

**Iryna Doronina, PhD in Economics**

*National Academy for Public Administration under the President  
of Ukraine*

## **WORLD TRENDS OF RENEWABLE ENERGY DEVELOPMENT AND THEIR IMPACT ON THE STATE POLICY OF UKRAINE**

Ukraine's energy future requires strong state and political decisions, given that renewable energy is now a fully mainstream element in the global electricity mix. Alongside energy efficiency, renewables are playing a critical role in reducing emissions in the energy sector and in end-use sectors. The purpose of the article is to identify the global trends in the development of renewable energy and to analyze their impact on the formation of state policy aimed to stimulate the development of renewable energy in Ukraine. The high goals, backed by appropriate governmental measures, allow renewable energy to fully realize its potential in response to extreme weather and global development imperatives.

**Keywords:** renewable energy, incentive tariff, sustainability, state regulation, state policy.

**Introduction.** According to the results of the REN 21 Global Report: “Renewable energy is an essential element of the global electricity generation structure that supplies more than a quarter (26%) of global electricity production»<sup>1</sup>.

In many regions, new renewable energy sources (hereinafter – RES) are the cheapest and most efficient way of providing electricity. Throughout the world, renewable energy has spread through replicated and reliable technologies, as well as through effective government support. This was primarily facilitated by: the increasing price competitiveness of RES technologies; policy initiatives that stimulate the development of the sector; the need to address energy and environmental security; policy initiatives that stimulate the development of the sector; growing energy demand in both developed and developing countries; the need to make modern energy accessible; open access to financing. All these factors have become an effective impetus for the emergence of new RES generation markets in all regions of the world. One of the main goals for the 21st century is building the sustainable energy future.

The promising development of renewable energy in Ukraine requires the provision and legislative support of favorable conditions for the development; increasing its investment attractiveness, through the mechanism introduction of economic incentives for energy efficiency of economic activity; implementation of appropriate competitive technologies and technological solutions for improving energy efficiency in the use of RES and the reduction in the cost of energy facilities, creating a certification and regulatory framework for all areas of RES development, implementing the economic incentive policy of the state through the formation of appropriate mechanisms of state regulation.

The energy future requires decisive government and political decisions, as renewable energy does not compete on an equal footing with fossil fuels and nuclear power, which is **the problem of the research**.

**The purpose** of the article is to identify the global trends in the development of renewable energy and to analyze their impact on the formation of state policy aimed to stimulate the development of renewable energy in Ukraine.

**Global trends in renewable energy.** Renewable energy plays an important role in responding to both the global climate situation and the global need for development by providing affordable energy services and improving energy security. The current world achievements of RES in electricity have shown that energy transition is possible, and in Ukraine as well. In 2018, the growth of renewable energy in the world was supported by a combination of targeted state policy and advances in energy technology.

Many countries are gradually abandoning fossil fuels in favor of renewable energy. According to estimates by Bloomberg energy experts: “the total energy capacity of all solar and wind power plants

<sup>1</sup> REN21's Renewables (2019). *Global Status Report. Perspectives on the global renewable energy transition*. <[https://www.ren21.net/wp-content/uploads/2019/05/gsr\\_2019\\_perspectives\\_en.pdf](https://www.ren21.net/wp-content/uploads/2019/05/gsr_2019_perspectives_en.pdf)> (2019, December, 11).

in the world for the first time exceeded a terawatt (1 trillion watts). It took about 40 years and \$2.3 trillion in investment”<sup>1</sup>.

In 2018, 135 countries applied a regulatory policy on RES in electricity, namely through preferential systems and quotas. For comparison, in 2010, this policy was only applied in 75 countries. Almost all EU member states apply different support models at the same time; one or two models are the main ones for the country. In many cases, preferential systems are complemented by other policy instruments, such as investment grants.

The strategic vision of governments, investment in research and development, as well as an industrial strategy have made it possible to reduce global spending on renewable energy technologies and attract private sector funding. Given the success of innovative countries (USA, EU countries (Sweden, Austria, Finland, Germany, Portugal, Spain), Japan, China), renewable energy technologies, along with effective integrated policies and business models, have spread worldwide.

