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PECULIARITIES OF DIGITAL TRANSFORMATION IN THE PROMOTING CLIMATE POLICY OF ALTERNATIVE ENERGY ENTERPRISES

ОСОБЛИВОСТІ ЦИФРОВОЇ ТРАНСФОРМАЦІЇ У ПРОСУВАННІ КЛІМАТИЧНОЇ ПОЛІТИКИ ПІДПРИЄМСТВ АЛЬТЕРНАТИВНОЇ ЕНЕРГЕТИКИ

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Abstract. *The transition to secondary processing of resources is a way of optimizing natural resource management and an alternative source of energy. The digitization of socio-economic processes affects the transformation of energy market on the basis of climate-neutral economy. Considering this, the article is devoted to identifying the peculiarities of the digital transformation in the promoting alternative energy. The factors of alternative energy production (on the example of biofuels) have been determined. The using of Internet of Thinks programs in the infrastructure is considered. The need of the promoting climate policy in the context of smart energy grids development is identified.*

Key words: *green energy, energy service, renewable energy sources, biofuels, sustainable development, smart grids, digital marketing.*

Introduction.

By 2050 in the US, 80% of jobs will be computerized in the automotive industry, 70% – in the plastics industry, 60% – in security and defense, 45% – in medicine and healthcare, 30% – in the tourism industry, and according to the Brussels European Global Economic laboratories in different countries, regardless of the level of development, 50-60% of professions can be replaced by new technologies [1, p. 8].

In the conditions of digitalization socio-economic development, it is necessary for consumers of energy to have a complex of digital skills. According to the research conducted by LinkedIn Learning to determine the most necessary skills [2], it is identified that along with creativity, collaboration, persuasiveness, emotional intelligence, sales management, affiliate marketing, there is the need to develop skills such as work on blockchain, cloud technologies, artificial intelligence, the use of digital technologies in the implementation of business intelligence, UX design, video content production, etc.

The development of green energy needs to ensure the production of biofuels, an important role belongs to the establishment of territorial cooperation with enterprises supplying raw materials (biomass) by creating regional clusters of enterprises for the production of green energy. Based on the combination of the strengths and weaknesses of agricultural enterprises, as well as the opportunities and threats of the external environment, the following strategies for the development of bio-production at agricultural enterprises (strategies at the intersection of the possibilities of the external environment – the strengths of the enterprise) are proposed in [3]: selection of the optimal organizational form of bio-production to use all the possibilities of

state support; using the possibilities of financial, scientific and technical support of international financial organizations for a fuller use of the potential and organization of bioproduction.

The main text.

The implementation of climate-neutral measures is based on the principle of resource conservation and efficient use of available resources, namely, the possibility of re-consuming such resources as a result of their recycling. In the context of increasing energy efficiency and energy saving, an important role belongs to the culture formation of processing renewable energy sources (solar energy, wind energy, etc.), biomass and waste.

Table 1 and 2 summarize the data on the reserves of renewable energy sources and traditional energy sources, as well as the volume of energy consumption based on renewable sources in Ukraine, indicating the growth of the green energy development dynamics.

