DEVELOPMENT OF SMALL AND MEDIUM-SIZED ENTREPRENEURIAL BUSINESSES IN THE ENERGY SECTOR: FEATURES OF HIGHLY INTELLIGENT PROJECTS' EVOLUTION

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Abstract: One of the main conditions for sustainable development of the economy is a sufficient amount of resources necessary for its running. The scientific and technological development constantly stimulates increase in the energy efficiency that is especially important for small and medium-sized enterprises. The article discusses the development opportunities and prospects of small and medium-sized entrepreneurial businesses in the energy sector through the project development based on the synthesis of Smart Grid and Green Economy.

Keywords: renewable energy source, green economy, intelligent networks, small and medium-sized entrepreneurial businesses, power industry, energy saving, energy efficiency, smart grid.

1 Introduction

Economic growth largely depends on the development level of country's energy industry, which represents the basis for all economic sectors' functioning, i.e. contributes to the formation of a significant portion of GDP, as well as meets the needs of the population in household electrical energy. The most effective ways to solve this problem include:

1) improving the energy efficiency of the economy so that to reduce the energy costs by reducing the amount of energy consumed;
2) developing alternative energy.

Small and medium-sized businesses, especially in the agricultural sector, often have sufficient capacity to produce their own energy through the use of solar, wind, water, land, and biomass; and thus they can become independent from a single-source energy provider. In addition, to gain a competitive advantage, these businesses may be interested in implementing ISO energy standards.

Thus, small and medium-sized enterprises (SMEs) are particularly interesting research objects in the context of energy saving and energy efficiency, since, on the one hand, they are significant consumers of fuel and energy resources, and on the other hand, they are one of the main implementers of energy saving and energy efficiency policies, and can provide energy services, energy management services, energy audit, as well as carry out design and construction works, etc.

Based on the generalization of pioneer theoretical models of energy consumption (the doctrines of the differentiated limited growth of M. Mesarovich and E. Pestel; World-1, World-2, and World-3 models of J. Forrester and D. Meadows; V. Leontief and D. Ford models of static intersectoral ecological-economic interaction, etc.), it can be concluded that each of these models serves a constructive tool for analyzing the types and forms of attracting energy resources in public production. At the same time, in the context of exhaustion of the industrial potential of social progress and reduction of traditional resources of economic growth, the theory of the third industrial revolution proposed by Rifkin [1] is the most adequate explanation of modern transformational changes in the energy paradigm of global economic development. According to this theory, today there is a transition from the second industrial revolution, which was based on hydrocarbon energy, atomic and nuclear energy, to the third industrial revolution, whose core is the generation, storage, accumulation, and distribution of energy through the so-called Smart Grids.

The use of highly intelligent networks, such as Self Monitoring Analysis and Reporting Technology (SMART Grid), which is a technology that provides its own monitoring and the ability to transfer monitoring results to the network management center, is a promising trend to improve managerial efficiency in the energy sector.

The most large-scale programs and projects based on the application of the Smart Grid concept are developed and successfully implemented in the USA, Canada, European Union, China, India, Japan, Australia, South Korea, and in fact are the state policy in technological development of the electric power industry of the future [2, 3].

In addition, climate change makes the seventh goal of the Sustainable Development Goals of the UN relevant worldwide. This goal concerns the promotion of environmentally friendly energy operating based on renewable energy sources. According to S. Vento, CEO of the Climate Bonds Initiative, by 2050, the world economy will have to invest 350 trillion USD in alternative power generation to stop climate change on the planet.

At this stage of building a Smart Grid, it is necessary to highlight the possibility of synthesis of Smart Grid and Green Economy. The global trend of the green economy is to increase energy efficiency and reduce the use of resources for products manufactured by reducing the production cost and raw materials' processing. The main goal of the green economy is reducing the impact on the environment through the use of highly efficient mechanisms to manage economic processes [4, 5].

At that, this is related to the strengthening of vertical integration of the industry sector: an increase in the number of SMEs, as well as hierarchical levels of management and the amount of processed information, the need to manage large organizational amounts of information within a single business process, strengthening centralized control both on the part of the power supply companies' management and the state.

2 The Relevance of the Highly Intelligent Projects' Development in the Energy Sector and their Relation to the Energy Strategy of the Russian Federation

The relevance of the development of highly intelligent energy projects in the Russian Federation is determined by the Energy Strategy for the period up to 2030 [6], as well as by a number of other regulations.

