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# SYSTEMATIC METHODOLOGICAL APPROACH TO THE FORMATION AND IMPLEMENTATION OF STATE ENERGY POLICY

*The article examines the features of the application of a systemic methodological approach in the issues of formation and implementation of state energy policy. The principles of formation and implementation of state energy policy are characterized. The directions of improvement of the state energy policy of Ukraine on the basis of a systemic methodological approach and the application of the relevant principles of its formation in the conditions of existing global transformations are outlined.*

***Keywords:*** *public management and administration, state administration, mechanisms of state administration, state energy policy, systematic methodological approach, principles of state energy policy formation.*

Problem setting. The global trend of continuous growth of energy costs in the long term makes the energy issue one of the biggest problems of humanity, which requires urgent solution. That is why on the global agenda is the task of appropriate formation and implementation of a certain model of energy policy, which will allow to provide humanity with the necessary amount of energy resources and increase the efficiency of their use.

It is also extremely important for substantiating the directions of improvement of the state energy policy of Ukraine and preventing or minimizing possible challenges and threats in the energy sector, which will contribute to ensuring the further sustainable development of the country in modern conditions.

Recent research and publications analysis. Scientists such as Barannik V., Hrytsyuk P., Joshi O., Gladka O., Korobko B., Harris Q., Shaffer B. and others have devoted their scientific publications to the consideration of the features of the application of a systemic methodological approach in public administration, including in the issues of formation and implementation of state energy policy [1; 5; 7; 10; 11].

However, many issues regarding the possibilities of applying a systemic methodological approach in the formation and implementation of state energy policy remain insufficiently researched.

Paper objective. The purpose of the article is to substantiate the theoretical and methodological foundations and principles of the formation and implementation of state energy policy based on a systemic approach.

Paper main body. Energy is a strategically important component of the national economy and the economy of regions, the technological unity of which is determined by organizational relationships and economic interdependence of the inextricable chain of extraction — processing — transmission — consumption — use of energy resources.

Organizationally, energy is divided into industries, spheres, systems and enterprises:

• extractive: coal mining, oil extraction, gas extraction, extraction of peat, shale, uranium and other nuclear materials;

• processing: coal processing, oil refining, gas processing, processing of peat, shale, electric power, nuclear power, boiler houses, etc.;

• transmission and distribution: transportation of coal, peat, shale, oil pipelines and other methods of transporting oil and oil products, gas pipelines, electrical networks, steam and heat pipelines, pipelines of local energy carriers, gas-filled gas industry;

• consumption and use by the national economy for technological, sanitary and technical and commercial and household needs, which are united by the concept of «Energy of the branches of the national economy», and are divided into energy of industry, transport, agriculture, utilities, etc. [9].

That is, all branches and spheres of energy, which are elements of an integral system, are very closely interconnected, since enterprises belonging to different sectors constantly interact.

In general, energy is characterized by high interchangeability of its products, close connection of production and consumption processes, as well as inertia. Since energy is a universal resource, and its consumption has its own characteristics, any prospects for the development of other sectors of the economy, first of all, are associated with energy consumption. This requires taking into account the peculiarities of state management in the energy sector, as a complex system with mandatory consideration of the interests of all its sectors and spheres.

For sustainable economic development, it is necessary to replace traditional approaches in management with new methodological solutions, the basis of which should be the positive experience of domestic and foreign public administration. The peculiarity of such solutions in public administration is to consider the objects of regulation, including in energy, as a holistic economic system, the elements of which are oriented towards the implementation of a specific target and are able to ensure reproduction at the expense of their own resources. At the same time, it is important to track the dynamics of such basic system properties that characterize, on the one hand, the potential of the object of regulation itself (self-organization, self-regulation, self-preservation), on the other hand, show its relationship with the external environment (adaptability, flexibility, autonomy, hierarchy, security, reliability) [6].

For example, energy, as a system, can reproduce itself both within the existing qualitative certainty and at the level of a new quality, the transition to which means the development of the public administration system, and the main systemic feature at this level should be considered the ability to renew the reproductive process. The system-forming components in this case are financial, material, information and labor resources. Moreover, financial resources act as the initial moment of the functioning and development of production, the root cause of capital circulation, and, together with the subjective factor — man, form the basis of reproductive processes.

