CREATING CONDITIONS FOR EFFICIENT ENERGY SUPPLY IN THE UKRAINIAN ECONOMY

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Considerable attention has been paid to the problems of energy efficiency of national economies. This is caused by the steady, and in recent years, rather sharp, rising energy prices. One of the main goals of these studies is to improve the energy efficiency of countries' economies. Research has shown that the value of Ukraine's energy efficiency is 10 times lower than in developed countries. At the same time, energy intensity of Ukraine's GDP is 2.6 times higher than the average value of GDP in the world as a whole.

The total contribution of renewable energy sources to the global electricity production is about 23%, of which 16.6% is hydropower, 3.1% wind power, and 1.8% biomass. The largest producers of energy from renewable sources are the following countries: the USA, China, Germany, Spain, Italy, India and Japan, whose total capacity is 71% of the global figure. It should be emphasized that about half of the world's final energy consumption is from thermal energy, with more than 25% of the demand coming from renewable energy sources, of which: 17% — "traditional biomass", 7% — "modern biomass" and 1% — other modern renewable energy sources. Analyzing the possible scenarios for the development of the bioenergy industry in the world, it is worth noting that most of the profile agencies predict the growth of the share of renewable energy sources in final energy consumption in the period 2030-2050 within 20-35% in total primary energy supply and 35-50% in production. electricity. Total energy supply by 2050 is likely to increase by 20-25%.

Ukraine's energy supply, its place in the global energy market is characterized by the following indicators (as of 2019): explored reserves: oil — 0.02% of the world, 78 place; natural gas — 0.3% of the world, 81; coal — 4% of the world 11th place (in Europe 3rd place); production: oil — 0.1% of the world 71 place; natural gas — 0.6% of the world's 31st place; coal — 0.8% of the world's 14th place; consumption: oil — 0,4% of the world 42 place; natural gas — 1.7% of the world's 16th place; coal — 0.3% of the world (11th place) (World Energy Council, 2018) According to research, the country's potential for energy development is "largely determined by the reserves of major energy sources and the state of 272 ecology. Although the estimates of these values are rather approximate, they do allow us to determine the prospects for the level of energy development, the likely role in this development of different types of energy carriers" [1]. Ukraine can be attributed to the countries with partial support to the FER, whose economy depends on the import of energy sources in the range of 50-65% [2]. The decisive indicator of the level of economic development of a country is its GDP. Comparing it with the annual consumption of fuel and energy resources, it can be established that the higher the GDP of a country, the greater the amount of fuel and energy resources it consumes. Ukraine ranks 55th in the world in GDP (2018) and 14th in the world in terms of energy consumption. This level of inconsistency indicates a high level of energy intensity of the Ukrainian economy. A necessary way of solving this problem is to revise the policy of energy saving, energy efficiency of production. As a significant amount of fuel and energy resources are involved in the industrial production of Ukraine, combined with their scarcity, this causes an increase in the level of imports, an increase in the level of energy dependency and a decrease in the level of energy, and therefore economic and to some extent political security of Ukraine. At the beginning of Ukraine's independence (in the 1990s), the government's measures to reduce the energy intensity of the economy gave positive results (it decreased by 40%); during 2000-2004 — by 30%; and for the years 2005-2013 — only 20% [2]. Despite the positive developments, as of 2018, the energy intensity of Ukraine's economy is 2 times higher than in Belarus and 3 times higher than in Poland. The structure of consumption of fuel and energy resources in Ukraine is still dominated by fossil fuels (oil, coal, natural gas). In structure, as of 2018, it is together at 78.5%. Another component is atomic energy (18.8%).

The potential for energy savings in Ukraine is primarily in the industry (savings according to expert estimates by the International Energy Agency (IEA) make up about 30%). Only reducing the loss of electricity transportation in the distribution networks of Ukraine (15-20%) will give a significant economic, energy saving effect. Another trend is to reduce (by 20-30%) the use of primary energy sources by Ukrainian households.

Ukraine's new energy strategy has three main stages, the result of which is to reduce GDP energy intensity by 2035 by comparison with the current value more than doubled (from 0.28 tones' / thousand US dollars in 2015 to 0.13 (for SCC) in 2035) (fig 1.).

A significant level of dependence of Ukraine on oil refining, gas production and ecology has been observed since the first days of the declaration of independence. The reasons for this are the problems of the need to load refineries, supply gas (and hence increase its import rates) for industry, housing and communal services.