In particular, the priority areas of scientific-and-technological advance in the energy sector defined by the Energy Strategy of Russia include "the formation of integrated intelligent system-forming and distribution electric networks of a new generation (high-intelligence Smart Grids), the implementation of automated metering and demand management systems for energy, the widespread use of alternative energy and projects based on renewable energy sources (RES)" [6].

The need for the development and implementation of mentioned areas is caused by a number of problems arising in this field. First of all, this is due to the continued depreciation of the main equipment of existing power plants and networks, where the proportion of obsolete equipment exceeds 40%, an increase in electric energy losses in electrical networks is more than 1.5 times, and an increase in the specific number of personnel - more

than 2.5 times. In addition, a reduction in the commissioning of generating capacity was noted.

Among the main reasons for the decline in the economic efficiency of the electric power industry are the lack of an optimal industry managerial system in the context of numerous owners of electric power facilities, as well as a sharp decline in the scientific and technical potential of the industry sector.

In this regard, it is planned to develop intelligent systems in the electric energy transmission and distribution systems. It is planned to create demonstration and pilot plants, as well as use of standard RES-based projects. There is also a direct dependence of the electric power industry development on the advanced development of the power engineering industry.

Energy from renewable sources can be used for electric energy production, heating, and hot water supply, as well as fuel and energy resources, that is, in all areas where traditional energy products are used (Table 1).

Table 1. Use of alternative energy: the advantages and disadvantages

Kind of energy / Utilization	Solar	Wind	Hydro	Bio	Geothermal
Electric energy production	+	+	+	+	+
Heat production	+			+	+
Transport sector	+			+	
Advantages	Accessibility, renewability, ecological compatibility				
	The durability of power units	Occupy relatively little space	Power regulation, ease of operation, cheapness	Waste recycling	High heat transfer
Disadvantages	High cost, dependence on climate, need for territory	Noise pollution, dependence on climate, need for territory	Dependence on climate, flooding of the territory	The need to use generated heat near the source of energy production	

Solar cell panels are used for heating and ventilation of buildings, as well as electric energy production. Wind power has recently been increasingly used to generate electric energy. Hydropower is aimed at generating electric energy, as well as is an integrated water management system which solves the problems of water supply to the population and industry, water transport, irrigation, fisheries, recreation, etc. Bioenergy products are used as fuel in all aggregate states to generate heat and electric energy aimed at meeting industrial and domestic needs in energy, as well as used in internal combustion engines of vehicles. Geothermal energy can be used for power generation, hot water supply, and heating of premises.

The use of alternative energy in the transport sector should be singled out because it accounts for a significant proportion of fuel and energy consumption, as well as since the operation of vehicles has significant impact on the environment.

Among the outcomes that may result from implementation of projects based on the Smart Grid and Green Economy synthesis, it is necessary to distinguish the reduction of peak loads and energy losses in electrical networks, improving the reliability of power systems and energy utilization efficiency, reducing the adverse impact of energy facilities on the environment, and the like.

The business processes' management in the industry is an integral part of the proper functioning of the intelligence network. These trends include the expansion of the territorial location of energy facilities, improving the quality and efficiency of services, reducing the cost of enterprises, ensuring modern energy efficiency requirements, and the transition to new energy industry functioning models.

The rapid development of innovative information technologies also has important impact. This concerns constantly increasing computing power, growing bandwidth and quality of communication channels, rising importance of mobile devices, using automated information and measurement systems of commercial energy accounting, emerging software solutions that enable to meet modern requirements and improve efficiency, the quality of analytics and accuracy of accounting, integrating information systems horizontally and vertically, emerging possibilities of rapid cooperation with adjacent systems, growing speed and amount of information processing, as well as ensuring its protection.

Thus, there is no doubt that improving the efficiency of small and medium-sized entrepreneurship in the energy sector can be carried out using high-performance smart systems of information processing and energy process control.

3 Review of Global Trends in the Energy Projects' Development Based on RES and Smart Grid

In recent years, the proportion of alternative energy in the world is constantly increasing. As of early 2018, almost a third of all electric energy is generated by RES. However, most of it, about 18-20%, accounts for hydropower plants of various capacities. In 2017, the amount of electric energy generated from RES in Europe exceeded the energy generation by coal-fired thermal power plants. In 2017, more than 100 GW of solar power plants were put into operation for the first time ever, while, according to forecasts, in 2018 this figure will amount to 106 GW. According to Bloomberg New Energy Finance, already in 20 years, more than half of the electric energy will be produced using renewable sources. At that, the proportion of solar and wind energy will be about 34% [7].

