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REACH THE TARGET USE OF RENEWABLE ENERGY AS A FACTOR OF IMPROVING ENERGY EFFICIENCY REGIONAL ECONOMY

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ДОСТИЖЕНИЕ ЦЕЛЕВЫХ ПОКАЗАТЕЛЕЙ ИСПОЛЬЗОВАНИЯ ВИЭ КАК ФАКТОР ПОВЫШЕНИЯ ЭНЕРГОЭФФЕКТИВНОСТИ РЕГИОНАЛЬНОЙ ЭКОНОМИКИ

The article presents the results of a study of the state energy saving policy in the area of development targets of renewable energy sources within the framework of the implementation of regional energy efficiency programs on the basis of analysis of the potential of the North-West Federal District of the Russian Federation. Research objectives: to conduct a qualitative analysis of the basic documents establishing requirements for the energy savings targets, based on the development of renewable energy sources to conduct a comparative analysis of the potential for the type of renewable energy sources and targets of their development on the example of the Northwest Federal District of Russia, to analyze factors influencing the development of renewable energy sources in the Russian Federation; to conduct a qualitative analysis of federal and regional energy saving policy regarding the development of renewable energy sources; suggest areas of efficient use of renewable energy sources in the current situation. To meet the challenges of research methods we used economic and statistical analysis, as well as regulatory and institutional method. The study systematized the factors affecting the development of renewable energy in our country in three directions: to meet the needs of the population, in entering the retail and the wholesale electricity market. We have shown the incompleteness of the requirements of the legal framework, excessive demands on the objects of renewable energy sources, the lack of effective mechanisms of state power generating facilities in the area of wholesale and retail electricity market. Proposed projects include the introduction of renewable energy sources in the federal targeted programs, the reduction of VAT on renewable energy equipment, its accelerated amortization, measures to strengthen the promotion of information renewable energy among households.

THE SUBJECT OF THE RUSSIAN FEDERATION; REGION; POWER MANAGEMENT; PROGRAM-TARGET METHOD OF MANAGEMENT; ENERGY SAVING PROGRAMS AND ENERGY EFFICIENCY; RENEWABLE ENERGY; REGIONAL ECONOMIES.

В статье представлены результаты исследования государственной политики энергосбережения в части развития целевых показателей возобновляемых источников энергии в рамках реализации региональных программ энергосбережения на основе анализа потенциала регионов Северо-западного федерального округа РФ. Задачи исследования:провести качественный анализ основных документов, устанавливающих требования к целевым показателям энергосбережения на основе развития возобновляемых источников энергии;провести сравнительный анализ потенциала по видам возобновляемых источников энергии и целевых показателей их развития на примере регионов Северо-западного федерального округа РФ;провести анализ факторов, влияющих на развитие использования возобновляемых источников энергии в РФ; провести качественный анализ федеральной и региональной политики энергосбережения в части развития возобновляемых источников энергии; предложить направления развития эффективного использования возобновляемых источников энергии в текущей ситуации. Для решения задач исследования применены методы экономико-статистического анализа, а также нормативно-институциональный метод. По результатам исследования систематизированы факторы, негативно влияющие на развитие возобновляемых источников энергии в нашей стране по трем направлениям: для удовлетворения потребностей населения, при

выходе на розничный и на оптовый рынок электроэнергии. Показана неполнота требований нормативно-правовой базы, завышенные требования к объектам возобновляемых источников энергии, отсутствие действенных механизмов господдержки генерирующих объектов в области оптового и розничного рынка электроэнергии. Предложено включение проектов внедрения возобновляемых источников энергии в федеральные целевые программы, снижение НДС на оборудование возобновляемых источников энергии, его ускоренная амортизация, усиление мер по информационному продвижению возобновляемых источников энергии среди домохозяйств.

СУБЪЕКТ РОССИЙСКОЙ ФЕДЕРАЦИИ; РЕГИОН; УПРАВЛЕНИЕ ЭНЕРГОСБЕРЕЖЕНИЕМ; ПРОГРАММНО-ЦЕЛЕВОЙ МЕТОД УПРАВЛЕНИЯ; ПРОГРАММА ЭНЕРГОСБЕРЕЖЕНИЯ И ПОВЫШЕНИЯ ЭНЕРГЕТИЧЕСКОЙ ЭФФЕКТИВНОСТИ; ВОЗОБНОВЛЯЕМЫЕ ИСТОЧНИКИ ЭНЕРГИИ; РЕГИОНАЛЬНАЯ ЭКОНОМИКА.

