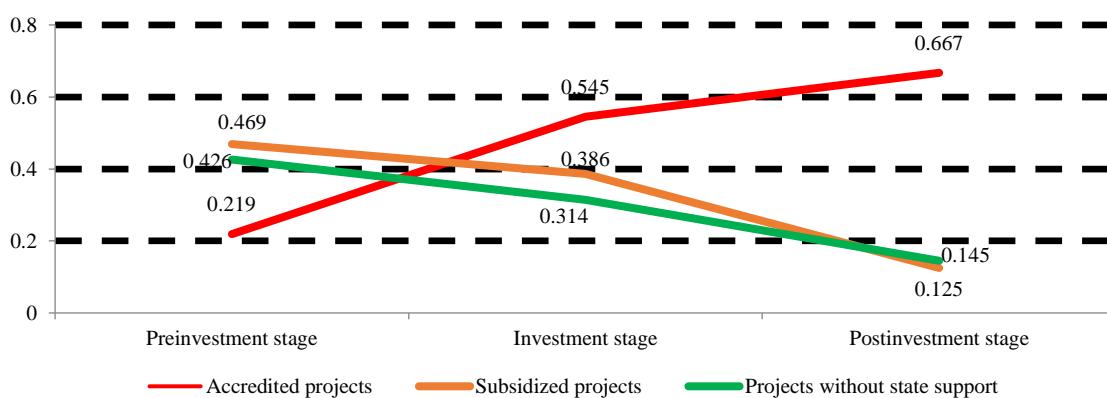


Fig.2. Distribution of average risk values by stages of renewable energy projects

Source: Own results

- 1) The projects that were funded with a *concessional government lending* included three solar power projects, two – in wind power and one – in hydro power. Calculations showed that practically all the studied projects have a minimal or low level of risk at the pre-investment stage. However, by the time they reach the investment and post-investment stages the level of risk significantly increases to a high and even maximum value. Only two projects were the exceptions, in which the risk is reduced to an average value closer to the end of the investment stage. It is not possible to assess the risk of this project at the post-investment stage due to the lack of data.

Therefore, there is a high probability that the initial minimal risk value of the most projects did not require direct financial state support. It led to an increase in the level of risk. The average risk values for this group of projects (Figure 2) confirm the findings. Such a result is largely due to the inefficiency of state support, as well as a significant influence of various political factors (Lisin et al. 2014; Chebotareva 2019).

- 2) In the case of *non-repayable subsidies* half of the presented RES projects have the maximum risk at the pre-investment stage. It necessitates the use of special support measures. The subsidy tool demonstrated great effectiveness: none of the projects showed an increase of the risk level. The calculated average risk values also indicate the same (Figure 2). However, a reduction of risk (to the minimal value) is observed only in two projects; in two more there are no actual results for the post-investment period (after 2018).
- 3) Among the projects in the case of *the absence of any state support*, more than half have an initial minimal or average level of risk. At the first stage, such projects do not require state support as a tool for minimizing risk. Only three of the RES projects are characterized by maximum risk. As a result, the increase in risk is observed only in one case. The remaining projects showed a reduction of risk to the minimal level by the end of the project term, which is additionally confirmed by the dynamics of the average risk value (Figure 2). Among the reasons for this trend it is worth noting the initial low

risk of these projects, the need to rely on private investment resources only, and the lack of the influence of political risks.

4 Conclusions

The problem of assessing the risk level of Russian renewable energy projects involves studying not only risk dependence on the types of government support, but also the dynamics of the risk during the life-cycle stages of the projects. It was possible to divide the selected projects into three large groups for the purposes of the study: those funded with concessional loans, non-repayable subsidies and the ones that did not get any state support. In each of the examined cases certain patterns were found. In wind and solar power projects, in the case of concessional government lending, the average level of risk increases sharply by the investment and post-investment stages of the project. All RES projects that received non-repayable subsidies are characterized mainly by a high level of risk at the pre-investment stage. However, none of the studied projects showed an increase in risk. Moreover, their risk levels decreased to a minimal value. Projects without state support generally did not need additional incentives: they generally had minimal risk. Indirect support of the market through the system of "green" pricing allowed them in the overwhelming number of cases to reduce the initial level of risk to a minimal.

As a result, the ineffectiveness of government incentives for the sector in terms of providing concessional loans was revealed. As a rule, such projects initially had a minimal level of risk and did not need any support. However, at later stages the risk of such projects increased to a high level. On the other hand, the subsidy instrument which does not require repayment showed considerable effectiveness. It was used in the cases of high risk at the pre-investment stage of the project. Among the main reasons for ineffective state support are the following: a small number of RES project applications registered today; the lack of effective deterministic risk assessment tools for such projects; significant impact of external and internal political risks.

The obtained results allow one to determine promising directions for further research, primarily in terms of methodology. They are associated with the development of new deterministic risk assessment tools for the main stages of the project, taking into account the specific character of renewable energy. The new mechanism should help to answer a difficult question as to what tools of state support are the most suitable for which projects, and which projects do not require additional incentives at all, taking into account the regional affiliation and size of renewable energy facilities.

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