Due to the impossibility of further economic development along resource-intensive trajectories, as well as under the pressure of the global energy and environmental crisis, today, the leading countries of the world have already actually moved to the implementation of an energy-saving model of economic development, which is the basis of the resource-saving type of social reproduction. This is evidenced, in particular, by the annual turnover of the green economy, which reaches more than 300 billion Euros in the European Union (3% of GDP), employing about 3.4 mln people; while 25% of total investment capital is invested in the development of clean technologies.

China is the undisputed world leader in the use of renewable energy. China produces 50% of all solar panels in the world. In 2017, China commissioned solar power plants with the total capacity of 46.7 GW. Now the proportion of renewable energy in China has exceeded 25% taking into account hydroelectric power plants. During the year renewable energy facilities have generated 1.7 trillion kWh of electric energy.

Germany is one of the undisputed leaders of alternative energy in Europe. The total capacity of solar and wind power plants is close to 100 GW, while private households account for about 40% of the capacity, and about 10% account for farmers. In Germany, every 12th citizen owns an alternative power

generating facility. Here, the type of property such as solar cooperatives is actively developing. Owners of solar and wind power plants are combined into a common mini-grid to ensure the sustainability and continuity of electric energy generation. The proportion of alternative energy in Germany exceeds 25%.

In 2017, the proportion of alternative energy in the UK increased by 5%, reaching 30%. In total, in recent years, the green energy generation accounts for about 55% of all electric energy produced. However, this includes the performance of nuclear power plants, though their proportion in electric energy production is constantly declining, while solar and wind power plants are increasing their total capacity.

Despite the fact that the proportion of alternative energy in Australia is yet 3-4%, this country is one of the world leaders in the pace of solar energy development. Each year, the capacity of solar power plants is almost doubled. Especially worth noting is Australia's contribution to the development of hybrid (joint use of solar and wind power plants) alternative energy, as well as the construction of large systems of energy accumulation and storage.
Countries that do not lack traditional sources of energy are also engaged in the development of alternative energy. For example, the UAE plans to invest about 50 bln USD in the construction of solar power plants. Iran, considering the possibility of building a 2 MW solar power plant, has already signed a delivery contract on solar panels with the Norwegian manufacturer.

Today, in most advanced countries worldwide, more and more attention is paid to the implementation of Smart Grid technologies in the power industry as the basis for future energy industry development. In this regard, the international energy practice initiated the development of innovative renewal concepts of the electric power industry, which is based on the following initial provisions:

1. Comprehensive modernization of the concerned power industry sector, including all its elements, such as power generation, dispatching, transmission and distribution, sales, and energy consumption.
2. The power grid (all its segments) is considered as a key object to create a new technological basis for the functional properties development of the power system.
3. The energy system is developing as an Internet-type infrastructure to form relationships between all energy market players and other stakeholders in the field of energy, information, economy, and finance.
4. The concepts' creating process includes the broad range of activities – from preliminary research to transfer of innovations, and is carried out at all tiers of innovative development of the electric power industry, namely, regulatory, technological, technical, organizational, managerial, and information levels.
5. The development and implementation of concepts and appropriate programs for the implementation of smart technologies are innovative in nature and give impetus to the transition to a new technological structure in the power industry and the economy in general.

The central position among the energy-efficient developments is occupied by Smart Grids, which are automated self-regulating power systems based on advanced information technologies, and capable of making energy supply more reliable, while energy consumption – more economical, providing maximum restriction of adverse impact on the environment.

In the world energy sector, there are different interpretations of the Smart Grid concept. Generally, Smart Grid is an electric network based on modern innovative technologies and equipment, which effectively coordinates and manages the operation of all connected objects, namely, various systems of power generation, transmission, and distribution of electric energy to consumers in order to create an economically viable and stable power system with low losses and a high level of reliability and quality of energy supply.

It follows from the conducted review that, first of all, Smart Grid is interpreted today all over the world as a concept of innovative renewal of electric power industry, which allows using the latest technologies, tools, and methods to significantly improve the efficiency of energy systems.