If the economic system is unable to finance its development, it should be considered a component of another, more developed system that has the ability to self-finance intensive expanded reproduction. For example, the disintegration of the energy industry has turned it into a set of organizational and legal forms of management that are unable to conduct effective scientific and technical policy.

One of the defining principles of the systemic feature of energy is integrity. The allocation of a holistic system as an organizational form of public administration is of significant importance for the development of market relations, and the formulation of its essence and content allows us to determine the principles that identify such systemic properties as independence and integrity. As a rule, not all newly created enterprises and organizations can successfully function as an independent economic entity, but only those of them that have concentrated financial, material and labor resources sufficient for expanded reproduction.

World practice of economic activity shows that the most stable enterprises, in which their own financial resources constitute at least 50% of the necessary funds, when the ratio of own and borrowed financial funds ensures the financial and economic independence of enterprises, determines their high level of solvency and liquidity. In this case, the growth of equity capital is a prerequisite for scientific and technological development, increasing capital equipment and labor productivity, implementing large-scale R&D and strengthening competitive advantage [4].

For example, during the restructuring of the energy sector, powerful power plants were allocated from energy systems. As a result, the power systems were left not only without large power generating capacities, but also without sufficient financial support. There is practically no investment and innovation activity in the industry, the number of physically obsolete and morally obsolete equipment is increasing. With a reduction in the number of powerful power complexes and a simultaneous increase in the total number of energy facilities, R&D programs, technical re-equipment of production and the introduction of new capacities are constantly being reduced to nothing. Of course, the deterioration of the investment climate in the industry will lead to a further decrease in the scientific and technical level of production and, consequently, an increase in socially necessary costs. This will become a prerequisite for an increase in the price level, and the share of net income for reproduction purposes in the price will become symbolic, since it is impossible to revive investment and innovation processes by artificially increasing energy prices, which is the result of a well-thought-out scientific and technical policy, and not a consequence of a subjective approach to prices. In turn, the constant increase in electricity tariffs hinders the intensification of production in the economy, complicates the deepening of electrification processes, and thereby hinders the growth of labor productivity [3].

A similar situation is observed in the oil and gas industry, that is, neither individual independent fuel and energy systems nor small energy systems will be able to determine an effective scientific and technical policy and have a real impact on the national economy.

That is why, when reforming the energy sector, it would be advisable to start by rethinking the role of regional vertically integrated energy complexes that provide real conditions for the concentration of material, labor and financial resources. This can be justified by the need to increase the technical level of production, reduce socially necessary costs, reduce tariffs, increase labor productivity and prevent the degradation of the energy base of the state.

However, one cannot neglect the general laws of production development and foreign experience. For example, abroad, no power plant will receive the status of an independent economic entity if the size of its equity does not provide resistance to the adverse effects of external factors [1].

Energy, as a system-forming sphere of the economy, should not be separated from the economic complex, of which it is an organic part. However, most problems cannot be solved unless pricing in the energy sector is regulated and the pricing methodology is revised, which has the disadvantage of following the cost principle, when the amount of profit is directly dependent on the amount of costs. Enterprises are not interested in reducing them and are of little interest in the use of energy-saving technologies.

The point is not only that pricing in proportion to current costs hinders scientific and technical development, and not that such a scheme does not take into account the dynamics of invested capital. First of all, the practiced methodology does not take into account the public utility of products (services). A dogmatic attitude to the methodological foundations of pricing does not allow the limited resources to be reflected in prices. At the same time, the option according to which prices are formed only on the basis of public costs recognized by the market counterparty is a narrow-sector approach to solving this problem, which does not take into account the effect of energy use by the consumer and does not reflect the interests of the energy sector as a holistic system.

It should not be forgotten that the effect is always defined by the consumer as savings or benefits, expressed in certain amounts of public labor. Therefore, the price should reflect both the producer's costs and the effect on the consumer. However, the theory of supply and demand does not allow us to reveal the price structure, because the equilibrium of these economic categories does not indicate how the costs and effects that determine the equilibrium price are formed. It is the effect on the consumer that determines the motive for purchasing products, since no one will invest in the purchase of products that do not pay off their costs and do not bring additional income [2].