Introduction. The energy efficiency of the regional economy at the moment is determined by the successful implementation of relevant regional energy efficiency programs. The planning horizon of these programs in 2020.

This requires systematic solutions and their effective coordination from the federal government and regional authorities [20]. That, in turn, leads to the need of using a program-oriented approach in order to coordinate the activities of key players, plan the actions and make the necessary operational adjustments after evaluating the effectiveness of the implementation of the respective programs [5].

One of the areas of energy efficiency and modernization of the Russian economy is increasing the share of renewable energy sources (RES) and local fuels in the fuel and energy balance of the region and, consequently, the country as a whole. The 261-FZ includes requirements for mandatory inclusion of this target in the regional targeted energy efficiency programs, based on which, in particular, the effectiveness of the executive authorities will be assessed [4]. The targets are determined by the requirements [2].

Russia has vast reserves of renewable energy, the technical potential of about 24 billion tons of equivalent fuel (t e.f.) [3], which is several times higher than the consumption of fuel and energy resources of Russia and the economic potential of 320 million t e.f. [3], which is about 25 % of the annual domestic consumption of energy.

Since the capacities of the Russian energy sector are worn out, there is already an acute problem of updating them, which creates conditions in many cases for making a choice not in favor of the restoration of the pre-existing schemes of energy supply, but in favor of the implementation of new solutions aimed at increasing the use of renewable energy, taking into account regional specificities.

The aim and objectives of the research. The aim of the study is to conduct a qualitative analysis of the targets of renewable energy development in the regions of the Northwestern Federal District and state regulation measures in this direction.

In order to achieve this aim the following objectives have been set:

1. Conduct a qualitative analysis of the key documents that set requirements for the targets of energy-saving through the development of renewable energy sources;

2. Conduct a comparative analysis of the potential of renewable forms of energy and the targets of their development using the example of North-West regions;

3. Conduct an analysis of the factors affecting the development of the use of renewable energy in Russia.

4. Conduct a qualitative analysis of federal and regional energy-saving policy regarding renewable energy development.

5. Propose directions of efficient use of renewable energy in the current situation.

Research Methodology. To solve complex tasks, the authors of the study used a combination of methods of economic and statistical analysis and the regulatory and institutional analysis. We used actual statistics from a variety of domestic and foreign sources, as well as the base of normative documents of federal and regional levels.

The findings of the study. The regulatory framework requires the presence of mandatory target values in the regional energy-saving programs, which should reflect the values, including an increase in the number of objects used as a source of energy secondary energy resources (SER) and (or) the renewable energy sources (RES).

Consider these figures as an example of energy efficiency programs of the Northwestern regions of Russia (see Tab. 1).

Table 1

The targets of energy saving programs NWFD regions [19] **and some EU countries (within the framework of Directive 2009/28 / EC)** (the volume of production of energy resources with the use of RES and RES)

