



ALTERNATIVE ENERGY OF THE REPUBLIC OF BELARUS



NATIONAL AGENCY
OF INVESTMENT
AND PRIVATIZATION

REPUBLIC OF BELARUS

Alternative Energy of the Republic of Belarus

Belarus is poorly endowed with fossil fuel sources such as oil and gas. Therefore, Belarus has to import more than 80% of consumed energy resources, mainly from Russia. Despite the decline in energy intensity of GDP, energy demand is increasing every year. That is why it is highly relevant to use energy efficient technologies. In Belarus, with GDP growth there is a natural increase in the consumption of fuel and energy resources. Therefore, modern energy efficiency technologies should be used in order to ensure the reduction of energy intensity of GDP.

With account of the natural, geographical and meteorological conditions of Belarus, the following types of energy can be used in the renewable energy sector: biomass (firewood, wood waste, fast-growing wood, crop residues, as well as by producing liquid and gaseous biofuels), hydroelectric power, wind power, solar power, municipal waste energy, geothermal energy.

Resource Potential

According to the key indicators that characterize the forest fund (amount of forests, forested area and growing stock per capita), Belarus is among the top ten forest countries of Europe.

As a result of the purposeful work on reforestation and forest cultivation, a positive dynamics of the forest fund has been reached.

Since 1994, the basic quantitative and qualitative indicators of forests have improved:

- The forested area has increased by 832.5 thousand hectares from 7371.7 to 8672.1 thousand hectares;
- The amount of forests of Belarus has reached 39.5% (increased by 4.0 percentage point);
- The total standing timber volume has increased by 621.1 million m³ and amounted to 1714.3 million m³ (including mature and overmature plantations have increased by 188.5 million m³ and amounted to 263.0 million m³);
- The stock per 1 hectare of forested land has increased by 61 m³ and amounted to 209 m³ per 1 hectare; the stock of mature and overmature plantations has increased by 43 m³ and reached 256 m³ per 1 hectare;
- The average age of plantations has increased from 44 to 45 years.

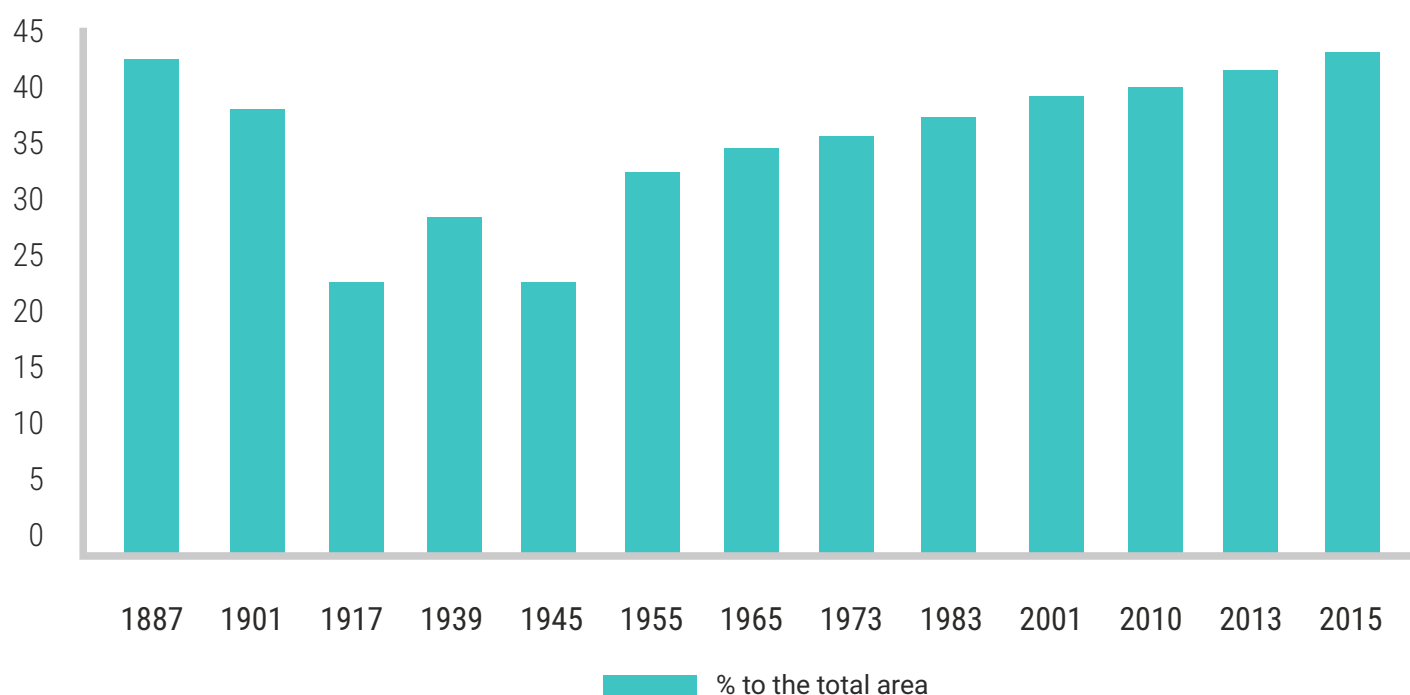
Dynamics of the forest fund of the Republic of Belarus

