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FEATURES OF THE FORMATION AND IMPLEMENTATION OF THE GLOBAL ENERGY "GREEN" TRANSITION POLICY

The article examines the peculiarities of the formation and implementation of the global energy "green" transition policy. The global trends in the construction of climate-neutral energy are characterized. Features of various models of formation and implementation of energy "green" transition policy in the world are determined. The directions for improving the state energy policy of Ukraine are outlined, taking into account global trends in the formation and implementation of the energy "green" transition policy in the world.

Keywords: *public management and administration, state management mechanisms, energy, state energy policy, energy "green" transition, climate neutral energy.*

Problem setting. Modern processes taking place in the energy sector at the global level have been called the "energy transition" ("energy revolution"), which is characterized by such trends as the transition from fossil energy to renewable energy, the fight against global climate change through the reform of industries and energy spheres, ensuring sustainable development and raising the standard of living of the population due to the efficiency of energy use and reducing its cost due to the use of alternative energy sources, the gradual abolition of subsidies for the use of fossil fuels.

For example, back in 2009, the leaders of the G20 pledged to eliminate inefficient

subsidies for the use of fossil fuels, because the reduction of such subsidies will stimulate investments in energy infrastructure, promote the use of renewable sources and clean technologies, and encourage consumers to make energy-saving efforts. Moreover, the phased elimination of all fossil fuel subsidies by 2030 should contribute to a 10% reduction in global carbon dioxide emissions [8].

Recent research and publications analysis. Scientists such as O. Voloshyn, D. Witzel, G. Golovanov, M. Kolisnyk, S. Maistro and others devoted their scientific publications to considering the features of energy policy formation at the global level and highlighting various models and directions of its implementation in the world [2; 3; 5; 6].

However, many issues related to the specifics of the formation and implementation of the global energy "green" transition policy with the aim of building a climate-neutral energy industry remain insufficiently researched.

Paper objective. The purpose of the article is to determine the features of the formation and implementation of the global energy "green" transition policy with the aim of building a climate-neutral energy industry.

Paper main body. The conclusion of the Paris climate agreement in 2015 caused the countries of the world to develop energy "green" transition plans. Therefore, it is no coincidence that the global share of energy obtained from wind and sun has more than doubled since 2015, when it was 4.6%. On the other hand, the amount of energy from burning coal - the dirtiest fossil fuel for ecology - decreased by 8.3% in 2020. A significant number of powerful economic states - China, the USA, India, Japan, Brazil, Turkey - produce at least 10% of electricity from wind and sun. And Great Britain and the European Union already receive 21% and 33% of energy from renewable sources, respectively. And according to forecasts by the Global Wind Energy Council (GWEC), by 2030 offshore wind energy production could grow worldwide from 29.1 GW in 2019 to 234 GW, with exponential growth expected in the Asia-Pacific region over the next 10 years of this renewable energy sector [3].

By the way, in the report of the International Agency for Renewable Energy Sources (IRENA), it is said that the decrease in the cost of renewable energy sources characterizes

the turning point in the transition to low-carbon energy. In modern conditions, the construction of new solar and wind power plants is cheaper than the operation of existing coal-fired ones. The agency said that more attractive prices for renewable energy compared to fossil fuel electricity generation could help governments take steps to move towards a clean economy. Scientists believe the world needs to make a much faster transition to mitigate the worst effects of climate change as wind and solar power become increasingly competitive. According to the IRENA report, the annual costs of the global energy system could be reduced by \$23 billion if offshore wind and photovoltaic power plants were used instead of the most expensive coal generating facilities with a total capacity of 500 GW. They are mainly located in Germany, India, China, Poland, USA, Ukraine, South Korea and Japan. Such a transition will also reduce global carbon emissions by approximately 5% of total CO₂ emissions in 2019 [1].

In 2021, an energy transition plan was presented in the USA, when President D. Biden signed a decree on the development of "green" energy (Green New Deal). In addition to investments in climate-neutral energy in the amount of \$2 trillion, the mentioned plan envisages achieving 100% "clean" electricity by 2035 [5].

And in 2019, the European Union presented the "European Green Deal" - a program whose main goal is to make Europe climate neutral by 2050. And in modern conditions, the EU's efforts to implement the Single Green Deal are intensifying (Green Deal). Therefore, in recent years, the European Union began to apply the so-called "EU energy diplomacy", the importance of which is growing in the context of reorientation in the conditions of the "new era", which refers to the Green Deal program announced by the EU at the end of 2019, which is translated as the "Green Pact for Europe" or "European Green Course": it refers to the concept of transforming Europe into the first climate-neutral continent of the planet by 2050 [9].

The European Green Deal program set a 30-year task of decarbonizing the energy sector and the economy as a whole, i.e. achieving the abandonment of the use of fossil energy carriers harmful to the global climate, coal, oil and natural gas, replacing them with renewable energy sources (RES) and those produced with the help of ecological

technologies raw materials, for example - for "green" hydrogen.