The subject of the RF	Mesure	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
The Republic of Karelia	thousand tce.	0.00	0.00	0.68	1.37	2.06	2.76	3.46	4.15	4.84	5.53	6.22	6.89	7.58	8.26
	%	*0.00*	*0.00*	*22.00*	*22.72*	*23.09*	*23.44*	*23.79*	*24.55*	*25.47*	*26.58*	*26.91*	*27.77*	*28.41*	*22.00*
Komi Republic	thousand tce	9.60	38.40	68.70	100.50	133.80	168.60	204.90	242.70	282.00	322.80	365.10	407.40	417.00	445.80
	%	*9.0*	*9.5*	*9.6*	*9.7*	*9.8*	*9.9*	*10.0*	*10.1*	*10.2*	*10.3*	*10.4*	*10.4*	*9.0*	*9.5*
Arkhangelsk Region	thousand tce	0.00	113.12	178.55	258.27	421.20	434.85	465.38	550.37	666.96	792.89	908.08	1031.05	1181.48	1298.56
	%	*13.76*	*14.63*	*14.55*	*15.20*	*15.30*	*16.83*	*18.18*	*19.09*	*20.62*	*22.27*	*24.05*	*25.97*	*28.31*	*30.59*
Vologda Region	thousand tce	0.00	0.00	0.00	0.00	0.08	0.12	0.15	0.21	0.25	0.25	0.25	0.25	0.25	0.29
	%	*7.5*	*8.6*	*10.1*	*8.6*	*9.0*	*14.8*	*18.3*	*20.8*	*23.8*	*23.8*	*23.8*	*23.8*	*23.8*	*24.5*
Murmansk Region	thousand tce	0.00	0.00	0.00	0.00	0.84	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21
	%	*21.0*	*21.0*	*21.0*	*21.0*	*21.1*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*
Leningrad Region	thousand tce	0.00	0.00	0.00	0.00	30.00	62.00	94.00	126.00	158.00	192.00	227.00	263.00	298.00	336.00
	%	*0.00*	*0.00*	*0.00*	*0.00*	*0.3*	*0.7*	*1.0*	*1.3*	*1.4*	*1.6*	*1.8*	*2.1*	*2.4*	*2.7*
Novgorod Region	thousand tce	0.00	43.10	89.30	137.30	186.30	237.30	289.70	343.50	397.70	453.30	510.30	569.70	569.70	612.80
	%	*6.0*	*14.3*	*14.5*	*14.7*	*15.0*	*15.5*	*16.3*	*17.1*	*17.9*	*18.7*	*19.5*	*20.5*	*6.0*	*14.3*
Pskov Region	thousand tce	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03
	%	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.4*	*0.7*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*4.0*
Kaliningrad region	thousand tce	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.56	9.56	9.56	9.56	9.56	9.56	141.56
	%			*0.23*	*0.22*	*0.16*	*0.15*	*0.15*	*0.29*	*0.46*	*0.46*	*0.46*	*0.46*	*0.46*	*1.83*
St. Petersburg	thousand tce	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	%	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
TOTAL:	*thousand tce*	*9.60*	*185.02*	*142.61*	*160.21*	*276.84*	*135.56*	*151.96*	*213.90*	*247.83*	*257.02*	*250.18*	*261.34*	*195.72*	*359.72*
EU (2009/28/EC)	*%*	–	–	–	–	–	–	–	–	–	–	–	–	–	*20.00*
Germany	*%*	–	–	–	*10.20*	*10.80*	*11.40*	*12.10*	*12.70*	*13.40*	*14.10*	*15.50*	*16.30*	*17.10*	*18.70*
Great Britain	*%*	–	–	–	*3.00*	*3.70*	*4.30*	*4.80*	*5.70*	*6.60*	*7.90*	*9.40*	*11.1*	*12.90*	*15.00*
Sweden	*%*	–	–	–	–	*41.60*	*41.60*	*42.60*	*42.60*	*43.90*	*43.90*	*45.80*	*45.80*	*45.80*	*49.00*
Finland	*%*	–	–	–	–	–	–	–	–	–	–	–	–	–	*38.00*

Targets are set in real terms in t e.f., and a share of the total volume of consumed energy resources. The greatest increase in the share of SER and RES by 2020 at the level of 30.59 % is planned in the regional program of the Arkhangelsk Region. The lowest rate (0 %) is contained in the energy saving program of St. Petersburg.

It should be noted that this figure includes all types of SER and RES in the region, including those taking into account the production of electricity by hydroelectric power plants (HPP) with an installed capacity of over 25 MW. The actual value of the share of energy produced using renewable energy sources in the Russian Federation according to the Federal State Statistics Service for 2014 is 16.4 %, and at the level of the Northwestern Federal District it is 10.2 %. The study also examined the production of energy in the Northwest Federal District, excluding hydroelectric power produced above 25 MW. According to the Federal State

Statistics Service of the Russian Federation, in 2014, the figure was only 0.14 %, and at the level of the Northwestern Federal District it was 0.15 %.

What accounts for such low rates? Perhaps in these regions there is no proper capacities for SER and RES? To answer this question let us analyze the economic potential[1] of renewable energy in the Northwestern Federal District regions on the basis of statistical data [6].

Analysis of the data for 2012 showed that the regions in question have considerable economic potential for SER and RES, which reaches 27.32 % of the current energy consumption in the District (Tab. 2).

Table 2

The economic potential of RES in the North-West regions in 2012

The subject of the Russian Federation	Consumption[2], thousand tce.	The potential of RES, thousand tce.	The percentage of consumption
The Republic of Karelia	4670.84	1118.94	23.96
Komi Republic	10 275.17	1399.22	13.62
Arhangelsk region	9635.10	2632.75	27.32
Vologda Region	18 951.95	1220.12	6.44
Kaliningrad region	3 031.22	368.79	12.17
Leningrad region	18 195.54	1889.58	10.38
Murmansk region	7091.90	873.43	12.32
Novgorod region	2963.76	496.3	16.75
Pskov region	1822.72	428.33	23.50
St. Petersburg	20 010.74	1216.16	6.08
Total	96 648.93	11 643.62	12.05

[1] As part of the technical capacity, the conversion of which into useful used energy is economically feasible at this level of the prices of fossil fuel, heat and electricity, equipment, materials, transportation, labor, etc. [6].