Item name	Item Unit	1994	2015	Change,+/-
The total area of forest fund	thousand ha	8676.1	9499.5	+823.4
1.1 Forestearth	thousand ha	7775.9	8672.1	+896.2
	%	89.6	91.3	+1.7
1.2 Forestedland	thouha	7371.7	8204.2	+832.5
total	%	85	86.4	+1.4
Including mature and overmature	thousand ha	350.1	1026.2	+676.1
	%	4.7	12.5	+7.8
2. Amount of forests	%	35.5	39.5	+4.0

Item name	Item Unit	1994	2015	Change,+/-
3. First-group forests	thousand ha	3637	4947.7	+1310.7
	%	41.9	52.1	+10.2
4. Total yield	mln m ³	1093.2	1714.3	+621.1
Including mature and overmature	mln m ³	74.5	263	+188.5
	%	6.8	15.3	+8.50
5. Average stand growth	mln m ³	24.9	32.1	+7.2
6. Average stand volume	m ³ /ha	148	209	+61
7. Average age	years	44	54	+10
8. Stand growth per ha	m ³	3.4	3.0	+0.5
9. Amount of periodic yield	thousand ha	5496	11259.4	+5763.4
10. Actual development	thousand ha	4779	9100	+4321
% of use of periodic yield	%	86.9	80.8	– 6.1

In Belarus, simultaneously with the increase in the total forest area a steady growth of ripening, mature and overmature stands can be observed. For twenty years the area of mature stands has increased by 3 times and now it is 1026.2 hectares.

Forest cover dynamics



In Belarus, all forests exclusively belong to the state.

Solar Energy

As stated in weather data, in the Republic of Belarus there are 250 overcast days, 85 partly cloudy days and only 30 clear days. The average annual solar energy input on the surface taking into account nights and cloudiness amounts to 243 kcal per 1 cm³ per day equal to 2.8 kWh per m² a day and if we take into consideration energy efficiency rating of 12 % it amounts 0.3 kWh per m² a day.

In the light of the above factors, the primary direction of solar energy usage is minor construction of photovoltaic power stations and separate photovoltaic modules, as well as usage of solar liquid heating apparatus and solar plant to intensify drying and heating processes of water in the agriculture sector and everyday life.

The annual amount of total solar radiation, megajoule per m²



Hydroenergy

The territory of Belarus is flat. This fact determines hydroelectric development with the help of low-pressure hydro potential of rivers, the usage of which is carried out by construction of new hydroelectric power stations, reconstruction and modernization of minor ones. The prospective potential of hydroelectric power stations amounts to 150 MW.

In Belarus, there are in total 51 hydroelectric power stations (hereinafter referred to as “HEPS”) in service with a total capacity of 34.6 MW. About 76% of all HEPS capacity falls at 23 HEPS, which are under economic jurisdiction of republican unitary enterprises of power industry of state production association Belenergo, a total capacity of which is 26.3 MW.

Two major hydropower stations are currently being constructed: Polotsk hydropower plant – 21.7 MW, which is to be launched in 2017, and Vitebsk hydropower plant – 40 MW in 2018.

