

# Prospect Analysis of Renewable Energy Power Generation in Belarus

Yitong Niu<sup>1,a</sup>, Andrei Korneev<sup>1,b</sup>

<sup>1</sup>Belarusian-Russian University, Mira Avenue 43, Mogilev, 212000, Republic of Belarus.

<sup>a</sup>e-mail: itong\_niu@163.com, <sup>b</sup>ankorn@tut.by

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## Abstract

Energy cooperation is an important foundation and support for the "One Belt, One Road" initiative. In recent years, Belarus has taken energy efficiency, energy conservation and emission reduction, and the development of renewable energy as important breakthroughs for sustainable social and economic development in the future. It hopes to optimize the energy structure through policy support, actively develop and apply clean energy technologies, and develop renewable energy. Achieve a green and low-carbon transition. However, it is no easy task to develop renewable energy in , where the traditional energy industry is so strong. In order to fully display the full picture of the development of renewable energy in Belarus, the development of renewable energy in Belarus is analyzed and the current renewable energy measures are formulated.

## Keywords

Renewable Energy; Sustainable Development; Energy Structure; "One Belt, One Road".

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## 1. Introduction

With the excessive consumption of traditional fossil energy sources such as oil, natural gas, and coal and the increasing negative impact on the environment, countries around the world have begun to pay attention to the development and utilization of renewable energy. As a typical resource-dependent economy, Belarus' oil and gas revenue in 2015 accounted for more than 33% of the federal budget revenue. However, in the process of economic development, the environmental costs such as carbon emissions are relatively high. Environmental pollution issues are more severe. Energy has an extremely important strategic position in Belarus's domestic political and economic life and international diplomacy. In recent years, in order to better protect the environment, create employment opportunities, and improve people's livelihood internally, and to more effectively respond to the impact of the global energy revolution externally, Belarus has begun to introduce policies to support the development of renewable energy, optimize its energy structure, and strive to make it greener. Carbon economy and social transformation.<sup>[1,2]</sup>

### 1.1 Energy distribution in Belarus

In terms of energy raw materials, Belarus consists mainly of petroleum, lignite, peat and flammable SLATE. High-quality oil reserves are smaller, estimated at 332 million tons. Belarus pumps about 1.7 million tons of crude oil a year, or about 20 percent of its domestic demand. Lignite reserves, estimated at 1.3 billion tons, have not yet been tapped, and discussions have resumed in recent years. Peat occupies an important position, with reserves of about 3 billion tons. In the case of flammable SLATE, initial excavation is currently under way at two sites, with an estimated 11 billion tons of strata located 600 meters below the surface. Belarus's own natural gas is obtained mainly from the extraction of oil, with estimated reserves of 8.4 billion cubic metres. In 2009, Belarus imported a net

4.47 billion KWH of electricity, including 2.908 billion KWH from Russia, 1.236 billion KWH from Ukraine and 3.56 KWH from non-CIS countries. Belarus develops annual fuel management plans.

## 1.2 Status of renewable energy in Belarus

Belarus has only 6MW of installed hydropower capacity, and its hydroelectric power generation accounts for only 60/10,000 of the country's total power generation. Wind power is only 1.5 gigawatts, and solar power is just two or three. Belarus is less than 55 percent self-sufficient in energy and hopes to increase its energy self-sufficiency by introducing Chinese technology and investment in renewable energy to develop wind, solar and biomass energy. In 2009, Belarus produced 30.376 billion kilowatt hours of electricity, 2 million kilowatt hours of coal, 44 million kilowatt hours of hydropower and 5.356 billion kilowatt hours of oil.

Table 1 Belarus each basin of renewable water resources

Drainage	Area within the territory of/km <sup>2</sup>	Renewable water resources within the territory/km <sup>3</sup>	Runoff from abroad/km <sup>3</sup>	Country of origin (retained)	Total renewable water resources/km <sup>3</sup>	Outbound flow (stay to)
Basin						
Dnieper River basin	169190	18.5	13.5	Russian Federation Ukraine	32	Ukraine
The Sidwyna Valley	20760	7.1	7.2	Russian Federation	14.3	Latvia
Sibug Valley	5190	9.3	0.1	Poland	9.4	Lithuania
Nieman river basin	12460	2.3	0	Poland Border river of Belarus	2.3	Poland
total	207600	37.2	20.8		58	

Second, as a weak area of hydropower in Belarus, small hydropower stations have been developed to a certain extent in recent years. While strengthening independent development of hydro power, Belarus has also carried out extensive international cooperation. The Andalusian Electric Power Company and the World Wide Fund for Nature (WWF) have comprehensively studied the impact of the construction of hydro-power stations in eastern Belarus on the local environment, and explored projects with minimal environmental impact and extremely high social and economic benefits. In 2014, Belarus reached an agreement with China Three Gorges Group (CTG) and China Power Construction Group to develop hydro-power projects with flood control power generation and pumped storage functions in Belarus. In the same year, it reached a cooperation agreement with China Power Construction Corporation to start the construction of Lukmueli National Regional Power Station project with an installed capacity of 2,460 MW. Belarus suffered from the chernobyl disaster, so the safety of new nuclear power plants is the most important.