[2] The authors' estimate of the gross energy consumption based on the data of Rosstat on «the energy intensity of GRP» and «GRP» of regions.

Structural analysis of the economic potential of SER and RES North-West regions has shown that the greatest potential is contained in the woodworking waste sector (up to 3075 thousand t e.f.), the largest contribution to this sector is from the Arkhangelsk Region (1263.5 thousand t e.f.) (see. Fig. 1). The greatest potential in physical terms is concentrated in the Arkhangelsk Region (2632.75 thousand t e.f., most of which is the potential of woodworking waste, i. e. 1263.5 thousand t e.f. [9]), the smallest is in the Pskov region (428.33 thousand t e.f., 139.44 t e.f. of which is the potential of biomass [9]). Despite the zero value of the target incorporated in the regional energy-saving program of St. Petersburg [20], the region has some potential for 1216.16 thousand t e.f. (most of which is the heat of sewage of 430 thousand t e.f., and the potential of biomass of 402.43 thousand t e.f. [9]) that with the proper development of this potential would be able to provide up to 6.08 % of the total needs of the city energy resources.

Considering the above target energy efficiency programs and taking into account the existing economic potential of SER and RES, we can conclude that these figures are too low and do not reflect all possibilities for the development of regions in this direction.

At the federal level a strategic target of increasing the relative volume of production and consumption of electrical energy using renewable energy sources (excluding hydro power plant of over 25 MW) from about 0.5 to 4.5 percent for the period until 2024 has been set in the Russian Energy Strategy to 2030[3].

In terms of analysis of the potential of the Northwestern Federal District, this goal is more consistent with the current situation. In these regions, it would be possible to substitute up to 3 % of the current electricity consumption through to the development of solar energy, small hydropower installations and wind energy. However, it should be noted that the strategic goal of reaching 4.5 per cent by 2024 does not look quite ambitious against the background of the strategic objectives of the European Union.

[3] Approved by Decree of the Government of the Russian Federation on November 13, 2009 № 1715-p.

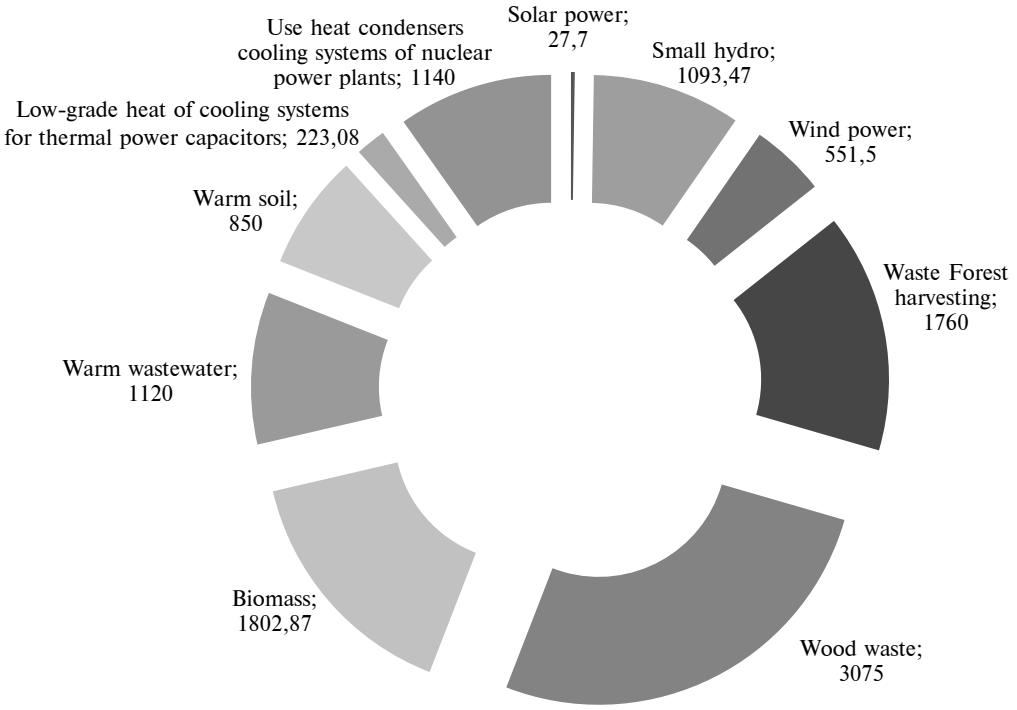

Fig. 1. Structure of the economic potential of RES of the Northwestern regions, thousand tce