Wind

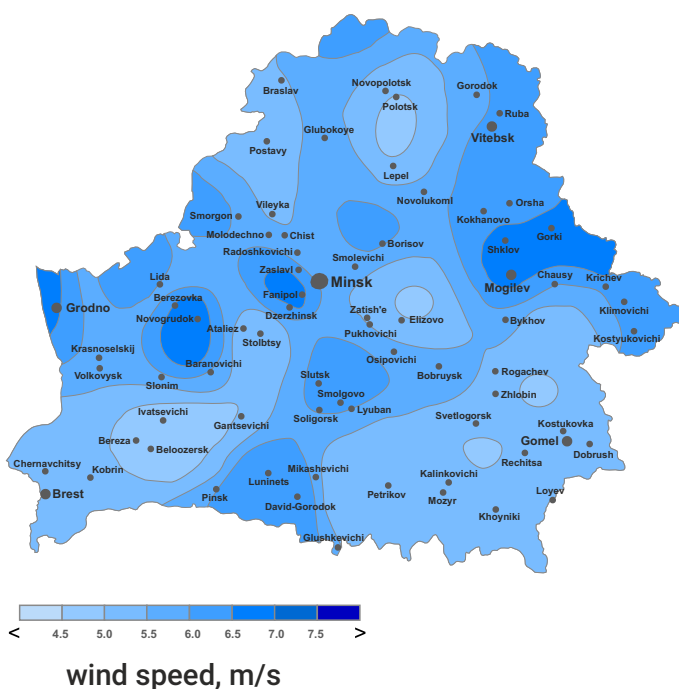
Wind energy resource is not being actively used in Belarus. Wind energy potential is unknown. According to the map shown below, wind speed of 5 m/s at 80 m prevails on the most territory of the country. The highest wind speed, and accordingly, there is a potential for development in the northwestern part of the country. The wind energy potential is estimated at saving (substitution) of fuel in 1.9 - 2.0 mln tonnes of oil equivalent per year. The wind potential is estimated at 220 bn Kwh.

1840 areas for wind turbines placement have been determined on the territory of the Republic of Belarus. According to the wind load research, the average wind speed amounts to 3-8 m/s. Among the inspected areas five of them were selected as priorities which are located in Grodno, Vitebsk and Minsk regions. According to the expert estimation, wind turbines with total capacity of 115 MW can be located on these areas.

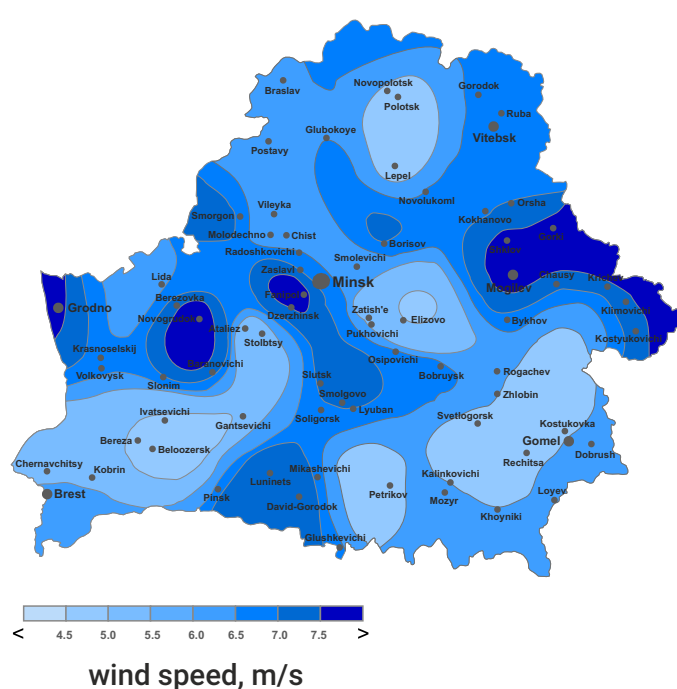
In Grabniky settlement, Novogrudok, Grodno region (Republican Unitary Enterprise Grodnoenergo) a 1.5 MW wind turbine is in operation.

Under the State Program of innovative development of the Republic of Belarus, Minenergo is executing the project of the wind farm construction with capacity of 7.5 MW in Novogrudok region.