Third, Belarus's state electricity company said it would install five wind turbines near the village of Grabonica, in The New Grodok district of Grodno state, all using equipment made by China's Huanyi Electric And Gas Company, which will ship the equipment to The Port of Kailai Peda in Lithuania and then transport it by land to the construction site. The project is part of Belarus's national innovation and development plan for 2011-2015, with a total installed capacity of 7.5 megawatts and is expected to be completed in May 2016. The general contractor of the project is The Belarus Electric Power Installation Engineering Company. <sup>[3]</sup> Engineers and technicians from The Polish company SARENPOLSCA will carry out the installation work of the wind power plant in The New Grodoc region, Grodno state, under the guidance of experts from The Chinese company HEAG. According

to belarus' national Innovation and Development Plan for 2011-2015, Belarus plans to build a number of wind farms and install 1,840 wind power generators with a total power of 1,600 MW, generating 3.3 billion kilowatt hours of electricity annually.

However, the installed capacity of wind power in Belarus has been maintained at 10 MW, and it has only made a breakthrough in 2015, increasing to 11 MW, and generating 6 GW·h in 2016. In recent years, Belarus will develop and implement a series of wind power (WPP) projects with installed capacity ranging from 100 to 300 MW. If these projects are successfully implemented, the wind power installed capacity growth will undoubtedly be a leap. However, despite the good plan, the development of wind power projects in Belarus is still slow in the short term. Industry experts and investors have expressed negative views on the Belorussian wind power industry.

In 1995, Belarus developed 250 kW vertical-axis wind power equipment. However, due to 's lack of wind power demand and development power, the total installed wind power capacity has not increased. <sup>[4]</sup> Its research and development in wind power technology has a certain degree compared with Western European countries. gap. As countries around the world pay more and more attention to the development of wind power, has begun to actively develop wind power projects in recent years and develop wind power equipment, such as new high-torque wind turbines and small mobile wind turbines.

Fourth, even if only 30% of the Belarus's land can be used effectively, the potential for solar power generation is still huge, and its application prospects are quite broad. However, because the development and utilization cost of solar energy is 50% higher than that of fossil energy, if a balance between price and quality is found through policy-driven and technology-driven, which can reduce costs while ensuring efficiency, solar energy is bound to be in the Belorussian energy supply system. Occupies a place in.

Since 2012, solar power generation in Belarus has seen substantial development. On the one hand, has accelerated the construction of local solar power stations. In August 2012, Belarus decided to build a solar power station with an installed capacity of 100 MW. At the same time, it also planned to issue a total of about 160 billion rubles through a bidding project selection mechanism. Subsidies for solar power generation. As of the end of 2016, 's solar installed capacity reached 540 MW, and it is expected to reach 2,000 MW by 2020. On the other hand, Belarus is also actively seeking international cooperation in the construction of solar power plants. In 2012, Belarus - st. Petersburg launched a solar power project in Uzbekistan with a total investment of nearly 150 million euros, including solar power generation with an installed capacity of 30 MW.

In addition, some of Belarus's geothermal plants are already in operation. It is estimated that the plant could save more than 4,000 tons of diesel or 7,000 to 10,000 tons of coal per year. Belarus also plans to build a 30-megawatt geothermal power plant.

Belarus' solid agricultural foundation and abundant forestry resources give it a huge potential for biomass fuel production capacity, but it has not yet been fully used. In May 2013, issued a government decree that established a mechanism for promoting the development of renewable energy, but eliminated biomass energy and biogas power generation. Due to the lack of relevant incentive policies, the planned construction of a 580MW biomass power plant and a 330MW biogas power plant before 2020 may not be completed. Experts believe that most of the biomass and biogas power plants are located outside the coverage of the power grid, and the installed capacity is smaller than the scale of industrial production, so no relevant incentive policies have been issued this time. For biomass and biogas power plants that are planned to be launched, they can still receive price subsidies in the retail market after obtaining qualification certification through competition. However, it is unlikely that large-scale biomass and biogas power plants will be established before 2020.