Thus, the main subject of business relations between the producer and the consumer, as well as the subject of special attention from state bodies when regulating prices, should be this element of the price, when the state sets the maximum level of tariffs, and enterprises set themselves the task of minimizing costs. At the same time, the price should prevent a wasteful attitude towards such valuable resources as natural gas and fuel oil, which are still burned by power plants. From the position of a systemic approach to public administration, it is advisable to be quite cautious about displacing coal from the country's fuel and energy balance, since this leads to the closure of mines and unjustified social costs that must be taken into account.

Energy as a system has general and individual properties that reflect the peculiarities of the development of a set of interconnected subsystems – electric power, fuel extraction, transport and others, knowledge of which helps in solving specific tasks of public administration.

It is necessary to apply all the principles of the system approach and the principles of optimal functioning derived from them to energy: complexity, dynamic probabilistic nature, hierarchical construction, purposefulness of functioning, allocation of general and local criteria of optimality, resource limitation, economic choice and multivariate development.

However, the use of a system approach in state energy policy requires clarity in the representation of the system, because to date there has been no unambiguous definition of the concept of «system», which is explained by the complexity and multifaceted nature of the content of this characteristic.

Most authors believe that a system is a set of interacting elements that are in relationships and connections with each other and that constitute a holistic formation. No system can exist in isolation without exchange with a more general system, which is called the «external environment», which means the impossibility of a complete and consistent description of the behavior of the system, since its state always depends on the state of another, which includes it as a component part [5; 10; 11].

Therefore, considering energy as a system, it should be borne in mind that its boundaries are conditional, as is its autonomy.

Taking into account the relationship of the system with the external environment, the theory of system management assumes:

• knowledge of the objective laws of the interaction of the system with the social and biological environment, as well as the organization of the functioning of the system itself;

• formulation of these legal relationships in the categories of purposeful behavior [5].

The concept of «purposeful behavior» is associated with the category of «state policy», which always begins with a goal, because conscious behavior — this behavior is purposeful. Any conscious action assumes the formulation of a goal as a representation of a certain final state, which should be the result of this action. At the same time, the directionality of conscious behavior should not mean freedom from the objective laws of the functioning of the external environment and the controlled object itself, arbitrariness in choosing a goal. Goal-setting, as an improvement of the system and its elements, makes sense while maintaining stability, which ensures the preservation of the system, which is important for setting goals.

The ability of a system to undergo change while preserving itself determines the law of functional evolution or the law of system integrity, which is the first law of systems management theory [5].

In conditions of significant variations in consumption flows in the system, up to a change in the number of consumers in the process of functional evolution, the management of the flow of this resource is ensured in such a way that the system retains its integrity, remaining identical to itself. The key concept here is "system integrity", which means internal unity and internal conditionality, which characterizes the qualitative certainty of the system. Acting as a condition for the existence of a system, integrity determines the requirement of the inseparability of the managed flow of resources as a source of life support for this system.

Since the very definition of the system is closely related to the problem of management, that is, with the organization of the movement of resource flows to support the life of the elements that make up the system, the solution of public policy tasks is determined by the presence of a multitude of possibilities — diversity, freedom of choice, alternative goals.

Self-preservation is the highest goal in any of the most complex hierarchy of subgoals that an economic system can have, since all subgoals are aimed at survival. A set of possible future outcomes is formed as a combination of the results of a set of possible events. In this case, the best future state is considered to be the one that provides the greatest guarantees for self-preservation within the framework of the existing model. This can be ensured only by comparing the system with the external environment [11].

Thus, one of the goals of the functioning of the energy sector as a system is to maximize profit. However, the technological process of production does not provide profit: it appears from the interaction of the energy sector with the external environment, from the difference that a potential consumer is willing to pay, and the costs of resources that need to be purchased outside the system to organize production. Therefore, the closure of the system can be considered conditional, because any system is open to the external environment and without it it is difficult to explain purposefulness.