Table 1

Stocks of renewable energy sources and traditional energy sources in Ukraine

	Units of measurement	2013	2014	2015	2016	2017	2018	2019
energy production	thousand toe	85914	76928	61614	66323	58863	60883	60095
energy imports	thousand toe	39722	34437	31575	29152	35145	33847	34768
energy export	thousand toe	8213	6967	1447	1427	1944	1464	1830
Coal and peat	thousand toe	41427	35576	27344	32450	25757	28055	25718
in % to the total	%	35,7%	33,7%	30,4%	34,4%	28,8%	30,0%	28,9%
raw oil	thousand toe	3978	3043	2851	2806	3351	3635	3786
in % to the total	%	3,4%	2,9%	3,2%	3,0%	3,7%	3,9%	4,3%
petroleum products	thousand toe	5928	7645	7700	8387	9345	9690	9747
in % to the total	%	5,1%	7,2%	8,5%	8,9%	10,4%	10,4%	10,9%
natural gas	thousand toe	39444	33412	26055	25603	24554	25653	23383
in % to the total	%	34,0%	31,6%	28,9%	27,1%	27,4%	27,4%	26,3%
nuclear energy	thousand toe	21848	23191	22985	21244	22449	22145	21771
in % to the total	%	18,8%	21,9%	25,5%	22,5%	25,1%	23,7%	24,4%
hydropower	thousand toe	1187	729	464	660	769	897	560
in % to the total	%	1,0%	0,7%	0,5%	0,7%	0,9%	1,0%	0,6%
wind and solar energy, etc.	thousand toe	104	134	134	124	149	197	426
in % to the total	%	0,1%	0,1%	0,1%	0,1%	0,2%	0,2%	0,5%
biofuels and waste	thousand toe	1875	1934	2102	2832	2989	3208	3362
in % to the total	%	1,6%	1,8%	2,3%	3,0%	3,3%	3,4%	3,8%
electricity	thousand toe	-851	-725	-116	-323	-445	-522	-348
in % to the total	%	-0,7%	-0,7%	-0,1%	-0,3%	-0,5%	-0,6%	-0,4%
heat energy	thousand toe	1000	745	571	599	546	534	667
in % to the total	%	0,9%	0,7%	0,6%	0,6%	0,6%	0,6%	0,7%

Source: [4]

Such data indicate the need to develop the provision green energy through the use of digital marketing tools [8] to promote the peculiarities of adaptation to climate change. The founder and Executive Chairman of the World Economic Forum, K. Schwab, characterized the Fourth Industrial Revolution as a fusion of technologies that blur the boundaries between the physical, digital and biological spheres [9].

Among the measures to provide bio-raw materials in [6], they propose the creation of innovative project clusters for the production of biofuel on the technological platform of bioenergy. Scientists consider the technological platform as a communication tool aimed at enhancing efforts to create promising commercial technologies, new products (services), to attract additional resources for research and development based on the participation of all stakeholders (business, science, government, civil society), improving the regulatory framework in the field of scientific and technological, innovative development [6]. In addition, as noted in [7, p. 90], technological improvements and research (especially in the processing of raw materials into fuel, the possibility of mixing and transporting them) can significantly increase the competitiveness of biofuels, and therefore, reduce the cost of production. In addition, the development of production and consumption of biofuels can also contribute to more efficient management of agricultural land.

Table 2

Energy consumption from renewable energy sources in Ukraine

	Units of measurement	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Total primary energy supply	thousand toe	115940	105683	90090	94383	89462	93492	89072
Total energy supply from renewable sources	thousand toe	**3166**	**2797**	**2700**	**3616**	**3907**	**4302**	**4348**
Share of energy supplies from renewable sources	%	**2,7%**	**2,6%**	**3,0%**	**3,8%**	**4,4%**	**4,6%**	**4,9%**

Source: [5]

Biogas is one of the alternative sources for obtaining green electricity and heat energy. Accordingly, it is important to create a favorable market environment based on digital transformation for the functioning of enterprises that produce electricity and heat from biogas.

Among the modern challenges of the formation of smart systems, the definition of the relationship between humans and artificial intelligence deserves attention. Indeed, according to the study “Humanity in the machine” [10] conducted by the global media company Mindshare, artificial intelligence as a self-learning problem solving program is the next major technology that will dominate in the world. In particular, the creation and improvement of the functional properties of chat bots (artificial intelligence programs that conduct a conversation with people through the chat interface) in instant messengers and as standalone mobile applications, as well as the expected the rapid growth in demand for them in subsequent years, both in business and in everyday life, testifies to the fact that they are considered as an

alternative to many types of human activities [10].

The Internet of Things is the interconnection of several devices such as computers, sensors, electronics and many other software devices, providing a better alternative to the traditional connection system [11]. Distributed Ledger Technologies (DLTs) and blockchain networks within the Internet of Things development serve as the basis for diversifying the development directions of the smart city.