## **2. Difficulties in the development of renewable energy in Belarus**

Although belarus's natural resources may not be as superior as those of many countries, it is well prepared for the development of renewable energy and shows regional diversity. The federal Republic

of Belarus has great potential for economic development of renewable energy. Wind and solar power could power remote areas that the grid cannot reach; Vast forests and arable land provide biomass energy; And can use geothermal energy; Can be developed to generate electricity from tidal power. On the other hand, Belarus is uniquely positioned to develop a hybrid supply of renewable energy and electricity. However, Belarus's oil and gas resources have been in a weak position, the financial heavy spending on natural gas energy imports. Fossil energy supply is general, leading to the lack of renewable energy development. In addition, energy prices and taxes in Belarus are far lower than in most countries in the world, with gasoline prices at just 0.5%. Around \$0.68/l (August 2017). Belarus's lack of a price advantage for renewable energy also makes fiscal policy difficult. These disadvantages have led to a shortage of talents in the field of renewable energy development.

Secondly, with the tension between Belarus and western countries, the change of international energy pattern has a profound impact on Belarus's energy strategy.

Table 2 Natural gas production in Belarus over 2007-2009

years	2007	2008	2009
Belarus	203	211	176

### 3. Renewable energy development countermeasures and prospects

First, develop a diversified model. In order to seize the strategic opportunity of the global energy revolution and promote the transformation of domestic energy production and consumption patterns, Belarus should devote itself to the large-scale development, diversified development, distributed utilization of renewable energy, and equipment manufacturing and infrastructure. Technological innovation in facilities and other fields, to achieve the large-scale, diversified, and distributed development and utilization of renewable energy, thereby reducing investment and use costs, alleviating financial pressure, and improving the market competitiveness of renewable energy and equipment manufacturing to reduce The competitive disadvantages of traditional fossil energy sources even occupy a more favorable position in international competition and cooperation by owning independent intellectual property rights.

Second, build a reasonable policy system. At this stage, renewable energy is still a policy-oriented industry. The absence of systems, difficulties in implementing policies, overlapping content, and conflicting objectives have become major obstacles hindering the development of renewable energy in Belarus. Belarus has gradually realized that the comprehensive development and utilization of renewable energy requires a clear and complete legal framework and policy system. In the future, it should continue to promulgate and improve relevant laws, regulations and policies to realize the rationality and comprehensiveness of the system design for renewable energy development. And coordination.<sup>[5]</sup>

Third, the development of an international capital model, capital and other production factors and international cooperation in scientific and technological research and development can optimize resource allocation, promote complementary advantages, increase market size, optimize utilization models, and reduce development costs. Belarus's renewable energy resource endowment and late-coming trends determine that it should make full use of international cooperation agencies or mechanisms such as the "Belt and Road" Initiative, the BRICS, and the Shanghai Cooperation Organization to strengthen strategic cooperation with China and other countries, and introduce More advanced technologies attract more international investment. In addition, will also encourage more domestic energy companies and capital to enter the field of renewable energy, seek international cooperation, expand domestic and foreign markets, and gradually establish international multilateral cooperation mechanisms and models for renewable energy.

Finally, capital and other production factors and international cooperation in scientific research and development can optimize resource allocation, promote complementary advantages, increase market

size, optimize utilization models, and reduce development costs. Belarus should make full use of international cooperation institutions or mechanisms, such as actively responding to China's "One Belt And One Road" initiative, strengthening strategic cooperation with other countries, and introducing more advanced technologies to attract more international investment. In addition, more domestic energy enterprises and capital will be encouraged to enter the field of renewable energy, seek international cooperation, expand domestic and foreign markets, and gradually establish international multilateral cooperation mechanisms and models for renewable energy.<sup>[6]</sup>

#### 4. Summary

Energy cooperation is an important foundation and support for the "Belt and Road" initiative, and the renewable energy industry, which is low-carbon and environmentally friendly, has huge reserves, and has high industrial relevance, is an important starting point for building a green "Belt and Road" initiative. At the same time, the "Belt and Road" initiative also provides an effective multilateral cooperation mechanism for energy cooperation among countries along the route. At the "Belt and Road" International Cooperation Summit Forum held in May 2017, my country proposed to seize the new round of energy restructuring and energy technology reform trends, build a global energy Internet, and achieve green and low-carbon development. As a global renewable energy technology, equipment production and application power, my country has accumulated many advanced concepts and development experience in the field of renewable energy that are worth promoting or learning from, and has formed a certain industrial competitive advantage. China should combine these advanced concepts, development experience and advantages with the needs of countries along the "Belt and Road" to build a renewable energy system, and provide relevant countries with experience in the construction of legal and regulatory frameworks and policy formulation; in renewable energy technology International cooperation in industrial chain and demonstration projects with other countries in areas such as research and development, personnel training, equipment manufacturing, energy storage, and smart grid construction; energy companies should be encouraged to plan development strategies, select partners, and integrate development from a global perspective Resources, make up for the lack of talents, capital, market, and technology, and achieve sustainable development.

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