Average design wind speed at a height
of 100 m (year)



Average design wind speed at a height
of 150 m (year)



Production

Current use of renewable energy sources in the Republic of Belarus (by types of sources).

As of January 1, 2016 the following sources operated in the Republic of Belarus:

- 3265 local fuel power-suppliers with a total heat capacity of more than 6,000 MW, including 22 local fuel mini-CHPs with a total electric capacity of 129.1 MW and a total heat capacity of 345.6 MW;
- 16 biogas plants with a total electric capacity of about 22.4 MW;
- 50 hydroelectric power stations with a total installed capacity of approximately 35.1 MW;
- 56 wind turbines with a total installed capacity of approximately 43.2 MW;
- 118 heat pumps with a total heat capacity of about 10 MW;
- 29 photovoltaic power stations with a total electric capacity of about 13 MW;
- 287 solar water heating installations with a total heat capacity of about 3.8 MW.

Energy Security Concept No. 1084 of the Republic of Belarus, approved by the Council of Ministers as of December 23, 2015 (hereinafter referred to as the Energy Security Concept) determines that one of the most important factors of energy security is to increase the level of energy provision by means of its own energy resources. Improvement of the energy independence is to be made by the greatest possible involvement of local energy resources, particularly renewable energy sources, in the fuel and energy balance.

The Energy Security Concept sets threshold indicators of economic independence for the period until 2035:

- the ratio of the volume of production (extraction) of primary energy to the gross consumption of fuel and energy resources in 2020 is 16 %, in 2025 – 17 %, in 2030 – 18 %, in 2035 – 20 %;
- the ratio of the volume of production (extraction) of primary energy from renewable energy sources to the gross consumption of fuel and energy resources in 2020 is 6 %, in 2025 – 7 %, in 2030 – 8 %, in 2035 – 9 %.

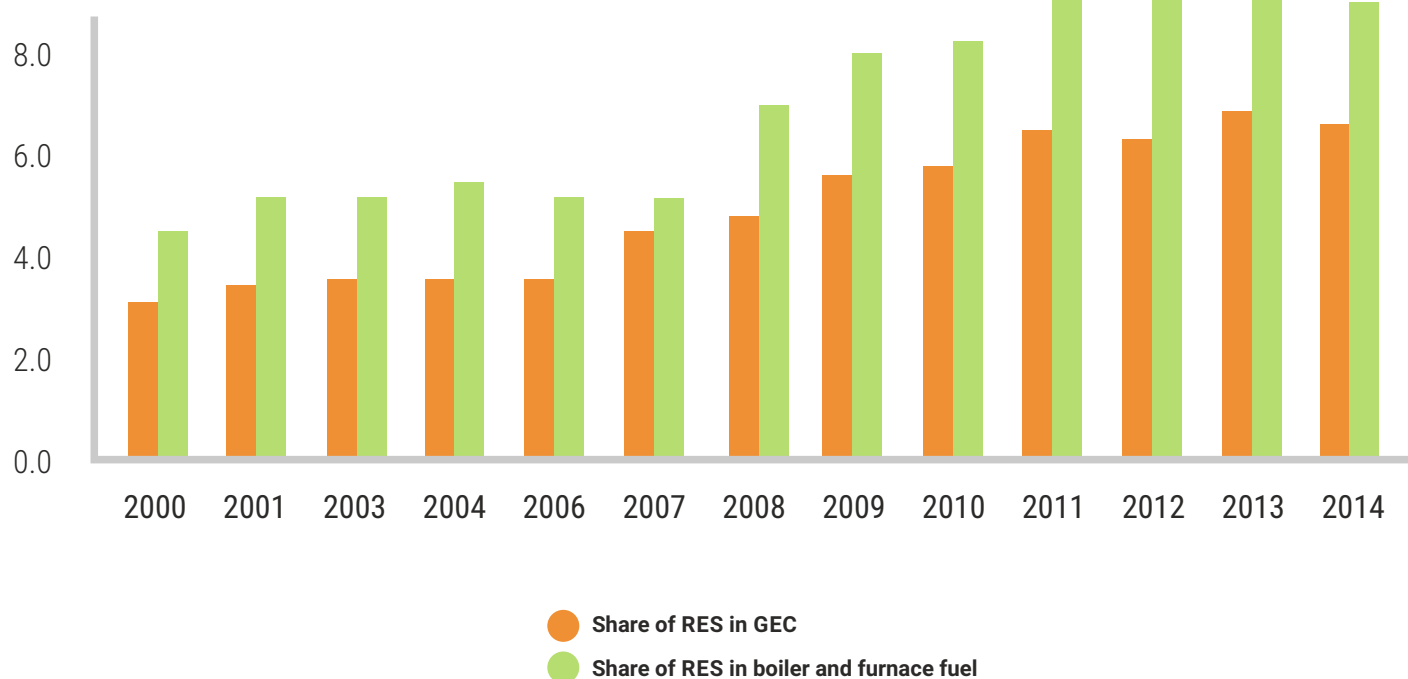
In recent years, much work has been done on including local fuel and energy resources together with renewable energy sources into the fuel balance. The share of local fuel and energy resources in boiler-furnace fuel has increased from 20.7 % in 2010 to 26.3 % in 2014.