For example, in 2001, the Directive on renewable electricity (2001/77/EC) has set a target to increase by 2010 to 21 % the share of electricity produced from renewable energy sources in the EU. The goal set was potentially achievable, since in 1997 the proportion was 12.9 %. Following the objectives of Directive 2001/77/EC, the level rose to 641 TWh×h in 2010, of which 334 TWh×h was accounted for by hydropower, 155 TW×h by wind power, 123 TWh×h by biomass, 23 TWh×h by solar energy and 6 TW×h by geothermal energy. The share of green electricity in the EU is growing, having increased from 13.6 % in 2005 to 19.5 % in 2010 [15]. At the moment, the actual directive in the field of alternative energy in the EU is the Directive 2009/28/EC.

The authors then analyzed and studied the reasons for low use of water and energy resources and renewable energy sources in our country, calling into question the very possibility of achieving the specified target of the federal and regional strategic energy saving programs. The analysis is conducted in three areas: the introduction of SER and RES for the needs of the population (household use), the development of SER and RES in the retail and wholesale electricity markets.

The implementation of SER and RES for the needs of the population. Quite often a price comparison with other countries is used when justifying the low cost of energy (especially electricity) in the Russian Federation. To test this hypothesis, we have conducted a comparative analysis of the level of prices for electricity for households in Russian Federation and other countries. To ensure the comparability of the data, the assessment was made on the basis of purchasing power parities (PPP) [8]. The aggregated data are shown in Tab. 3.

Analyzing the results of the comparative analysis, we can see the following. The level of electricity prices for households in the areas of centralized power in the Russian Federation based on PPP is not much different from the price level in other countries. For example, the average price level in the Russian Federation ($ 173.43) is comparable to the price of New Zealand ($ 176.61), Luxembourg ($ 169.69) and Greece ($ 175.82) and above the price the United States, Switzerland, Norway and others. Price levels in the regions of the Northwest Federal District are also comparable with prices in the EU and the world, and in some cases are even higher. For example, the highest price for households among the regions of the Northwestern Federal District is in the Vologda region. ($ 288.76), which is higher than electricity prices in many countries (see Tab. 3).

Table 3

Electricity prices for households and industry at PPP in 2011 [15, 16, 18]

Country (regions of the Russian Federation)	Electricity prices for households at PPP, $/MWh	Electricity prices for industry at PPP, $/MWh	Ratio of prices for households and industry
Austria	230.79	–	–
Belgium	219.39	114.95	1.91
Denmark	280.51	78.96	3.55
Finland	162.24	86.31	1.88
Germany	316.94	141.59	2.24
Greece	175.82	127.55	1.38
Hungary	359.89	207.24	1.74
Japan	194.92	133.74	1.46
Korea	119.35	–	–
Luxembourg	169.69	90.37	1.88
Mexico	145.17	178.51	0.81
New Zealand	176.61	61.38	2.88
Norway	99.32	41.41	2.40
Spain	298.96	150.61	1.99
Sweden	180.47	75.77	2.38
Switzerland	132.03	78.19	1.69
Turkey	271.40	222.19	1.22
Great Britain	194.05	120.63	1.61
United States	117.84	69.57	1.69
For the centralized power supply zones			
Russia	173.43[4]	156.20[5]	1.11
Northwestern Federal District	193.66	–	–
The Republic of Karelia	113.54	–	–
Komi Republic	141.21	–	–
Arkhangelsk Region	167.15	–	–
Vologda Region	288.76	–	–
Kaliningrad Region	226.51	–	–
Leningrad Region	223.05	–	–
Murmansk Region	107.78	–	–
Novgorod Region	340.63	–	–
Pskov Region	245.53	–	–
Saint Petersburg	168.88	–	–
For The Decentralized (Isolated) Power Supply Zone [7]			
Tersko-Orlovskiy	1152.74	–	–
Kharlov Island	1072.05	–	–
Tsypnavolok	985.59	–	–
Pummanki	922.19	–	–
Kildin Island	887.61	–	–
Selo Chapoma	818.44	–	–

[4] The installed economically justified rate for electricity in homes with gas stoves (ruble), second half of 2011, according to the United interdepartmental statistical information system (EMISS);

[5] According to the Market Council NP for the first price zone (European Russia and Ural) of the «Comparative analysis of the level and structure of electricity prices for end-users in Europe and Russia 2010—2012» on the basis of the CFR and regional energy commissions.

Analysis results can be interpreted as follows: PPP level of electricity prices for households may not be a factor adversely affecting the level of RES in the region and the country as a whole.