As is known, the external environment is characterized by a high degree of dynamism, therefore, in the hierarchy of goals, the "public criterion" undergoes significant changes. In addition to a high degree of variability, the external environment is unpredictable. In addition, the enterprise contains subsystems within itself in relation to its constituent elements. Therefore, any economic system, ensuring the stability of its functioning, produces internal impulses of development. It is incorrect to automatically deduce the evolution of cybernetic systems from an external impulse. The ability to self-develop systems that have a homeostatic nature of functioning is inherent in the structure of these systems, in the relative nature of the subordination of the goals of individual subsystems, which leads to a certain «competitiveness» in the interaction of subsystems with each other and, as a consequence, to changes in the compromise point on the negotiating set. This kind of internal energy is the source of evolutionary processes in systems.

It is advisable to link the internal impulse of the system with such a law of systems theory as the law of functional hierarchy, which reveals how management should be organized so that the functional purpose of the system can be realized depending on the properties of this formation and the environment of its functioning. This law of systems theory defines two levels of state management for each subsystem: a behavior plan and a reaction to changes in the external environment. In this case, the behavior plan of the subsystem is the result of the behavior of the nearest upper level [10].

Thus, the system begins where a holistic formation carries out its vital activity not only according to the program (behavior plan), but also taking into account the reaction to a sudden change in the environment. This important result of evolutionary development turns into a simple but capacious formula: the function generates the system, the structure interprets the goal.

It is important for energy management to understand the fact that only rigidly determined systems can be in a stable state, to which energy, as a system, cannot be attributed. Setting a goal and determining the means of achieving it when managing a system means modeling the object within the framework of available information and set restrictions. In this case, the system should be considered as closed and, accordingly, cannot be fully investigated due to the fact that there is uncertainty.

The presence of conscious purposeful activity in state management of the system is not equivalent to the conditioning of all processes occurring within the system itself, because uncertainty always occurs. And since most models are strictly deterministic, they do not have a complete description of the object, which complicates system management. Deterministic development according to strict criteria does not allow obtaining new information about the degree of correspondence of the subsystem representations, about the functioning of the system to the real laws of its development [8].

Thus, it is believed that when determining the axiomatics of the functioning of complex socio-economic systems, the postulate about the existence of a criterion of optimality of the system (goal-seeking) should be supplemented by the postulate about the finite uncertainty of this criterion and the objective necessity of the existence of a mechanism for the formation, refinement and correction of the criterion in the process of the functioning of the system. The introduction of the uncertainty principle into the axioms of the functioning of complex systems allows us to realistically represent a system that is self-developing and self-improving. The development process with this approach looks not only as a process of finding the shortest path to a clearly defined goal, but also as a simultaneous search and adjustment of development goals.

Therefore, the range of the complexity of a system, especially such as energy, varies depending on its scale. In addition, such a system has a pronounced level structure, in which a higher level integrates according to certain rules, and information signals of a lower level operate with different units, and the number of levels depends on the scale of the system. However, this dependence is not linear, as is the dependence between the complexity and the number of levels of the system. In this regard, it is necessary to distinguish the following groups of energy characteristics at the methodological level: structural, developmental, functional and controllability. The group of structural characteristics reflects the unity of the elements (subsystems) included in the system, reveals the essence of hierarchical levels and determines: the integrity of individual systems and subsystems included in this structure, the degree of their autonomy and individuality; the degree of centralization of management, the system's connections with other systems of different levels of the hierarchy; the complexity of the structure, the volume and significance of the external and internal connections of the system. And the group of features characterizing the development of the system includes such characteristics as stability, dynamism, inertia and discreteness [7].

So, energy, which is a complex system, acts as a kind of integrator, ensuring strong economic, social, production, technological and environmental ties between its individual components. That is why energy is one of the main factors of stabilizing the economy, ensuring the vital activity of other industries, the consolidation of business entities, and making a decisive contribution to the formation of the main financial and economic indicators of the state.

Conclusions of the research and perspective of further development in this direction. Thus, considering energy as a closed system within the framework of a systemic approach, it is advisable to improve it within the framework of the goals that lie within the complex: increasing productivity, reducing costs, increasing sustainability, etc. The transition to considering energy as an open system requires setting other goals that ensure its success only if the internal components, quality and volume of external environmental factors, which are constantly changing, correspond. At the same time, the properties of purposefulness are brought to this system from the outside, and tasks are solved, as a rule, not only within the system (management of energy enterprises), but also from the outside (state energy policy).

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