In 2014, the share of renewable energy sources in boiler-furnace fuel has increased to the level of 2010, from 7 % to 8.1 % correspondingly, mainly due to the increase in the use of chip fuel. In the structure of renewable energy sources the share of chip fuel has increased from 12.8 % in 2010 to 22.7 % in 2014 (by 223 thousand tonnes of oil equivalent).

The share of renewable energy sources in gross consumption of fuel and energy resources in 2014 has increased to the level of 2010, from 5.2 % to 5.4 %.

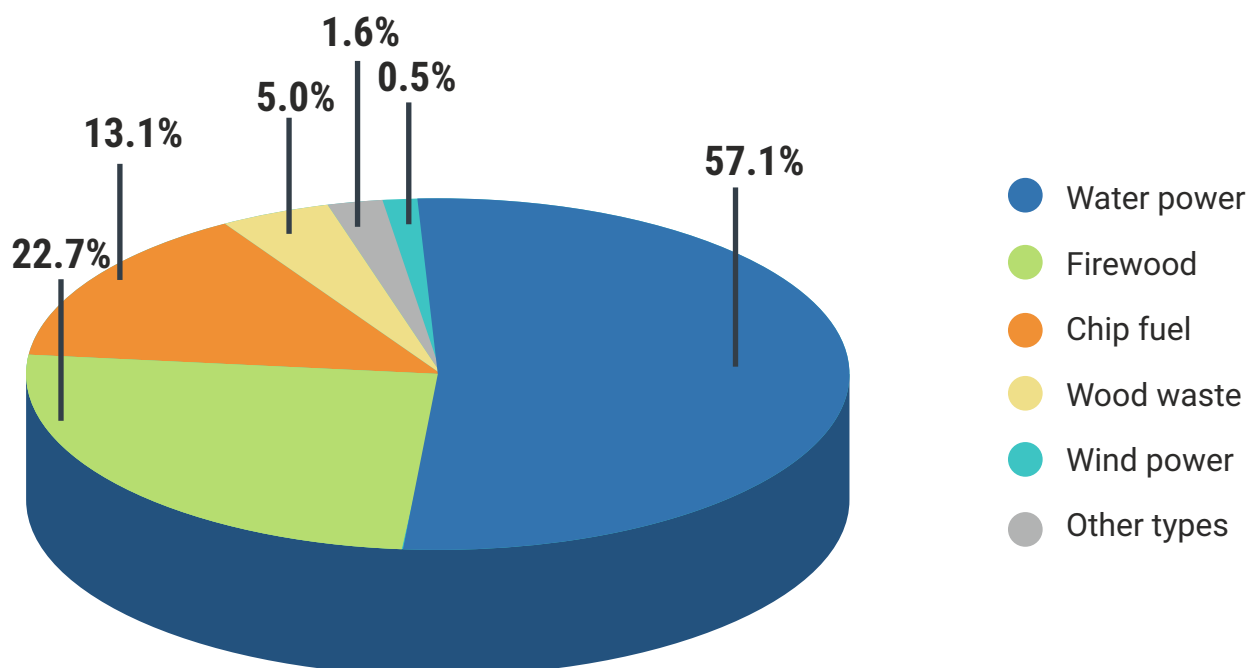
According to the National Statistics Committee in 2014, the share of production (extraction) of primary energy in gross consumption of fuel and energy resources was 13.5 %, the consumption of local energy resources was 5,393 tonnes of fuel equivalent, the gross consumption of fuel and energy resources was 39,811 tonnes of fuel equivalent.