However, at the moment about 65 % of the territory of the country [3] lies in the area of a *decentralized* power supply zone. These consumers deserve the greatest attention as subjects predisposed to the use of local RES. For example, consumers who live in the border, coastal and inland areas of the Kola Peninsula, where fuel delivery is significantly difficult, are forced to use petrol and diesel units with the power of 8–20 kW to provide for their energy needs [7]. Tab. 3 also shows the cost of electricity generated by diesel power plants in remote settlements on the coast of the Barents and White seas, which ranges from 818.44 to 1152.74 $/MW×h PPP. The price level is several times higher than similar rates for the regions of the Northwestern Federal District of centralized power, as well as prices in other countries. Thus, the price level for decentralized consumers can be a factor in stimulating the development of SER and RES.

Let us look at the energy-saving program of the Murmansk Region. Under this program [20], it is planned to establish in the settlements in the Terek and Lovozero districts (where installation is appropriate) the stand-alone automated diesel-wind power stations (ICE). The use of wind power generators paired with the diesel ones (VDES) can be an effective solution to reduce the costs of generating electricity from a diesel power plant (DES) and improving energy security for isolated consumers [4]. But there is still a low level of interest on the part of households in the use of renewable energy equipment, which is due primarily to its high costs [3], as well as the lack of effective mechanisms of state support.

The analysis also determined the ratio of the price of electricity for households and industry. Calculations show that in developed countries, the price level for the industry is lower than than the price level for the population. A similar ratio is observed in Russia, but the proportions are much lower. This suggests the continuation of cross-subsidization, in which industrial consumers actually pay part of the cost of the electricity consumption of the population and some other consumer groups equivalent to the population [12]. This factor can be considered as one having a negative impact on the level of water and energy resources and renewable energy sources in our country, as in the case of liquidation of cross-subsidizing the prices on electricity for households (population) will certainly grow which will serve as an incentive for them to move towards the SER and RES.

Another negative factor for the development of renewable energy in this group of consumers is the lack of adequate information on the benefits of renewable energy. Lack of demonstration experiments (including those supported by state programs) creates uncertainty and reduces the potential for the introduction of 'green' technologies.

Development of SER and RES in the retail electricity market. Within the framework of the existing rules of activity in the retail and wholesale electricity market, established in the legal acts of the federal level, the subjects of the retail electricity market can only be the objects of renewable energy with an installed capacity less than 25 MW. The basis of the small power in Russia is about 50 thousands of different power plants, with total capacity of 17 GW, or 8 % of the total installed capacity of power plants in Russia, working both in the power systems and autonomously. The total annual electricity generation at these stations reaches 5 % of the production of all stations of the country. [11] Since this direction of the energy industry is part of the sphere of natural monopolies which are regulated by the state, it is necessary to conduct a qualitative analysis of the federal and regional energy-saving policy (described in legal acts) as part of the development of renewable energy sources.

Paragraph 128 of Government Decree No. 442 of May 4, 2012 provides a procedure for the compulsory qualification of generation facilities based on renewable energy that grants them the right to sell electricity on the retail market. According to the rules established by the RF Government Decree No. 426 from 03.06.2008, the qualification function of generating facilities based on renewable energy is performed by the Market Council NP. Analysis of Regulation No. 24 of the Market Council NP on the qualifications of generating facilities revealed a high bureaucratization of the procedure, which reduces the initiative of organizations and investors in this direction.

Federal legislation establishes the requirement for state regulation of executive authorities of the Russian Federation on the basis of the guidelines approved by the Federal Tariff Service, the prices (rates) or marginal (minimum and (or) maximum) levels of prices (rates) for electric energy (power) produced on the basis of

renewable energy generation facilities qualified and purchased in order to compensate for losses in electrical power systems[6]. State regulation of prices (rates) in this area is especially important, because at the moment the level of prices for equipment and operation of renewable energy is much higher compared to traditional generation facilities. But at the moment there is no method of calculating prices (rates) for such property approved at the federal level.

In a competitive environment, due to a high level of rates for electricity produced from renewable energy sources, lack of transparency and incomplete legal acts, prescribing mandatory and conditions of contracts for the sale of 'green' energy, network companies may shy away from entering into the appropriate agreements. These circumstances will undoubtedly hamper the development of the industry and attracting investments for the construction of renewable energy facilities. [10]

Projects based on SER and RES should get tangible government support, including through the inclusion in regional development programs. Regional development programs are the responsibility of the regional bodies of power, which should include these items based on all the factors that operate in a region. It is not only a desire to reduce the cost of energy for consumers, but also the desire to improve the reliability of electricity supply, to solve environmental issues, to develop small and medium businesses, etc. [19]. At the same time, it is a deterrent, as, on the one hand, the regional authorities do not want to take on more responsibility, while on the other hand, the suppliers of traditional energy sources in the region are not interested in the development of renewable energy sources, and they may lobby for their for interests when regional regulations are enacted, thus putting pressure on regional authorities.