In accordance with this, the components of a smart city for the development of such programs based on the Internet of Things are the following [11-13]:

- smart transport and an innovative solution to traffic jams (smart traffic lights with built-in sensors and advanced artificial intelligence systems);
- smart energy and smart energy grids, an energy efficient system for the operation of power distribution stations using automation;
- smart home and supply chain of goods, home services;
- minimization of the crime rate (CCTV systems consist of motion sensing models with infrared cameras with low light levels, and also have wireless batteries);
- an intelligent water supply management system consists of physical components such as pipes, tanks with built-in sensors, which works on data analysis;
- a smart healthcare management system, etc.

The development of Internet of Thinks programs presupposes the fusion of physical things from the Internet, i.e. the minimization of physical contacts between a person and a thing in order to perform the corresponding operation, in particular, the development of smart houses. Accordingly, the development of smart competencies of employees of energy enterprises is of great importance. Indeed, given the trends in the development of smart specialization, including the emergence of intelligent energy houses and the need to develop smart competencies, it is proposed a human data model using a cyber-physically social approach, where the virtual world and the physical world merge with each other, and the social world crosses the physical and virtual worlds, reflecting social relations and interactions.

The following technologies are being implemented in various socio-economic areas [14]: QUIC (transport network protocol), data fabric, self-adaptive security, computational memory, exoskeleton, explanatory artificial intelligence, carbon-based transistors, 5G, digital twin, privacy technologies, limit computing , biocomputing, natural user interface, real time analytics, natural user interface, big data, neuromorphic computing, cloud, cognitive computing, smart machines, blockchain, autonomous vehicle, quantum computing, Internet of Things, communication «brain - computer».

Such peculiarities of artificial intelligence integration into socio-economic processes have a direct impact on the transformation of the energy sector through the development of smart energy networks. The content of such networks work is to ensure the automation of energy distribution, technology management, which is in the power supply chain, optimization of the pricing policy formation system and feedback from consumers.

Taking into account the trend of increasing energy efficiency, energy and environmental safety and, as a consequence, the development of the sphere of

providing green energy services, in particular the diversification of the activities of energy service companies and energy enterprises [15-16], the introduction of an energy block-chain network in order to protect the environment and transparent planning the activities of energy service companies in a virtual environment [17], the implementation of international standards for certification of raw materials for biofuel production [18], it is important to use the communication model of the energy service market participants [19], which ensures the provision of high-quality green energy services as a result of taking into account the interests of all consumer segments. As the result, an urgent issue is the restructuring of the marketing management structure at enterprises of alternative energy based on a network, digitalization of promoting climate policy.

To understand the operation of smart energy grids, it is necessary to take into account the specifics of the respective energy market functioning. For example, among the difficulties of integrating renewable energy sources into electric power grids, there are unstable production, the complexity of forecasting production (dependence on the climatic characteristics of the territories).

Conclusions.

Ensuring climate policy for alternative energy networks involves the implementation of a set of measures for the transition to alternative fuels (innovative development of energy companies), decarbonization of transport (electric cars), introduction of energy management and demand for energy services in industrial enterprises and households, energy. As a result, the role of using smart technologies in assessing climate impact is growing. In turn, there is a need for innovative decisions based on fuzzy logic of production, supply of green energy and the impact of digital transformation of socio-economic processes on the behavior of consumers of such energy.

In order to increase the energy efficiency of business entities and households by increasing the share of energy production from alternative sources, it is necessary to build an omni channel for the provision of green energy services based on the interaction of subjects of the energy service market, the electricity market and the alternative energy market.

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Анотація. *Перехід до вторинної переробки ресурсів є способом оптимізаційного природокористування і альтернативним джерелом отримання енергії. Цифровізація соціально-економічних процесів впливає на трансформацію енергетичного ринку на засадах кліматично-нейтральної економіки. З огляду на це, стаття присвячена визначенню особливостей цифрової трансформації просуванню альтернативної енергії. Визначено фактори виробництва альтернативної енергії (на прикладі біопалива). Розглянуто використання програм Інтернету речей в інфраструктурі. Встановлено необхідність просування кліматичної політики у контексті розвитку «розумних» енергетичних мереж.*

Ключові слова: *зелена енергія, енергосервіс, відновлювальні джерела енергії, біопаливо, сталий розвиток, «розумні» мережі, цифровий маркетинг.*

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