It should be noted that the European Union needs "strategic patience" when building its new energy diplomacy. SWP experts recommend that the EU prioritize the fight against local environmental pollution, the promotion of "green" projects, electrification, energy system integration when forming energy partnerships, and not immediately demand a reduction in CO₂ emissions or the abandonment of coal use [9].

In general, the leaders of the EU countries reached an agreement to reduce greenhouse gas emissions by 55% by 2030 compared to the level of 1990 and intend to phase out not only coal, but also gas generation by 2030, to replace nuclear power plants, as well as meet the growing demand for electricity for electric cars, heat pumps and electrolyzers due to the development of renewable energy. The shift is due to the expansion of the use of wind and solar energy, the volume of which has almost doubled since 2015, and a fifth of electricity in the EU is produced by wind and solar power plants. Coal-based energy production fell by 20% – coal-fired power stations provided only 13% of the electricity generated in Europe. By the way, the highest shares of wind and solar energy production today are recorded in the following countries: Denmark (61%), Ireland (35%), Germany (33%), Spain (29%) [10].

An important component of the policy of the Single Green Course of the European Union is the so-called "energy transition" in Germany, which involves the transition to a low-carbon economy with the abandonment of nuclear energy.

The plan is based on a policy called the Energy Concept (energiekonzept) published in 2010 and the Renewable Energy Act (Erneuerbare Energien Gesetz, EEG) adopted in 2000. The Energy Transition program has received broad support among stakeholders in government, industry and civil society and provides for the following:

- reduction of greenhouse gas emissions and primary energy consumption;
- achievement of target indicators of energy generation from renewable sources (by 2025, it is planned to generate 40-45% of electricity from RES);
- gradual abandonment of coal generation by 2038 and nuclear energy – by 2022;
- stimulation of measures aimed at ensuring energy efficiency (it is planned to reduce

electricity consumption by 10% by 2020, and by 25% by 2050 compared to 2008) [8].

Germany's "Energy Transition" policy is Germany's plan to transition to a low-carbon economy without the use of nuclear energy, based on the "Energy Development Concept" policy published in 2010 and the Renewable Energy Sources Act (Erneuerbare-Energien -Gesetz, EEG), adopted in 2000, subject to subsequent changes. Its main provisions are the federal government's commitment to reduce greenhouse gas emissions by 80% by 2050 compared to 1990 levels and to complete the phase-out of nuclear power plants by 2022. The Energy Transition Plan provides for 3 main goals that must be mutually compatible and serve as guidelines for the formation of all policy bases in the energy sector: maintaining security of supply, maintaining availability and ensuring environmental safety (according to plans to reduce CO₂ emissions and use nuclear energy) [7].

One of the key elements of the "energy transition" in Germany and the basis of the incentive tariff program is the transformation of the regulatory framework, primarily the adoption of the Renewable Energy Sources Act (EEG), which is aimed at supporting the production of electricity from RES. EEG usage is monitored by the Federal Network Agency. The three main components of the program are obligation to buy, guaranteed fixed prices and a reimbursement system. Local grid operators act as guaranteed buyers, and the EEG provides for guaranteed minimum prices for RES under 20-year contracts with minimal or no investment risk. Before the introduction of the fixed tariff, German incentive tariffs were set at the level of 80-90% of the average cost of electricity, which differed significantly depending on the cost of technologies and installed capacity. However, later, the cost of electricity production, depending on the selected RES and its use in the country, as well as discounts, were added to the tariff in order to stimulate the improvement of the efficiency of electricity production. Currently, Germany is moving away from incentive tariffs in favor of an approach that combines green tariffs with an auction system based on tenders [8].

To ensure the country's energy transition, the Ministry of Economic Affairs and Energy of Germany launched a monitoring process called "Energy of the Future", based on the results of which a monitoring report is prepared every year, which is approved by the

Cabinet of Ministers and submitted to the Bundestag. In addition, an independent commission of four experts in the field of energy provides policy advice and scientific materials. Every three years, the Government prepares a report on the results of the implementation of the transition program for a more in-depth analysis. Electric power industry has become one of the main industries affected by the "Energy Transition". In the first half of 2018, renewable energy caught up with the key source of electricity in Germany – coal. Thus, the share of renewable energy sources in the gross volume of electricity consumption reached 38.2%. In addition, Germany continues the course towards the abandonment of nuclear energy by 2022: the largest nuclear reactors have already been decommissioned without negative consequences for the security of electricity supply. Within the limits of the specified process, problems related to the balancing of networks and the abandonment of coal energy are also revealed, which are solved with the help of appropriate mechanisms of state regulation [7].

Germany's "Energiewende" is a successful OECD best practice example of how addressing these issues can improve the quality of energy strategy implementation. The measures of the "Energy Transition" policy are clearly synchronized with the main energy goals thanks to a four-level methodological structure, which covers: 1) measures; 2) management goals; 3) strategic solids; 4) main goals. First, such an approach ensures the simultaneous consistency and integrity of the energy strategy, while taking into account each individual program measure and the role it plays in achieving the main goals. Secondly, it enables the authors of the policy to form the concept of a logical path of coordination of various components of the energy strategy [8].