However, an early 2015 RF Government Decree of 23 January 2015 No. 47 makes changes to some acts of the Government of the Russian Federation, substantially contributing to promoting the use of renewable energy in the retail electricity markets. It establishes the procedure and the limits of long-term rate regulation parameters of RES facilities, the duty of purchasing electricity from qualified renewable energy generating facilities in order to compensate for losses on regulated rates set by the competent regional authorities and others.

To encourage the development of renewable energy facilities in isolated areas and non-price retail energy market the following measures may be proposed: the inclusion of RES projects in the federal target program, reduced VAT on equipment for the facilities of renewable energy, accelerated depreciation of equipment [11].

Development of SER and RES on the wholesale electricity market. According to the plan, the share of 'green' energy on the wholesale market in 2020 is expected to be 2.5 %, or about 6 GW. [19] As noted above, the objects of renewable energy with an installed capacity to 25 MW cannot be subjects of the wholesale market. Thus, only the development potential of the objects of renewable energy with a capacity of over 25 MW should be considered.

The Federal Law 'On Electric Power Industry' of November 4, 2007 has been amended to improve the competitiveness of renewable energy facilities. [1] Taking into account the indirect effects of the laws of Russian Federation, by-laws were adopted which contain guidelines on the qualification requirements of generating facilities, the provision of budget subsidies for technological connection, subsidizing interest rates on commercial loans for the development of renewable energy sources et al. [10]. Let us analyze these documents.

RF Government Decree of May 28, 2013 No. 861-p establishes the requirement of localization of the equipment which will be used in the construction of generating facilities of the wholesale market. For example, for power generation using wind up to 2017 there is an established requirement for the localization of the generating equipment at 40 %. Given the dramatically low level of production of renewable energy equipment in Russia, these requirements, in our opinion, are impracticable and making it difficult to achieve the set targets for the development of renewable energy in our country.

The procedure and terms for technological connection are established in paragraph 16[7]. The approximate period of 2 years (but not more than 4 years) is set for the applicants, the maximum capacity of the power units is no less than 670 kW[8]. This reduces the likelihood of implementing the proper amount of projects in construction of renewable energy.

[6] On pricing in regulated prices (rates) in the electric power industry. Resolution of the Government of the Russian Federation of December 29, 2011 No. 1178.

[7] Approved by Decree of the Government of the Russian Federation of December 27, 2004, No. 861.

[8] Order of the Government of the Russian Federation on January 8, 2009 No. 1-p with the changes.