At the global level, the Smart Grid concept combines a number of modern trends and technologies, which include:

- control of electrical and energy consumption systems, such as intelligent control systems at centralized and distributed power generation, including alternative energy sources;
- power distribution automation systems for medium and low voltage systems;
- smart metering, i.e. smart system technology for accounting and settlement, as well as load control mode;
- customer information and billing systems in the field of energy supply and public services;
- electric vehicle charging systems, and the like.

In order to improve the efficiency of energy resources and reliability of the power grid complex during the global economic crisis, the initiative for the Smart Grids development was supported by the governments of several countries. The EU countries, USA, and Canada have stepped up work in these areas with priority implementation of the two main components of the Smart Grid concept: flexible alternating current transmission systems (FACTS), and voltage regulation, as well as the system of smart multitariff metering on energy consumption (Smart Metering).

The implementation of the Smart Grid concept should take into account the requirements of all stakeholders, namely, the state, generating, network, and energy supply companies, consumers and equipment manufacturers, etc.

In accordance with this, the core values of the new electric power industry are defined as follows:

- availability, i.e. providing consumers with energy meeting the required parameters;
- reliability and quality of power supply;
- efficiency, i.e. optimization and differentiation of tariffs for energy supply with simultaneous reduction of system-wide costs for electric energy production and distribution;
- efficient use of all types of resources and technologies in electric energy production, transmission, distribution, and consumption;
- reduction of adverse impact on the environment.

Achieving the above goals in the framework of the Smart Grid concept is based on the following core approaches:

1. Taking into account the needs of all participants and customer-oriented approach. Decision-making on the electric power industry development and activities is carried out by balancing the array of participants' interests in terms of their expected benefits and costs, where the consumer is also an active participant in the process in the context of the independent formation of conditions for the amount of energy received, the nature of energy properties, and the quality of energy services.
2. The increasing role of automated control in power systems and energy consumption modes with improved control of individual elements and the power system in general.
3. Transforming information links into the main element that provides the transition from the energy system to a qualitatively new energy information system.

At that, information is the main means of optimizing management.

The following functional properties of the electric power industry are developing within the framework of Smart Grid concepts:

1. Self-repair in case of emergency damage. The power system and its elements constantly maintain their technical condition at the required level through the identification of risks, their analysis and the transition from the perturbation-based management to the prevention of emergency damage to the power grid elements.
2. Encouraging active actions of the end consumer.
3. Ensuring the stability of energy supply and quality of energy in all price segments; transforming a system-oriented approach into the customer-based approach.
4. Ensuring a variety of power plant and energy storage types (distributed generation), as well as optimal integration of generating and storage capacities into the power system, connecting through standardized technical connection procedures, and implementing microgrids at the consumer level.
5. Expanding power and energy markets to include end-users. Free access to the energy markets of an active client and distributed generation.

Smart meters as the main element of the Smart Metering system are an economical means for obtaining reliable information, enabling power systems and pricing authorities to widely introduce differentiated tariffs for energy consumption depending on the time of day and time of year, and to monitor and manage energy consumption through stimulating tariff design, thus ensuring rational use of energy resources.

In general, Smart Grids combine elements of traditional electric power industry and the latest electric power technologies, as well as Wide Area Control Systems (WASS) and Wide Area Monitoring Systems (WAMS), information technology and communication tools, smart measuring systems, including Smart Metering, Dynamic Grid Management, energy flow management systems (FACTS), demand response, increased security, and reducing energy costs.

It should be emphasized that the implementation of Smart Grid technologies will facilitate the integration of RES into the electric energy grid.

4 Assessment of the Structure and Development Trends of Green Energy Projects in the Russian Federation

According to Bloomberg New Energy Finance data, the total installed capacity in the Russian Federation for all types of energy generation is at the level of 225 GW, of which alternative sources amount to just 1%, namely: biomass (0.6%), small hydropower plants (0.3%), wind energy, solar power, and geothermal sources (0.1%) [7]. It should be noted that the Resolution of the Russian Federation Government of May 28, 2013, No 861-p assumes that by 2020 the proportion of green energy in the wholesale market will be about 6 GW, that is 2.5% (Figures 1 and 2).