**Shares of renewable energy sources consumption in the gross energy consumption (GEC)
and the balance of energy resources (boiler and furnace fuels)
for the production of heat energy and electric power in 2000-2014, %**



In the structure of renewable energy sources 93 % is the use of wood fuel, wind power is about 0.5 %, water power is about 1.6 %.

The balance of renewable energy sources in the Republic of Belarus in 2014, %



The completed large-scale projects in the field of alternative energy

Over the last years, among the completed projects for using of local and renewable energy sources in state production association Belenergo the following ones can be noted: mini-CHPP (Central Heating and Power Plant) functioning with the help of local fuel types of Baran, the largest hydroelectric power station of Grodno HEPS with a capacity of 17 MW, the wind turbine of 1.5 MW in Grabniky settlement, Novogrudok, Grodno region. 17 MW

In 2015, in the Republic of Belarus the installed capacity of energy source using solar energy amounted to 11.51 MW, electrical supply was 11 mln kWh. 11.51 MW

At present the capacity of the largest solar power station among other 28 exploited stations in Belarus amounts to 3.75 MW.

The allocation of quotas is made competitively. Given that the selection criteria of winners for the right to create plants with usage of renewable source of energy make it possible not only to select the best technical offers including the highest production figures but also determine the most effective plants.

The Republican Commission for fixing up and allocation of quotas established the volume of plants construction for the use of renewable source of energy for 2016-2018 in the amount of 215 MW.

LEGAL FRAMEWORK

On 18 May 2015, the President of the Republic of Belarus signed Decree No. 209 “Concerning the use of renewable energy” (hereinafter referred to as the “Decree”), which had been actively discussed the Belarusian business community for more than 3 years. The Decree was officially published on 20 May 2015. It changes significantly the regulation of green energy in Belarus.

1. QUOTA SYSTEM

Before the Decree, renewable energy in Belarus was regulated by the law of the Republic of Belarus of 27 December 2010 No. 204-Z “On the renewable energy sources” (hereinafter referred to as the “Law”). According to the Law, the state guarantees to the investor an access to the public grid, also the state guarantees to purchase the produced energy applying the feed-in tariffs and multiplying factor.

There have not been any restrictions for the construction of renewable plants until today. Any investor has been able to construct a power plant and sell energy to the state, but the Decree introduces the quotas for building renewable plants.

The quotas will apply to:

- Construction of new power plants,
- Modernization and reconstruction of existing plants. The investor needs to obtain permission of a public authority, in order to increase capacity or to add a new facility to an existing plant.

The quotas will not apply to:

- Companies, which produce energy only for their own needs and not with the aim to supply the public grid,
- Renewable power plants being built under investment agreements with the government of the Republic of Belarus concluded and registered before 20 May 2015.

2. TARIFFS

The current legislation makes provision for the state to purchase energy with the multiplying factor for 10 years after the commissioning of the power plant and the feed-in tariffs for the next 10 years.

The cost per 1 kWh of the energy produced with the use of renewable energy resources is provided in the table below*.

	Multiplying factor (for 10 years after the commissioning)	Feed-in tariffs (for the next 10 years)
Wind biomass, biogas	1.3 (0.17 USD/kWh)	0.85 (0.11 USD/kWh)
Hydro	1.1 (0.15 USD/kWh)	0.85 (0.11 USD/kWh)
Solar	2.7 (0.36 USD/kWh)	0.85 (0.11 USD/kWh)

*at the prices as of 20 May 2015

The Decree has also introduced new rules for tariff determination.

Rule No. 1: Multiplying factor differentiation

The multiplying factor can be differentiated either by the source of renewable energy or by electric capacity of a plant, service life and other equipment characteristics.

According to the government, the service life criterion will limit the usage of second-hand power plants imported from other countries (for instance, wind power plants, solar panels).

According to the Law, the Ministry of Economy is entitled to establish the factors. A resolution on the establishment of the multiplying factors should be adopted in the nearest future. It is not possible to estimate any specific factors prior to the adoption of an act by the Ministry of Economy.

