

The Stimulation of Renewable Energy Source Usage: Economic Mechanism



Andrey Boyarinov

1 Introduction

According to the long-term prediction of the socioeconomic development of the Russian Federation up to the 2030s, in the twenty-first century, energy security will become a battleground, initiating a new conflict or cooperation. Future stability and the possibilities of the country's economic growth will be defined by the success of the response to such global threats such as global climate change and a lack of energy.

Being connected to all the vital services (healthcare, food, transport, and trade), energy will be the key factor of global economy development. Energy demand will grow globally. Lack of conventional strategic resources (water, minerals, metals) will be felt stronger. The search of long-term sources of energy will take more effort. Investments in development of new energy sources can attract billions of dollars. Economic growth and labor productivity will decrease if decisions on the use of alternative fuels are not made. The development of energy technologies might have a significant effect not only on the energy industry but also on the field of the environment [1].

One of the main prospective development vectors of the fuel and energy industry branches, provided by the energy strategy of Russia for 2020, is the transition to the way of innovative and energy-efficient development [2].

Renewable sources of energy (renewables) are energy resources of constantly existing natural processes on the planet and energy resources of waste products of plant and animal biogenesis. The main characteristic of renewables is their

A. Boyarinov (✉)

Department of Environmental Economics, Ural Federal University, Yekaterinburg, Russia
e-mail: au.boyarinov@net-ustu.ru

inexhaustibility or their ability to recover potential in a short time (within the period of one people's generation lifetime).

The energy of solar radiation, winds, water flows, and biomasses and the thermal energy of the upper layers of the Earth's and ocean's lithosphere are referred to as renewables.

2 Trends and Forecasts of Renewable Energy Usage

The practicability and scales of renewable usage are primarily defined by their economic efficiency and competitiveness with traditional energy technologies. The main advantages of renewables, in comparison with fossil fuel energy sources, are the actual inexhaustibility of these resources, ubiquity of most of them, and absence of fuel costs and emissions. However, they are more capital-intensive, and their share in total energy production is not big yet (except for hydropower plants). According to most forecasts, this share will remain moderate in the coming years. At the same time, interest in the development and implementation of unconventional and renewable energy sources will increase in many countries (Table 1).

About 100 countries have special state programs of renewable implementation and indicatives of their development, approved at the state level for medium- and long-term prospective. Most countries set targets to raise renewables' contribution to the energy balance of the country at least to 15–20% by 2020 and European Union countries to 40% by 2040. Top-priority development of renewables with the growth rate of 10% per year is implemented with powerful legislative, financial, and political support from the government.

Nowadays, Russia is almost absent in the renewable energy market. The contribution of unconventional renewables (except large HPP) to energy balance of Russia is less than 1%. Recent governmental decisions order to raise renewable contribution to 2.5% by 2020 (Table 2).

That will demand creating power plants working on renewables with a total power of 20–25 GW. Unlike many other countries, there is no clear and coherent state policy formed for renewables' usage in Russia. Political declarations about

Table 1 Indicators of global renewable energy [3]

Indicators	Year			
	2009	2010	2011	2012
Investment in new projects (per year), billions \$	161	227	279	244
Renewable power plant capacity (without HPP), GW	250	315	395	480
Energy production from biomass, TWh	–	313	335	350
Photovoltaic power plant capacity, GW	23	40	71	100
Solar power station capacity, GW	0.7	1.1	1.6	2.5
Wind farm capacity, GW	159	198	238	283
Number of countries using renewable energy, unit	85	109	118	138

Table 2 Forecast indicators of input capacity of renewables in Russia (MW) [4]