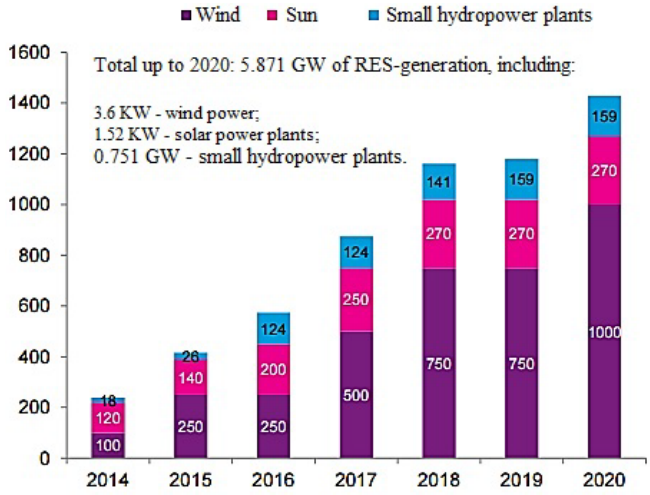

Figure 1. The target amount of RES capacity commissioning in the Russian Federation, MW [8]

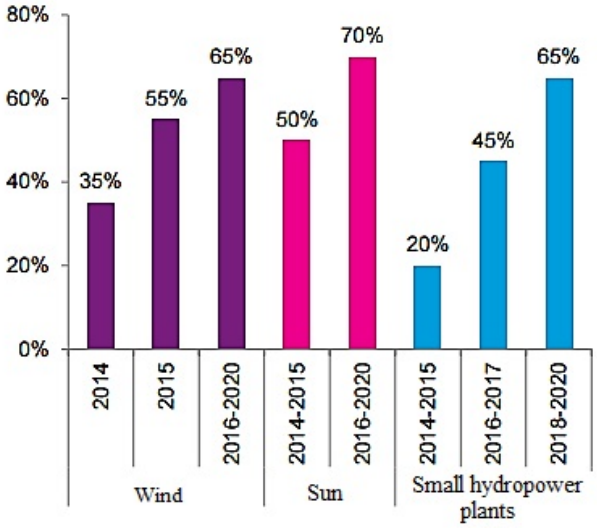

Figure 2. Target localization of RES objects in the Russian Federation, % [8]

The current Russian renewable energy production potential is shown in Table 2.

Table 2. Russian renewable energy production potential [9]

Types of power plants	RES potential, bln kWh		
	Technological capacity	Economic capacity	Industrial capacity
Hydropower plants with capacity <25 MW	372	205	6-10
Wind power plants	6,517	32,6	70-90
Geothermal power plants	34,905	335	40-60
Biomass-based thermal power plants	412	203	90-130
Tidal power plants	253	61.6	16-45
Solar power plants	2,714	435	5-10

In accordance with the major public policy in the field of energy efficiency, Russian government plans to increase the proportion of RES in the production and consumption of electric energy in Russia from 1.5% in 2010 to 2.5% in 2015, and to 4.5% in 2020 [10].

At that, in fact, competition is noted only among the objects of solar generation. In particular, in 2014, 33 investment projects on solar power engineering with the total planned capacity of 505 MW were selected. Among them, 5% of capacity were commissioned in 2015, 8% - in 2016, 31% - in 2017, and 56% - in 2018. The average amount of capital investment as of 2015 reached 78 thousand rubles/MW [10]. The projects were implemented in Russian regions with increased solar activity, namely, the South of the country and Siberia.

In accordance with the limited capital investment and installed capacity targets given in the Russian Federation Government Resolution of 28.05.2013 No. 861-R, the amount of investment in renewable energy facilities by 2020 will have to exceed 480 bln rubles. At that, it is planned to invest in the wind energy facilities about 230 bln rubles, in the solar energy facilities – more than 150 bln rubles, and in a small hydro generation – more than 100 bln rubles [11].

At first glance, the expected increase in the number of RES seems rather insignificant. As of the current date, the proportion of alternative power engineering in the energy balance of Russia does not exceed 1.5-2%. However, in case of effective implementation of the state program, a fairly serious basis will be formed for the further development of high-intelligence energy projects based on renewable energy and Smart Grid that will give an additional impetus to the development of small and medium-sized businesses in this industry sector.