Rule No. 2: Voluntary factor reduction

The amount of the factor may be reduced for particular investors who have an intention to build renewable energy facilities within the quotas, on the initiative of these applicants. It means that the investor can apply for a reduction of the multiplying factor, while obtaining a permit from the authorities for construction of the renewable energy facilities.

This possibility to set a lower factor will become a strong argument in negotiation with investors.

Rule No. 3: Compliance with deadlines for plant construction

Investors may benefit from the multiplying factors only if they meet the declared construction deadline. Since the maximum period of applying the multiplying factor is ten years, any delay apart the declared launch date will lead to a decrease of the ten year beneficial period commensurately with the delay.

New tariff rules will not apply to:

- power plants that have been placed into operation before 20 May 2015,
- power plants that are being constructed under investment agreements, which have been concluded and registered before 20 May 2015.

The energy generated by these plants can be delivered to the public grid according to the previous rules from the date of commissioning. This means that investors will be able to use the multiplying factor, valid before the adoption of the Decree for ten years (please see the table below).

	Multiplying factor
Wind biomass, biogas	1.3 (0.17 USD/kWh)
Hydro	1.1 (0.15 USD/kWh)
Solar	2.7 (0.36 USD/kWh)

**at prices as of 20 May 2015*

HOW WILL COMPANIES RECEIVE THE QUOTAS?

Companies and individual entrepreneurs interested in obtaining a permission to build a renewable energy plant should submit an application until 1 September.

The application must not be submitted to the executive committee where the applicant is registered, but instead to the executive committee of the region, where the applicant plans to construct the renewable energy plant.

Two copies of the application must be submitted:

- one to the regional executive committee,
- the other to the Commission (in a sealed envelope).

The application should also include information about the location of the power plant specifying it on a map. Regional executive committees consider providing land plots to the applicants and changing the designated land plot use accordingly on their own initiative.

WHAT CRITERIA MATTERS IN THE QUOTA COMPETITION?

The quotas will be distributed basing on competitiveness. An application submitted to the Commission will contain only technical parameters. This will help choose the most efficient projects.

The applicant with the most points receives the quota. If there are several preferential applicants, then the quota will be given to the applicant who plans to build a power plant on the territory affected by the Chernobyl disaster.

WHO IS RELEASED FROM THE COMPETITION?

The quotas will be primarily distributed among the following projects (without submitting applications):

- power plants being built under international and investment agreements with the Republic of Belarus;
- investment projects financed through external government loans and external loans against the guarantees of the Government of the Republic of Belarus;
- international technical assistance projects approved by the Council of Ministers of the Republic of Belarus;
- projects financed through foreign donations.

3. CONSTRUCTION OF PLANTS FOR OWN NEEDS

Companies that build plants solely for their own needs (for instance, biogas power plants installed at manufacturing enterprises and farms) will not be affected by the new rules:

- the quota rules will not apply to them;
- surpluses of produced energy may be fed into the public grid applying the feed-in tariff (0.85 as of 20 May 2015). However, multiplying factors will not be applied.

New prices and the feed-in tariff criteria have introduced new regulation tools in renewable energy in Belarus:

- a decline in the use of second-hand equipment (especially for wind parks): projects with older equipment will be provided with a lower feed-in tariff for the first ten years of operation;
- renewable energy sources, which are the priority for the state (i.e. biogas) will be stimulated;
- an oversaturated market (i.e. solar energy sector has experienced deep tariff cuts) will be balanced.

This new approach to the quota distribution and the feed-in tariff introduction will considerably improve the investment climate of Belarus in the green energy sector. Investors will be able to consider Belarus as a stable market.

Additionally, financial institutions and banks will have an opportunity to calculate payback period of a project and make decisions on its financing more efficiently.

Energy produced for own needs	Energy produced for sale
<ul style="list-style-type: none"> – Energy surpluses may be sold to the public electricity grid network applying the feed-in tariff (0.85-0.11 USD/kWh)* 	<ul style="list-style-type: none"> – The multiplying factor may be applied for ten years, subject to the terms of construction – The investor is free to reduce the multiplying factor for a particular object

**at the prices as of 20 May 2015*



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