Types of renewables	Installed capacity	2015	2016	2017	2018	2019	2020	Total
Hydropower plant (capacity less than 25 MW)	18	26	124	124	141	159	159	751
Wind farm	100	250	250	500	750	750	1000	3600
Solar power plant	120	140	200	250	270	270	270	1520
Total	238	416	574	874	1161	1179	1429	5871
Percentage of total installed capacity, %	0.10	0.28	0.51	0.88	1.37	1.87	2.48	

renewables' importance are still not thoroughly reinforced by a set of legislative acts and regulations which stimulate renewable usage and define order of cooperation for investors and consumers. The relation toward renewables is contradictory in Russia. There are enthusiasts who claim that we need to use renewables as widely as possible at the very moment, and there are pessimists, mostly from the fuel and energy complex industry, who claim that renewables are not very promising for Russia, energy nation with large reserves of organic fuels, and that they won't be able to make a significant contribution to the energy balance of the country in the nearest future, and that is why they shouldn't be seriously developed yet [5].

3 Restrictions of the Renewable Energy Production

Intensive development of renewables in Russian Federation is constrained by a number of barriers. All of them could be divided into three groups: financial, information, and institutional barriers.

3.1 Financial Barriers

The main problem is the lack of domestic and foreign investments. Russian companies interested in the development of renewable usage have limited financial resources and insufficient access to funds of investment projects of renewable usage. Income of foreign capital is partially offset by unstable business climate and economic conditions and partially by the absence of appropriate regulatory framework and efficient system of forcing to follow the requirements of legislation.

The next serious barrier is the lack of long-term loans with moderate conditions. Commercial banks are reluctant to provide loans as the return of long-term investments is risky. Besides that, financial institutions do not have any experience in the

analysis of financial aspects of renewable energy investments. Foreign long-term loans are expensive because of the high risk perceived by foreign commercial banks.

Also companies have to bear pre-investment costs. The costs of investment project preparation must be incurred before starting its funding with no guarantee of acquiring funds for project implementation. The absence of demonstration projects increases costs connected with their preparations.

Nowadays, the domestic market of native equipment for power production from renewables is very small. Thus high prices of special equipment produced in small amounts due to the absence of sufficient demand have been formed by now. As a result, companies have to invest a huge sum of money in power plant building.

Finally, access to federal funding, which is necessary, considering technical complexity, high-risk level, and duration of renewable project development, has a significant restriction. Important condition for acquiring funds for a renewable project is compliance with degree of localization which means a certain share of domestic equipment and engineering services usage during the implementation of the project. This course is defined by a number of problems such as an insufficiently skilled workforce, quality and quantity of domestic equipment, etc. One of the main difficulties is fulfillment of requirements of production localization in the set timeframe. The equipment for renewables is produced in Russia, but the technology used in production loses in comparison with imported analogs.

3.2 Information Barriers

Insufficient information about technologies and possibilities of their usage inhibits investment. There is no information about already tried technologies, which are applicable for transfer of existing large fossil fuel boilers to the usage of different kinds of renewables.

Insufficient information about financial, social, and ecological benefits and about rate of investment returns in renewable usage leads to GDP growth limits and environmental degradation.

Absence of reliable information about renewable energy supplies increases a risk of investment. Nowadays there are only preliminary estimates of potentially useable renewable energy supplies.

3.3 Institutional Barriers

Insufficient legislative base in the sphere of renewable development support and inefficient system of measures for enforcement of environmental legislation lead to a complication of projects due to increasing bureaucratic procedures. These negative

factors do not contribute to the growth of interest to use more environmentally friendly forms of energy such as renewables.

Local authorities do not take an active part in funding of investment projects in renewable development. The problem was caused by tax legislation. According to the Russian tax legislation, the most part of tax revenues goes to the federal budget. A smaller part goes to a region budget. The local budget has nothing from tax revenues. As a result, local authorities have no money to support any investment projects.