5 Analysis of Existing High-Intelligence Projects in the Field of RES and Smart Grid-Based Power Engineering

Greenpeace International environmental organization suggests in its report entitled "Energy revolution: The path to Russia's energy security system" quite an ambitious scenario for the development of alternative energy in the Russian Federation. The report is based on the review of international documents and recommendations of scientists of the UN Intergovernmental Panel on Climate Change (IPCC). According to the Greenpeace scenario, available and cheap hydrocarbon resources will be exhausted in the coming decades. [12]. The report contains proposals to reduce carbon dioxide emissions in the Russian energy sector by 78% by 2050 compared to 1990 and the abandonment of nuclear energy by 2030. As specified in this report, in order to reduce carbon dioxide emissions to the required level, Russia will have to make maximum use of energy efficiency and renewable energy. In the production of electric energy, the proportion of renewable sources should be 18.5% (including large hydropower plants), while in heat supply - about 2% [12].

The proportion of RES in thermal power engineering will exceed 68% by 2050. Centralized heat supply will be largely replaced by geothermal energy, biomass-based energy, and solar collectors. Since 2020, the role of electric vehicles will increase. By this time, the proportion of primary energy produced by RES will reach 14%, while by 2050, about 57% of primary energy will be produced based on alternative energy sources.

According to the data for 2017, in the Russian Federation, there were up to 20 wind and 20 solar power plants, of them more than 50% were built in the Crimea (isolation of the energy system of the Peninsula is an objective explanation for this fact). More than 60 solar and 12 wind plants were at the design and construction stages.

The report presented by the National Rating Agency notes that according to the data of 2013-2015, the results of the competitive selections indicate that the development of RES projects in the Russian Federation is uneven: the most actively implemented projects are based on the photoelectric conversion of solar energy. At the same time, the target parameters of state programs envisage percentage of wind energy generation equal to 60%, while the percentage of small hydro generation (up to 25 MW) is 13% of the total energy generated from RES [13]. Other types of alternative energy have not been widely reflected in policy documents, while statistics are not available at the sectoral level. At the same time, one can mention some cases of effective implementation of projects in the segments of geothermal and biofuel energy.

According to data for 2018, Russia is implementing two major projects in the field of green energy, which are Orskaya Solar Power Plant named after A.A. Vlaznev and the wind farm in the Ulyanovsk Region.

Describing RES projects in terms of energy efficiency, one can highlight the following advantages of their application:

- performing an innovative role in the highly intelligent development of the national economy and energy;
- saving financial and natural resources and serving as a highly profitable source of capital investment in the future;
- providing opportunities to improve national and regional energy security;
- reducing harmful emissions into the environment;
- solving large-scale problems of traditional energy markets distribution and transformation.

Thus, renewable energy has become in the last decade a dynamic segment of the Russian energy market, which plays a compensatory role in total energy consumption. The key factors of its development are a significant reduction in the cost of technology development in this area, an increase in the level of environmental taxation of the business sector, and large-scale government support of energy efficiency projects.

6 Development Prospects of Small and Medium-Sized Entrepreneurship in the Field of Energy Efficiency and Energy Saving

For an individual enterprise, improving energy efficiency should lead to a decrease in the proportion of fuel and energy in the cost of products and services, as well as increase profitability, competitiveness and, as a consequence, the market value of the company.

The main measures aimed at improving energy efficiency are the implementation of effective technologies, modernization of equipment, reduction of energy intensity of technological processes, replacement of traditional fuels with alternative ones, etc.

Energy efficiency of enterprises is influenced by a number of external and internal factors:

1. External factors:
- state tariff policy in the energy resource sector and their final cost;
- state fiscal policy in energy saving;
- energy supplier policy;
- availability of energy supplier infrastructure;
- regulatory rules in the field of regulation and energy consumption audit.

2. Internal factors:

2.1. Investment opportunities of the enterprise:
- indicators of the enterprise's financial performance and financial sustainability;
- the proportion of innovative implementations at the enterprise in energy efficiency;
- the proportion of funds allocated by the enterprise for the implementation of new energy-saving technologies;
- the involvement of enterprise in public and private energy efficiency programs.

2.2 Technological and innovation policy of the enterprise:
- application of energy-saving technologies and equipment;
- energy rating and metering system at the enterprise;
- energy audit;
- the proportion of production of energy-intensive products;
- involvement in energy saving programs;
- the degree of utilization of secondary energy resources;
- production of energy resources by own/local energy sources.