To achieve these goals, the Energy Development Concept uses the methodological principle of bottom-up analysis, which consists of 3 interrelated levels, including: 1. Main goals at the strategy level; 2. Management goals; and 3. Measures (laws, regulations and directives, funding programs, etc.).

This multi-level structure helps to gain a clearer picture of the areas where progress has been made towards achieving the main goals and where special attention will be needed. The effectiveness of individual measures is extrapolated from the progress in

achieving the guiding goals in the short term in all sub-sectors and aspects of energy. In turn, these guiding objectives clarify progress toward higher-level strategic goals. The government's biennial report also assesses the impact of policy frameworks on security of supply [7].

Ukraine, the European Union and the entire progressive world are experiencing difficult times today due to russian military aggression against our state. The consequence of this is the extremely difficult situation that has developed in the energy sector, which is associated with constant russian attacks on energy facilities and the energy infrastructure of Ukraine. The mentioned events accelerated the processes of the so-called energy "green" transition, that is, the global processes of building a climate-neutral energy industry were actualized.

Thus, in the spring of 2022, the European Commission presented another plan for the implementation of energy reform - REPowerEU (this Plan is a response to the energy crisis that intensified as a result of russian aggression against Ukraine), which provides not only for ending dependence on supplies of energy carriers from russia, but also measures from energy savings, investment and accelerating the transition from fossil fuels to clean energy.

The International Energy Agency (IEA) 2022 report says the global energy crisis caused by russia has triggered lasting changes that could accelerate the transition to a more sustainable and secure energy system. And IEA Executive Director Fatih Birol said that "the energy world is radically changing before our eyes. The response of governments around the world promises to make this a historic and definitive turning point towards a cleaner, more affordable and safer energy system" [5].

Of course, the changes will not be instantaneous. According to the IEA, global emissions from fossil fuels will peak by 2025, but coal consumption will decline thereafter. Demand for natural gas will reach a plateau by 2030, while demand for oil will decline until the middle of the next decade, before falling sharply [5].

It should be noted that despite the powerful development of wind and solar systems in the period until 2022 (before the russian military aggression against Ukraine), the global

energy turnaround slowed down somewhat, that is, the share of renewable energy sources worldwide remained at the level of more than a decade ago.

Thus, the international network REN21 states in its report at the beginning of 2022 that "the energy turnaround is not happening, despite important measures to stimulate the green economy adopted in many countries. A significant economic boom with a real growth of the gross domestic product in the world by 5.9% contributed to an increase in final energy consumption by 4%, thereby negating the effect of the growth of renewable energy sources" [2].

That is, the global need for energy resources grew faster than the construction of wind and solar parks. At the same time, the lagging of renewable energy from the growth of global energy needs was mainly covered by fossil fuels, which are often subsidized.

And indeed, investments in the production of renewable electricity increased 4 times and reached \$366 billion, and wind and solar energy for the first time reached more than 10% of the share of global electricity needs. However, since the electric power sector accounts for only 17% of total energy consumption, the high growth rates of wind and solar systems are not reflected so prominently in the overall balance. Therefore, according to the data, in 2019, renewable sources covered only 11.7% of global energy demand, which barely exceeds the level of 2009, when their share was 10.6%. At the same time, in the transport and industrial sectors, as well as in the construction and operation of facilities, the use of renewable energy sources generally progressed too slowly [2].

However, according to the executive director of REN21, R. Adib, the Russian invasion of Ukraine led to the strengthening of the energy crisis: "The old energy system is collapsing right before our eyes, and with it the world economy. Therefore, instead of postponing the transition to renewable energy sources, national governments should directly finance the use of renewable energy in socially vulnerable households, rather than subsidizing fossil fuels to lower electricity bills. Despite previous investments, the renewable path will turn out to be cheaper, so it is necessary to increase the share of renewable energy sources and make them a priority of economic and industrial policy" [2].

Therefore, more and more countries of the world set the goal of switching to the

predominant use of "green" energy sources in all spheres of economy and social life, develop their own strategy for achieving this goal, with an appropriate structure, time horizon of implementation, target purpose, certain incentives for implementation, etc. At the same time, responsibility for the future and environmental protection lies not only with the state, government, and parliament, but also with the corporate sector through the introduction of ESG principles (social and environmental obligations of companies). That is, energy companies must implement their development strategy based on ESG principles, that is, integrate the 12 Sustainable Development Goals of the UN into their own development strategy [4; 6].

Therefore, the further development of energy in various countries takes place according to the decarbonization scenario through the implementation of projects (state, regional, city, local, industry) regarding the gradual transition to renewable energy and reducing the level of negative impact on the environment and climate.

Conclusions of the research and perspective of further development in this direction. Thus, the main global trend of today, which is taking place in the energy sector of the leading countries of the world, is the so-called "energy transition", that is, the transition from fossil energy to renewable energy and the fight against global climate change through the reformation of energy industries and spheres in a certain direction. The developed countries of the world have chosen the "green" economy and climate-neutral energy as a strategic vector for their further development. That is why Ukraine, including within the framework of the European integration policy, should join these processes, form and implement the appropriate state energy policy and become an integral component of the aforementioned global changes.

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