With the right market conditions and policy frameworks, renewables can help countries anywhere in the world provide reliable electricity services, improve energy security and reduce harmful emissions.

Research shows that targeted government policy is essential to support the industry by enhancing the cost-effectiveness of technology, deploying new market models and promoting advances in new technologies, especially with cross-industry potential. A well-considered state-of-the-art approach to renewable energy and energy efficiency is one of the key success factors.

The 2018 REN21 study states that “countries should move from the electricity transition to the energy one”<sup>2</sup> because most of the energy is consumed for heating and cooling as well as transporting. Electricity accounts for only around 17% of worldwide energy demand, so there is an urgent need to decarbonise heating, cooling and transport as well. Whereas renewables supply more than 26% of global electricity production, they provide only 10% of the energy used for heating and cooling, and just over 3% of energy use for transport. In addition, the policy effort focused on these sectors has been insufficient compared to the power sector. As of 2018, only 20 countries had regulatory policies for renewable heat and 70 countries had mandates for renewable transport, compared with 135 countries that had regulatory policies for renewables in the power sector.

Instead, the 2019 REN21 study states, “Countries should move from the electricity transition to the transformation of energy systems”<sup>3</sup> (Fig. 1). Transformation of the grid requires the promotion of a renewable energy policy in all sectors and the elimination of fossil fuel support.

The inter-sectoral use of RES in heating, cooling, and transporting is a must for decarbonisation, as the history of the electricity sector has shown that ambitious goals and a comprehensive sustainable policy are key to increasing the use of RES. With the support of proven technologies, the creation of favorable political conditions and a balanced public policy in promoting cross-sectoral integration, RES will be able to reach its full potential in all sectors.

The development of RES contributes to the synergistic effect in all sectors of the economy, since the balanced use of RES will add to the effective development of the country’s economy. However, such effects are not taken into account in market prices for electricity generated from RES, which makes it impossible to develop renewable energy without government support.

To stimulate the growth of renewable energy in the world, a number of measures have been identified, including:

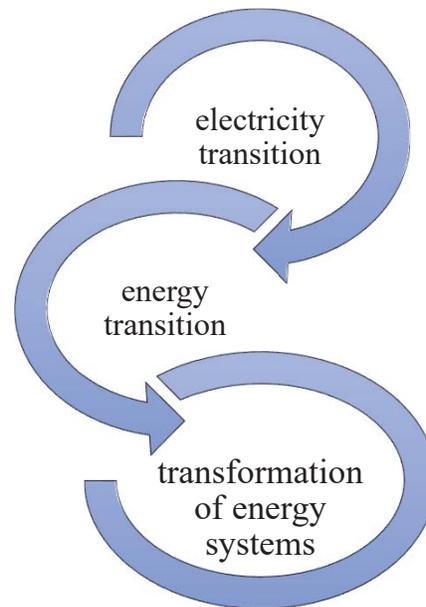
- ensuring the formation of market conditions that will allow investing confidently in the industry and will enable large energy consumers to integrate renewable energy sources into their decarbonisation strategies;
- implementation of an effective RES policy in cross-sectoral application (in the areas of heating, cooling, and transporting);
- harmonization of regional, national and sub-national policies;
- implementing a policy to ensure energy efficiency measures while facilitating the implementation of RES technologies;

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<sup>1</sup> Українська асоціація відновлюваної енергетики (2014). *Реформування відновлюваної енергетики – крок до енергетичної незалежності України* <<https://uare.com.ua/novyny/24-vitroenerhetyka-praktychni-aspekty-i-perspektyvy1-5.html>> (2019, December, 17).

<sup>2</sup> REN21’s Renewables (2018). *Global Status Report. Renewable energy policy network for the 21st century*. <<https://www.ren21.net/wp-content/uploads/2019/08/Full-Report-2018.pdf>> (2019, December, 10).

<sup>3</sup> REN21’s Renewables (2019). *Global Status Report. Perspectives on the global renewable energy transition*. <[https://www.ren21.net/wp-content/uploads/2019/05/gsr\\_2019\\_perspectives\\_en.pdf](https://www.ren21.net/wp-content/uploads/2019/05/gsr_2019_perspectives_en.pdf)> (2019, December, 11).