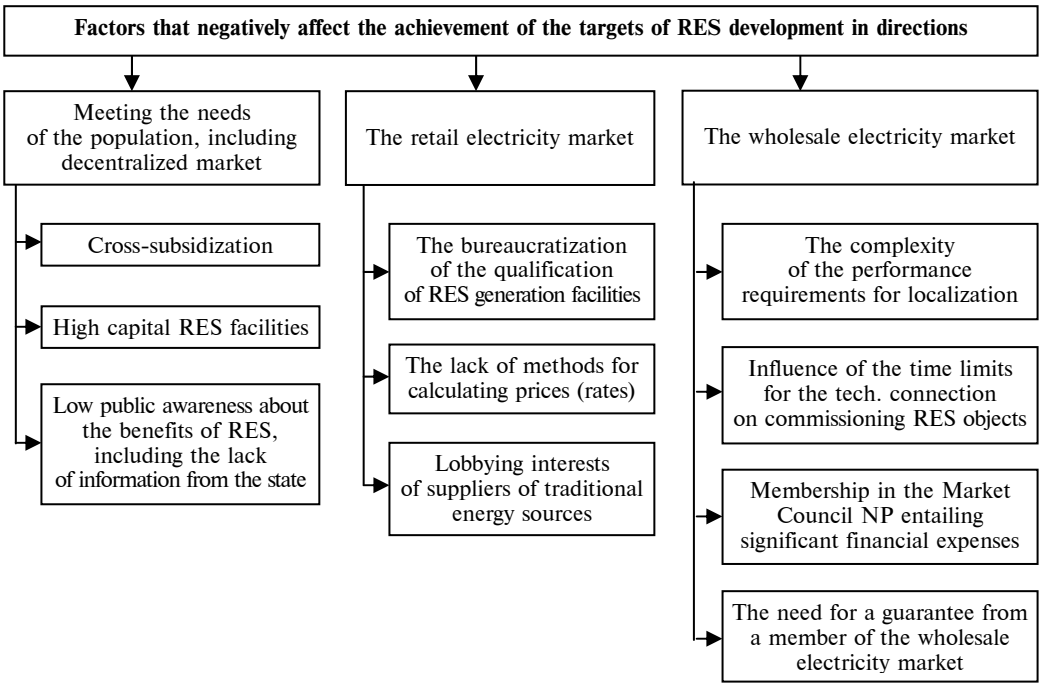

Fig. 2. Systematization of the factors that negatively affect the achievement of the development RES targets

The support system for renewable energy by the wholesale power market was introduced in 2013. Government Decree No. 449 of 05/28/2013 defined the procedure for the selection of investment projects for the construction of renewable energy generation. Once a year, wind (WEC), solar (SES) power and small hydropower plants meeting the requirements for capital expenditures and containment equipment are selected by competition and are then given the right to sign the agreement to supply power (PDM), which guarantees a return on investment through increased payments [19]. The PDM RES is valid for 15 years, the target level of the rate of return is 12–14 % (14 % for the first two years and 12 % from the third year after the selection of the project). The obligations to purchase power supplied by renewable PDM are distributed among all consumers in the appropriate price zone. [11]

There is a strong demand for competition SES projects, as-the entire volume of output for the years 2015–2018 was sold out, but only 8.5 and 4.8 %, have been sold for WPP and small hydropower plants, respectively. The main obstacle for the participants was the requirements for localization of equipment, which has already been mentioned above, i. e., in fact, the lack of currently relevant equipment manufacturing in Russia.

There are additional requirements for such investment projects, adversely affecting the pace of implementation of renewable energy facilities. Responsibility for organizing and carrying out the specified selection procedure has been transferred to the Market Council NP. The Regulation of the Market Council NP No. 27 from 07.16.2013 'On carrying out the selection of investment projects' secured the conditions for participation in the competitive selection of RES projects, one of which was a requirement for membership in the Market Council NP, which implies the introduction of a one-time introductory membership fee in the amount of 1,000,000.00 rubles and payment of quarterly fees. For generating companies in 2014 this figure amounted to 1,091,000.00 rubles, which is equivalent to the proceeds from the sale of electricity on the wholesale market produced by a SES with an installed capacity of 100 kW at a peak in the development and in the climatic conditions of the Belgorod Region for more than 5 years. At the same time, this amount is the same for large nuclear and hydroelectric power plants, and small objects of alternative power [10].

Thus, it is possible to systematize factors that negatively affect the achievement of the targets RES development (Fig. 2).

Conclusions. An analysis of the current domestic and foreign statistical data from different sources of information and analysis of legal acts in the area of program-oriented power management and development of renewable energy:

1) formed a structured assessment of the potential of the Northwestern Federal District of the Russian Federation in the field of renewable energy;

2) proved the validity of targets due to their compliance with the terms of the economic potential of renewable energy regions of the Northwestern Federal District, taking into account the hydroelectric power production capacity of over 25 MW;

3) proved at the same time that these targets for energy efficiency programs are understated, if the energy generated by hydroelectric stations with a capacity over 25 MW is not taken into account;

4) showed that the PPP level of electricity prices for households in the Russian Federation is not low compared with other countries and cannot be a factor that affects the implementation of the targets of SER and RES;

5) showed that the development of renewable energy is especially important for the consumers of the isolated areas of power supply where prices are several times higher than the similar rates for the regions of centralized power, as well as prices in other countries;

6) revealed the incompleteness of the requirements of the legal framework, excessive demands on the objects of renewable energy (in particular the degree of localization), which is associated with the negative lobbying influence of natural monopolies, adhering to the traditional areas of generation.

All this, of course, negatively affects the level and pace of development of renewable energy sources in the Russian Federation, and, consequently, the possibility of achieving the specified targets of the respective energy efficiency programs. On the other hand, given the identified energy resources of the Russian Federation, a high development potential of renewable energy in our country and in the Northwestern Federal District may be noted.

High speed and quality for achieving the targets of renewable energy in the EU Member States can be explained by their desire to ensure the independence and energy security in view of the significant limitations of its own reserves of non-renewable energy sources within the framework of the EU general policy.

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