4 Renewable Energy Sources' Usage Stimulation: Experience of Different Countries

4.1 Germany

Nowadays, renewables cover about 10% of total energy consumption in Germany with a constantly growing trend. It would be impossible to achieve such a high rate without targeted governmental support, which means [6]:

- Introduction of a guideline aimed at the improvement of overall building energy efficiency
- Adoption of a law considering energy saving which submits strict requirements for construction companies, which now must design and construct buildings in such a way that energy losses from heating and cooling would be minimal
- Implementation of various premium systems for renewable usage
- Current law considering heating plants which rules out that the grid company is obliged to install units for renewable energy production in short terms and also to reward owners of the renewable units for every kilowatt per hour of power supplied
- Introduction of the law considering taxes on electricity (20.5 Euros for megawatt per hour) which provides tax discounts for consumers whose power is supplied by renewable units

4.2 China

In China renewables cover about 17% of total energy consumption. China is the leader on the renewable market. The Chinese leadership is credited by present reforms aimed to encourage renewable development, the essence of which is as follows [7]:

- Introduction of a law that obliges grid companies to purchase all the electricity produced by renewable power plants.

- Creation of conditions for production of equipment for renewable power stations. Nowadays China is the biggest producer of solar panels.
- Large state investments (more than 50 billion dollars) in construction of mini plants that generate electricity from biogas in the countryside.
- State funding of research and development and staff training.
- Regulation of electricity tariffs and introduction of “green tariffs.”

4.3 The USA

The USA is also one of the leaders in energy production based on renewables due to the following government support measures [8]:

- Introduction of federal and state-level tax discounts (10% tax discount for investments in solar and geothermal energy, preferential credit against tax, accelerated amortization, etc.)
- Financial payments for new facilities in generating renewable energy
- System of mandatory quotas in individual states
- Introduction of the Act establishing a system of guaranteed price for energy, produced on renewables’ stations
- Regeneration of current

5 Proposals on Stimulation of the Introduction of Renewables in Russia

The Russian Federation Government must be extremely interested in renewables’ support, as it will allow the exporting of larger volumes of conventional energy sources which are the main instrument of replenishment of the Russian budget. Renewables’ development might create conditions for the production of domestic equipment for renewable energy. Renewables will allow reducing the burden on the environment as the amount of energy produced by TPP using coal, fuel oil, and diesel fuel will reduce. Following mechanism of state support is suggested for stimulation of renewable usage:

1. There are many areas in Russia with population isolated from a centralized power supply (some districts of Sakha Republic, Kamchatka, Murmansk region, etc.). Supplying consumers with power in these areas is carried out by imported fuel (coal, fuel oil, and diesel fuel) that leads to the high cost of power production in these districts; that is why the renewable development here can be economically justified (savings on fuel). There were some calculations (on the example of energy complex which consists of diesel power station and photovoltaic power plant in Bagatai town, Sakha Republic) that allowed reducing production costs by

7% [9]. However, high capital costs will not allow making implementation of renewables economically attractive. State support is required to attract private investors. Unlike the existing support scheme based on power supply agreements, the author suggests to introduce premiums for each kilowatt per hour sold, which makes the procedure of state support acquiring more clear and predictable for business.

2. Due to stimulating the renewable competitiveness with conventional resources on domestic market, it is necessary to legally limit grants, subsidies, and tax incentives to hydrocarbon producers (Gazprom, Rosneft, etc.).
3. Temporary cancellation of a rate that considers the degree of localization of the equipment used for renewable energy plants. This will allow applying more modern, reliable imported technologies and equipment in construction right now and also will make domestic manufacturers more competitive in the struggle for Russian consumers.
4. Simplification of procedure for renewable capacity connection to distribution grids. We need to oblige grid companies to carry out connections at their own expense and also to introduce penalties for refusal to connect in the size of renewable producer's losses.
5. Legal confirmation of a long-term contract with the renewable energy supplier for 15 years at least. This will allow minimizing risks for the supplier.
6. Finally, it is only natural that the primary importance is acquired by establishing a proper legislative base. The result should be a design of clear procedure to obtain the budget financing for everyone who wants to invest in renewables and changing tax legislation in favor of local budgets.

6 Conclusion

The suggested measures on stimulation of renewable introduction in Russia will allow making domestic energy market more competitive. State financing will cause an increase of investments in the renewable sector and also will trigger a multiplicative effect with the help of the development of related industries. Renewable “green energy” will allow us to reduce the negative impact on the environment.

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