**Fig. 1 Movement to transformation of energy systems**

- support for job creation and re-qualification of labor resources;
- ensuring public recognition and stimulating public interest in the use of renewable energy sources.

United Nations Strategic Course on Sustainable Energy, the Kyoto Protocol's Clean Development Mechanism, the PRC's Energy Security Concept, the US Energy Strategy 2014-2018 and the European 2020 Strategy emphasize the critical importance of reducing atmospheric emissions and increasing the efficiency of use of fuel, increasing the share of renewable energy in the energy balance.

However, the relatively high cost of green energy has always been a deterrent. Political will and state support are needed to refocus the energy strategy on the use of renewable energy sources. The specificity of renewable energy, at least at the start-up stage, is the need for long-term large-scale investment in relatively high payback projects. Traditionally, state support mechanisms are used to increase investment attractiveness, such as: special preferential tariffs, higher than average market prices for electricity, tax, customs privileges, privileges for connection of objects to the electricity grids, as well as the so-called quota mechanisms, including renewable energy portfolio standards and green certificates.

Effective policies range from building energy codes to renewable energy incentives and mandates, as well as indirect approaches such as carbon taxes; however, these policies remain under-utilised on a global scale.

In most EU countries (20 out of 27), today, green tariffs are used as a major and effective tool for stimulating the development of renewable energy. 93% of the installed capacity of wind power plants and 100% of solar power plants were commissioned due to reduced fare. The implementation of the “energy turn” (Energiewende) of Germany began with the introduction of a “green” tariff for solar power plants at the level of 57 euro cents per kWh.

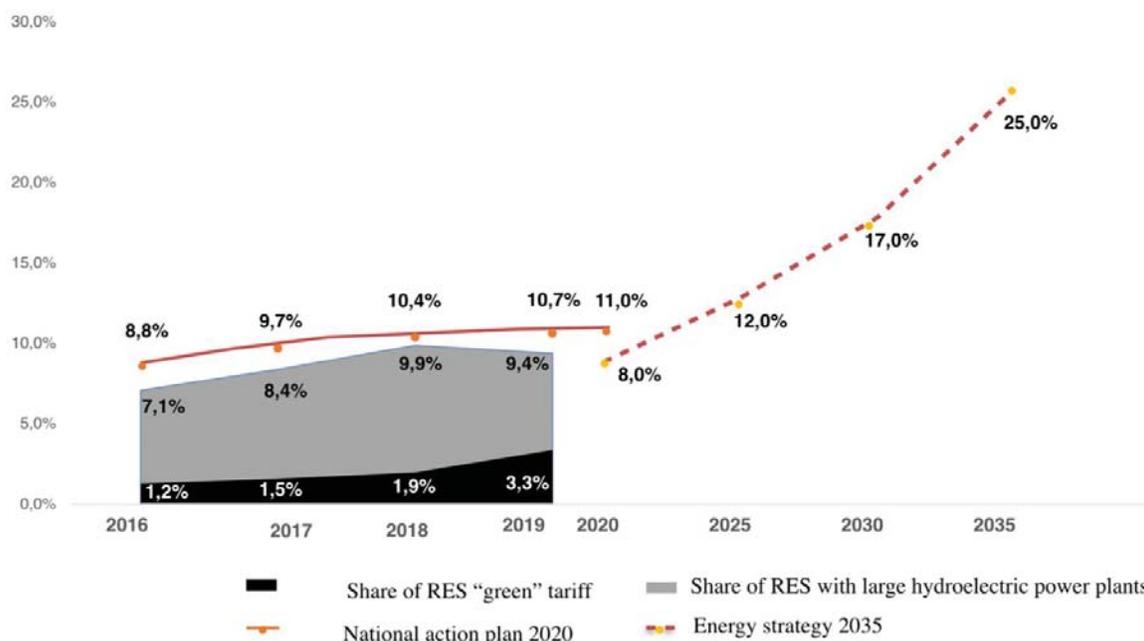
Powerful incentives are reflected in the dynamics of the sector, with 114 MW of installed capacity in 2000 converted to 36 GW in 2013. At the same time, Germany's ambitious goal is to achieve a total share of RES in the country's energy balance at 40–45% by 2025 and 80% by 2050. Conscious refocusing of energy on renewables is a well-thought-out, long-term, future-oriented solution to environmental security and energy independence. The technological advancement of renewable energy is a factor that offsets the cost imbalance compared to the “traditional” one, and in the future contributes to the creation of a competitive, innovative, and promising sector of the economy<sup>1</sup>.