2.3. Personnel Policy:
- staff incentive towards energy efficiency and energy saving;
- personnel qualification in energy saving;
- encouraging suggestions for saving fuel and energy resources through the wages fund, and other ways of the personal motivation of the personnel.

The search for the optimal strategy of the enterprise to save and improve energy efficiency, as well as its implementation and monitoring of the results is called energy management.

Energy management is an activity which allows significantly optimizing the energy inputs and is aimed at ensuring the rational and saving use of energy resources. Energy management at enterprises is regulated by the international standard ISO 500011 and provides for the following sequence of actions to improve energy efficiency:

conducting an energy audit, which involves identifying bottlenecks;
identifying optimal energy efficiency and energy saving measures which can be implemented at a particular facility, taking into account the available budget, and development of a strategy for their implementation;
implementation of the energy efficiency strategy;
monitoring of achieved results and searching (if necessary) for new ways to optimize production processes.

Energy management and its elements (for example, energy audit) can be implemented by SMEs independently or purchased as a third party service.

The main energy saving measures are presented in Table 3.

The compositional application of innovative and organizational measures by the enterprise will provide an opportunity to reach a new level of energy efficiency, thereby increasing the competitiveness of both products and the enterprise in general.
Certain types of energy efficiency and energy saving measures can lead to the optimization of the use of a certain type of resource (for example, replacement of networks, installation of meters), while others will have an integrated effect (thermal insulation leads not only to a reduction in heat supply costs but also to a reduction in the consumption of electric energy by air conditioners).

At the same time, it should be noted that eco-construction is mainly aimed at meeting the needs of domestic consumers. At that, the construction of office centers based on eco-technologies is still an unoccupied niche, which can be of significant interest for both developers and potential consumers (tenants, who are mainly representatives of SMEs).

Table 3. Main energy saving measures for SMEs

Industry sector	Recommended measures
1	2
Agriculture	Organizing an accounting and reporting system on energy costs; Applying waste-free technologies of production, processing, and storage of agricultural products; Equipping existing and newly commissioned livestock and poultry complexes with bioenergy plants to produce organic fertilizers and biogas; Improving the heating system of greenhouses, livestock farms, and poultry plants, drying processes of agricultural products and production waste, utilizing low-potential secondary energy resources.
Service sector	Implementing energy-saving measures to ensure compliance with the requirements of relevant state standards, construction rules and regulations to achieve the established specific indicators of energy consumption; Organizing energy cost accounting and automated energy management in buildings and engineering equipment systems; Using heat recovery equipment in the projects of buildings and structures.
Industry	Organizing record-keeping (including technical record-keeping) of energy and automated management of energy consumption in production processes; Using secondary energy resources for heat and power generation; Implementing energy-efficient production technologies, installing high-performance equipment in terms of energy efficiency; Full utilization of effluent gases heat, the heat from the cooling equipment, heat from spent steam, and the like.

Depending on the financial capacity, structure, amount of current costs and expected benefits, SMEs have the opportunity to choose a strategy to optimize energy costs. At that, measures that do not actually require significant capital costs can be effective. This concerns, for example, the implementation of the green office strategy, which provides for personal responsibility and discipline of each employee, that is, attracts SME employees to save energy resources.

The behavior of employees in the framework of energy strategy chosen by the management plays an important role in controlling energy consumption. At that, the management of the enterprise should take into account that the average employee transfers habits from household energy use to the workplace. Therefore, if an employee is accustomed to the careless use of energy at home, it is likely that the same behavior will be observed in the workplace, especially if he is not a business owner. It is logical that the larger is the business, the more difficult is to manage energy consumption processes and implement the energy saving principles, and thus, the higher is the need to encourage employees to save energy.

7 Opportunities of State Support of SMEs in the Energy Sector Based on RES and Smart Grid

The RES projects in Russia are implemented with the support of the Industrial Development Fund. Besides, such projects can be supported through a special investment contract. Further development of small and microprojects of alternative energy at the local level can be supported under the terms of syndicated lending by means of special project financing societies. Such green foundations can be represented by VetroOGK and NovaVind public companies.

Positive factors in the development of renewable energy projects in the Russian Federation include considerable progress in the development of green energy technology. In particular, the increase in the efficiency of solar cells and the development of storage technologies makes it possible to obtain solar energy even in polar latitudes. This leads to increased availability and cheaper solar-wind power plants, even in the piece version, not to mention combined options. Another development driver is the possibility of using hybrid stations that combine the use of renewable energy and hydrocarbons.