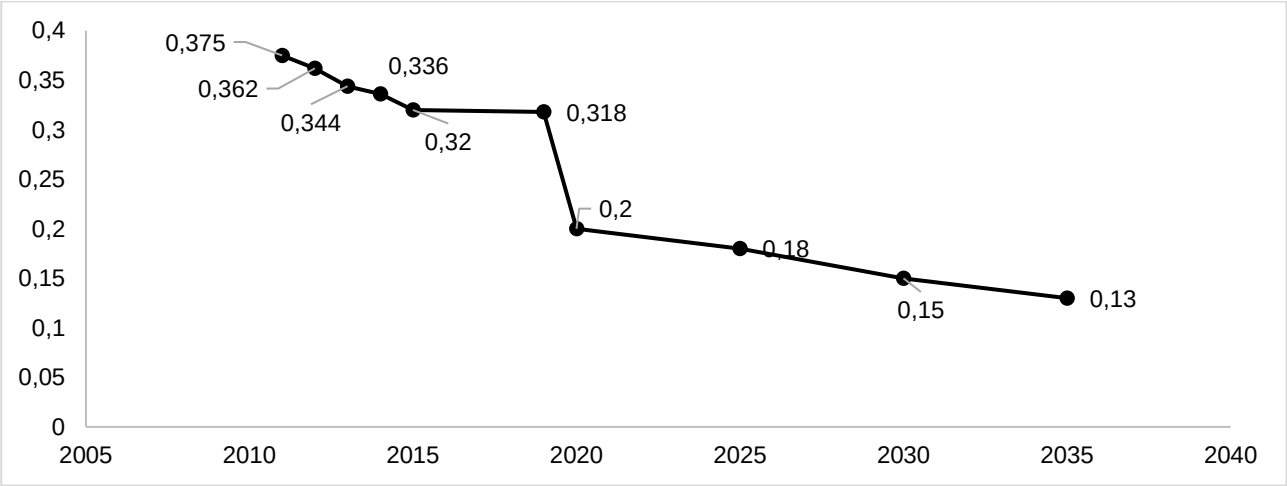

Fig. 1. Projected value of energy intensity of GDP of Ukraine [3]

Estimating the needs for investment resources needed for the development of generating capacities and backbone electric grids of the UES of Ukraine, it was determined that the total investment needs for the period 2016-2025 are estimated at UAH 493.6 billion, including for three years — in the amount of UAH 280.9 billion or 56.9% of total needs (fig. 2).

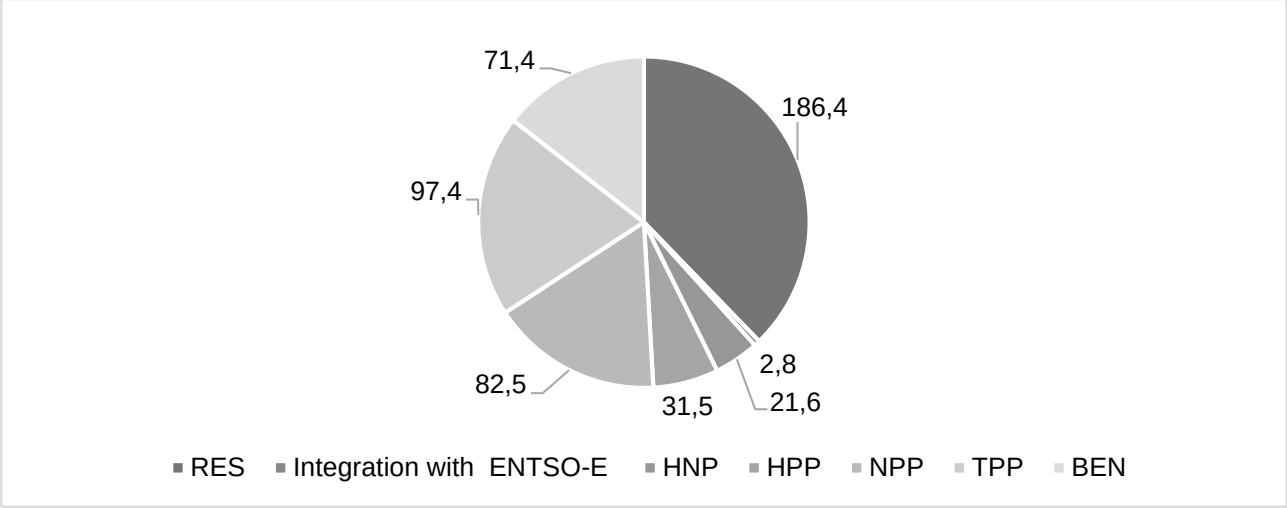

Fig. 2. Structure of necessary investments for the period up to 2025, UAH billion, [3]