<sup>1</sup> Українська асоціація відновлюваної енергетики (2014). *Реформування відновлюваної енергетики – крок до енергетичної незалежності України* <<https://uare.com.ua/novyny/24-vitroenerhetyka-praktychni-aspekty-i-perspektyvy1-5.html>> (2019, December, 17).

**State Policy for Promoting the Development of Renewable Energy in Ukraine.** One of the priority directions of the development of the state policy of Ukraine is the development of the sphere of the renewable energy use, which is one of the main directions of diversification of energy resources.

By decision of the Council of Ministers of the Energy Community of 18.10.12 No. D/2012/04/MC-EnC, Ukraine has committed itself to the implementation of the Directive of the European Parliament and of the Council 2009/28/EC on the promotion of the use of energy from renewable sources.

In pursuance of this decision, the Decree of the Cabinet of Ministers of Ukraine No. 902-p of 01.10.2014 approved the National Renewable Energy Action Plan for the period up to 2020, according to which Ukraine needs to achieve the share of energy obtained from renewable sources in final energy consumption in the year 2020 at the level of 11%. However, as of 2019, the achieved level was only 3.3%, and together with the hydroelectric power plants it comprised 9.4%. In 2017, Decree No. 605-p “On approval of the Energy Strategy of Ukraine for the period up to the year 2035 “Security, Energy Efficiency, Competitiveness” was adopted, in which the forecasted indicators for the development of RES had been adjusted. The real and projected share of RES in the energy balance of Ukraine is presented in Fig. 2.



**Fig. 2. The real and projected share of RES in the energy balance of Ukraine**

One of the most influential mechanisms for stimulating the development of renewable energy is the use of a “green” tariff for electricity produced from renewable sources.

The Law of Ukraine “On the Electricity Market” No. 2019-VIII of April 13, 2017, provides for the possibility of concluding long-term contracts for the purchase of electricity produced under the “green” tariff until 2030.

It is also important that the Law of Ukraine No. 2628-VIII of November, 23, 2018 “On Amendments to the Tax Code of Ukraine and Some Other Legislative Acts of Ukraine on Improving the Administration and Revision of Rates of Individual Taxes and Fees” came into force on January, 01, 2019, which outlines the main provisions aimed at promoting the development of the renewable energy sector.

Due to these legislative incentives, in 2019 the total capacity of renewable electricity facilities which have a “green” tariff increased by 68%, and their capacity is about 4,000 MW. However, the high level of “green” tariff (especially the tariff for solar power plants) creates an unnecessary price burden for consumers. Also, the operation of large RES power plants is characterized by dramatically changing modes of operation within the United Energy System of Ukraine, which leads to additional costs for power plant dispatching and maintenance of reserve capacity.

The cost of resolving imbalances translates to consumers. There is also no responsibility of RES companies for their imbalance. The average error of forecasting of electricity generation in the day ahead (SES and WPP) in Ukraine is 35%; for comparison, in Denmark this indicator is approximately 5%. An increase in the share of RES with a “green” tariff in the energy balance significantly increases the total cost of electricity. The share of RES in the cost of electricity is presented in Fig. 3