It should be noted that the greatest interest in renewable energy projects is shown, first of all, by nonstate-owned companies. In order to increase their interest and, consequently, increase the amount of investment, the state needs to create an attractive climate for activity in this area. Currently, this is implemented through the mechanism of power supply agreements (PSA). In particular, such agreements allowed attracting an additional 3.6 trillion rubles of private investment to the electric power industry in 2008-2014. As a result, the installed capacity of the country's energy system has already increased by more than 20 GW, and another 7 GW are coming soon. If the cost compensation by the state and the guaranteed purchase of power capacities and electric energy have worked for traditional power engineering, then, as experts believe, one can expect a similar result for the alternative power engineering [14, 15].

The public-private partnership mechanism is another option for cooperation. Today, such cases are rare in Russia and mainly depend on the attitude of regional and local authorities. The most relevant example is the Center for Alternative Energy, which is planned to be created in Khimki near Moscow.

However, small and medium-sized businesses can take the initiative to solve together with the authorities the problem of getting money for green projects. It is enough to agree on the launch of the so-called circulation of green bonds.

The first green bond was issued in 2007. For the first time, such securities were traded on the Luxembourg Stock Exchange in 2016. But as far as by the beginning of 2018, investors have bought green bonds for 384 bln dollars worldwide. As of 2018, the largest amounts of financing for alternative energy have been attracted through green bonds by the USA (82 bln USD), China (48 bln), France (43 bln), and Germany (25 bln). Mainly, the governments of the mentioned states were the issuers of such securities. Note that yet in China the circulation of green bonds is widespread only in five provinces. Among the Eastern Europe countries, Poland has similar experience.

Small and medium-sized entrepreneurs will be wise to cooperate with local authorities to reduce the cost of issuing green bonds, and then to increase investment in renewable energy.

In addition, in the light of the fact that there are prerequisites for the development of RES through venture funds in order to encourage the implementation of renewable energy projects, it is necessary to create attractive conditions aimed at developing high-risk investments in the Russian Federation, as well as to establish a special system of motivation on the part of the state in order to create venture funds and companies. It is necessary also to carry out constant monitoring of the state of affairs in the innovation sector, strengthen the protection of intellectual property rights, and provide adequate information support to venture investors ensuring a high level of quality and reliability of the information provided.

8 Conclusion

In general, it can be argued that alternative energy in Russia continues developing. However, in the short term, the main burden falls on private companies, including SMEs in the energy sector. The state, for its part, should create the most favorable working conditions for them, knowing what benefits it will bring in the future.

According to expert assessment [11], the combined effect for the Russian economy from the renewable energy projects development will amount to 200 bln rubles. At that, over 80 bln rubles will go directly to the budgets of different levels and extrabudgetary funds in the form of taxes, duties, and insurance premiums. Export income will exceed 90 bln rubles, while the environmental costs will decrease by 20 bln rubles. In the field of alternative energy, 25,000 jobs will be created and more than 100,000 jobs will appear in the related industry sectors.

Expected results from the implementation of Smart Grid systems include the following:

- using energy resources more efficiently;
- improving the reliability of power supply, reducing the time of emergency shutdown;
- increasing the utilization efficiency of electrical networks' equipment;
- increasing transit amount of electric energy (up to 40-50%) excluding construction of new grid facilities;
- reducing the cost of electric energy production and energy loss in electric networks;
- activating distributed generation and overall growth of RES application;
- reducing the adverse environmental impact of energy facilities (reduction of CO2 emissions into the atmosphere);
- providing two-way communication with the consumer;
- identifying irrational use and theft of electric power, damage to equipment, as well as reducing the cost of energy resources when implementing differentiated tariffs that is very important and appropriate for SMEs.

In the framework of the implementation of Smart Grid systems' concept and methodology, the requirements of all stakeholders should be taken into account. This concerns the state, generating, network, and energy supply companies, as well as consumers, and equipment manufacturers.

In addition, a synergetic and a multiplicative effect from the development of alternative energy and Smart Grid systems is expected, assuming the impact of this industry sector on the GDP of the Russian Federation through the development of metallurgical, engineering, and electrical industries, as well as power electronics, transport, and telecommunications sectors, information technologies, production of innovative energy-saving building materials, etc.

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