Given the Jevons paradox, one should expect a gradual increase in the amount of energy consumed from renewable sources, along with an increase in its production efficiency and a decrease in cost. This is also borne out by The Khazzoom-Brookes postulate that increasing energy efficiency makes energy use relatively cheaper and therefore stimulates energy consumption. Thus, the projected increase in energy efficiency will stimulate the growth of energy consumption by reducing the cost of its use. Increasing energy efficiency of production due to renewable energy sources leads to economic growth, which accordingly increases energy consumption in the country's economy. As a consequence, energy resources become less scarce, which in turn will increase the use of related technologies that have been constrained by resource scarcity. The rapid technological development of renewable energy at this stage demonstrates compliance with Gordon Moor's Law, which exhibits exponential growth in technology over a period of time and is limited only by the atomic nature of the substance [4].

To fulfill all planned obligations of Ukraine in the field of energy efficiency, a framework law "On energy efficiency", a package of by-laws, methodological materials, without which full implementation of EU norms in this field is impossible.

The country's energy complex is being transformed under the influence not only of industry factors, but also of the socio-economic transformation of the country, a factor of security in the face of external aggression.

Therefore, the state policy of Ukraine in the electricity sector should be aimed at: ensuring reliable, uninterrupted, safe supply of electricity; creation of conditions for efficient functioning of the liquid electricity market, its further reform and development; provision of conditions, implementation of measures for development of energy efficiency in the electric power industry, demand management systems, energy substitution, etc.

On the other side of the problem of increasing the level of energy efficiency of the Ukrainian economy, namely the development of energy capacity, determining the cost of producing a unit of energy, you must first consider the potential ways to obtain it from different energy carriers, replacement with various energy-saving technologies. Production costs should be ordered by their level (from the lowest cost to the highest). The cheapest should be preferred. This approach is defined in the Protocol on Energy Efficiency, relevant environmental aspects by defining it as an "energy cycle" (the entire energy chain, which includes activities related to exploration, exploration, manufacturing process, transformation, storage, transportation, distribution, consumption of various forms of energy, recycling, waste disposal, cessation, closure of this activity in order to minimize the level of harmful effects on the environment).

Issues related to the interdependence between the local energy system (which will use renewable energy), the central system and final energy consumers, as well as the development of innovative methods of designing energy installations, devices that use the renewable energy sources, taking into account the specific nature of their system energy supply [4].

The introduction of energy supply systems in Ukraine at the current stage of energy development is appropriate taking into account the innovative in the world of energy Smart Grid concepts, one of which is based on the principles of prediction and main response of the energy system to the dynamics of modes of energy consumers. In particular, when consumers switch to the use of energy from renewable sources (solar, wind, etc.), unpredictable inconvenient load energy systems arise. Because of this, there is a need to improve the security system in the information flows that will come from end-users and inform the load dynamics and enable them to respond in a timely manner (in real time).

The influence of the state should be based on the isolation of four blocks of state regulatory influence on the level of efficiency of functioning of the economy, namely: ensuring the creation of the necessary volume of energy product (services) required by society; the reproduction of funds spent on creating an energy product; production of the newly created value (profit), part of the profit through the system of tax deductions is sent to the state budget for the purpose of providing life support for Ukraine; ensuring extended reproduction and successful implementation of social programs. The said state influence should be carried out in compliance with the principle of state regulation of the energy sphere, which presupposes a stable balance between the imperative influence of the state on energy and freedom in the energy market.

Therefore, it is advisable to carry out the process of designing combined energy supply systems using renewable energy sources in stages: justification of the allowable (critical) amount of costs and the estimated level of economic effect; organizational and technological measures aimed at harmonizing the consumer's readiness to receive / use energy produced from renewable sources; Improvement (upgrading) of existing key elements, devices of the local energy supply system or introduction of innovative technologies, equipment and more. The substantiation of the functional dependence of the sizes of consumption of energy varieties should be laid as a basis when designing the components of the device for automatic control of the smart energy network.

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