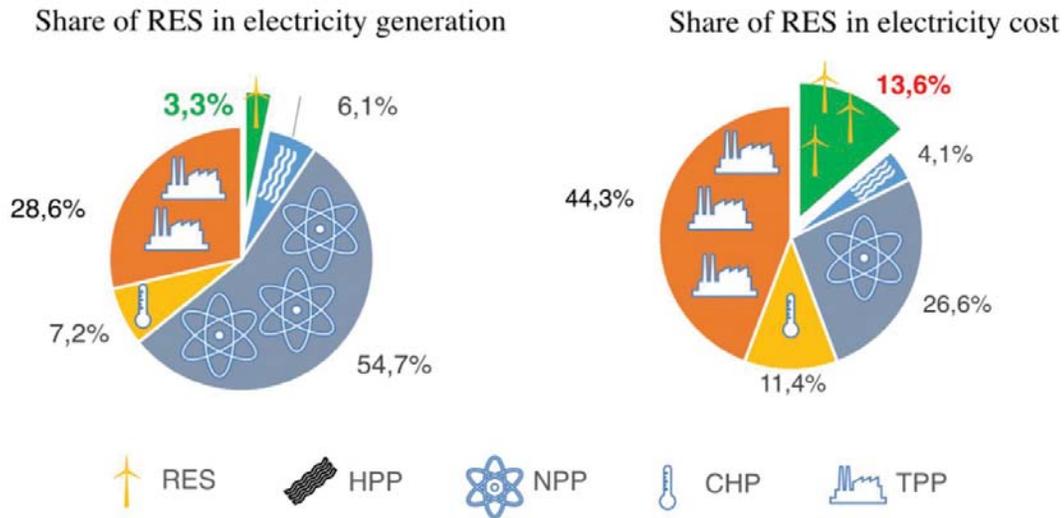


Fig. 3. Share of RES in electricity generation and cost in 2019

In our opinion, the adoption of the Law of Ukraine “On Amendments to Certain Laws of Ukraine on Ensuring Competitive Conditions for Generation of Electricity from Alternative Energy Sources” No. 2712-VIII of 25 April 2019 is an important step towards improving the state policy on the development of renewable energy in Ukraine, as it foresees the transition from 2020 to a new auction system for the promotion of renewable electricity. The main purpose of the auctions is to set a market price for “clean” electricity and reduce the financial burden on consumers. The first auctions are scheduled for March 2020.

It is also worth noting that according to the annual report “Climatescope” by Bloomberg NEF, Ukraine has risen to 8th place in the rating of investment attractiveness of “clean” energy among developing countries. The top seven countries in the ranking are India, Chile, Brazil, China, Argentina, Jordan and Kenya<sup>1</sup>.

The potential for new big investors to enter the market could be a new driver for the sector’s growth.

An effective state policy to stimulate the development of renewable energy in Ukraine should be in line with global trends and should include the following goals, including:

- creation of favorable conditions for the development of renewable energy, diversification of energy resources, optimization of energy balance;
- providing conditions for the formation of a competitive electricity market.
- Ukraine’s fulfillment of its obligations to implement Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources;
- increasing the investment attractiveness of the renewable electricity sector of Ukraine;
- introduction of an effective mechanism for issuing guarantees of origin of electricity for economic entities producing electricity from renewable energy sources.

**Conclusions and prospects for further research.** Reducing the cost and expanding the use of renewable energy technologies, developing electric transport, improving accounting systems, forecasting and accumulating energy, combined with deepening the implementation of decarbonisation policies, will surely influence the reformatting the Ukrainian energy system towards reducing the capacity of traditional generation and increasing the share of RES in the country’s energy balance.

<sup>1</sup> Climatescope by Bloomberg NEF (2019). *Which emerging market is the most attractive for clean energy investment?* <<http://global-climatescope.org/results>> (2019, December, 14).

The positive world experience of RES has shattered myths about the inability to meet global energy needs. Renewable energy technologies have proven reliable and currently provide the cheapest energy generation options. RES generation facilities can also be successfully integrated into the grid. With many years of active support, technology, rapid growth, and dramatic reductions in solar photovoltaic and wind power costs, renewable electricity is now cheaper in many parts of the world than in newly installed carbon and nuclear facilities; in some places, it is cheaper than in traditional existing operated power plants.

The key to the development of the renewable energy sector in Ukraine is the establishment of a legally guaranteed level of “green” tariff for electricity from renewable energy sources and an obligation to repurchase the entire amount of “green” energy. It is determined that in the presence of proper market conditions and effective state policy, renewable energy sources are able to provide reliable services in the field of electricity supply, improve energy security of Ukraine and reduce harmful emissions. Effective state policy will positively allow attracting investments in renewable energy for a long time.

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