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Problems of management of the energy cluster

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Annotation. The relevance of the work is that it gives a new understanding of the cluster as an industrial entity that can be used in the management system. The main processes of cluster formation and development of the total technological process of energy supply to the industry of the region are considered. The factors of controllability according to the development of the overall technological process are identified. The classification of factors of weak manageability of cluster enterprises is given.

Keywords: energy cluster, controllability as a criterion for cluster allocation, factors of weak controllability, dynamics of controllability, use in management practice.

Energy is a set of industries, the main purpose of which is to provide energy to all types of economic enterprises and organizations, industry, the national economy, and the personal needs of a person in households. Traditionally, enterprises that carry out this process are considered as a complex of production facilities.

However, in the market economy, the term cluster (from the English cluster − cluster) is increasingly used, which in the modern sense means the union of several economic objects, which can be considered as an independent unit of study. According to the definition of M. A cluster is a group of geographically adjacent interconnected companies (manufacturers, suppliers, etc.) and related organizations (educational institutions, public administration bodies, infrastructure institutions) that operate in a certain area and complement each other [2].

Without setting the task to consider all the concepts of clusters, which then appeared and are discussed in the economic literature, it can be generally noted

that in most of the works of modern foreign and Russian authors, it is the regional component of these formations that is distinguished.

In [1], it was proposed for the first time to understand that in a market economy, the main criterion for identifying clusters, in addition to the accumulation of enterprises, should be the manageability of these enterprises. Within the cluster, there are enterprises that are directly managed by a certain management entity and enterprises that are managed by indirect methods. That is, here it is proposed to understand a cluster as a poorly managed complex of industries located in limited territories. In other words, a cluster can be characterized as a not fully managed territorial production complex of enterprises, joint operation due to the location on this territory gives greater joint efficiency.

We suggest that the energy cluster is understood as a not fully managed complex of enterprises that provide the overall technological process of energy production, distribution and use. Given the fact that the real directive management of economic systems is carried out only within the limits of ownership, it can be assumed that enterprises in a market economy can be generally managed only within the concept of a cluster, and not a complex.

The energy system, represented by a set of enterprises that perform a common technological process of energy production and delivery of energy resources, should be considered as a cluster managed by end users. An energy cluster is not a fully (or weakly) managed group of enterprises that provide a combined technological process for the production and delivery of energy carriers, considered by the final energy consumer. In contrast to the concept of the fuel and energy complex, an energy cluster is considered as a set of enterprises belonging to different owners.

The key systemic factor of weak manageability can also be attributed to the fact that in market conditions, the control actions that form the cluster structure are carried out not vertically, but horizontally - from the consumer to the producer on the basis of incoming money. The implementation of energy products is considered as a signal of its efficient production.

The factors of weak manageability include the temporary uncertainty of the number of enterprises and industries operating in the energy markets, their mutual competition and the corresponding mismatch of the interests of different

owners. This uncertainty is reinforced by the dynamic changes in the required structure and volume of energy consumption in industrial enterprises and the emergence of new alternative as well as proprietary energy sources.

Scientific and technological progress in the energy sector inevitably leads to a reduction in the cost of the final product. This, in turn, affects the change in the competitiveness of energy sources. Factors of weak manageability include temporarily unknown results of R & D, potentially being prepared for implementation in competing enterprises. The constant reduction of energy production costs becomes the main factor of their survival in the market economy. First, the task is to provide the required amount of energy, then-the task of reducing the cost of this energy.

The newly emerging own energy sources of industrial enterprises (in the form of reserve and complementary capacities) should be considered as equal processes of the energy supply system. This means, in turn, that the "big energy" should not only consider the "small energy" as a competitor, but as a part that objectively complements and interacts with the "big".

In a market economy, the final consumer has the right to choose the energy supply option. The cluster structure is formed on the basis of assessing the competitiveness of different options for energy production. Consequently, the real management of the cluster is carried out by the end user, starting from its assessment of the energy demand along the entire energy production chain. In this case, the cluster management process begins at the end of the energy consumption process.

The concept of "incomplete management" is based, first of all, on the real disunity of the owners of energy enterprises. The territorial component of this complex is considered in the second place. The second component of "weak" management is that the number of enterprises included in the generating system is not precisely determined. Each of the enterprises can create generating capacities as auxiliary, backup emergency, etc. The third component of the "incompleteness of management" is due to real technological progress, when new sources of generation and energy savings constantly appear, which are unknown to decision-makers for some time.

Consider the structure of the energy cluster enlarged. At the beginning of the combined technological process of energy supply, as a rule, there are several

mining enterprises that form parallel flows of energy resources extraction from the environment. These include enterprises working with such well-known resources as: solar energy, wind energy, hydropower, tidal energy, wave energy, oil, coal, gas, firewood, geothermal, nuclear, etc. This could theoretically include other sources of energy that are not yet known to decision makers.

This is followed by the stage of transportation of energy resources. It is also carried out by transport enterprises operating in parallel with each other: railway, water, automobile, pipeline (oil), pipeline (gas), etc., delivering energy resources to the consumer. Theoretically, power transmission lines could also be classified as energy transportation industries, but they are still traditionally referred to as distribution networks of generating power systems.

Coal warehouses, oil storage facilities, and gas storage facilities can be considered as intermediate or storage facilities. The same class of industries can include those that store energy: electric accumulators, thermal accumulators, hydraulic accumulators, oxygen, air, steam, etc.

The main element in the energy system is generating production: thermal power plants (coal, gas, petroleum products), nuclear, hydroelectric power plants, wind, solar stations and installations, heat pumps, blowers, boilers, oxygen stations, compressors. Here it is important to note the parallelism of their work and the possibility of competition among themselves.

At the end of the process, at the consumer, this flow of energy resources is "decomposed" into many channels according to the required structure of consumption of the final energy consumer. End users are national, regional (urban) systems, manufacturing enterprises, housing, and households. Each end user has its own structure of energy supply and consumption due to a wide variety of factors that affect the efficiency of energy sources and their transportation.

In the context of intra-industry specialization in each of the intermediate industries, it is generally impossible to accurately determine the energy needs. In this planning process, the main production links of the energy cluster should be understood primarily as the real flow of energy carriers. In a market economy, management decisions are made on the basis of market signals of the price of products, the assessment of their competitiveness, and the profitability of their own enterprises. Competitiveness reflects the comparative efficiency of energy

consumption. There is a certain time lag from obtaining information about the final efficiency of the energy source to making decisions on the actual production. This is the next factor of the weak controllability of the power system: a complex system of feedback from the consumer to the producer through a number of intermediate owners of the energy cluster.

The next factor of weak controllability can be seen in the fact that in modern conditions, at any stage of production, transportation and consumption of energy products, consumer enterprises can create their own energy base, i.e. compete with industrial generating plants. In this case, the small-scale energy sector of enterprises that operates essentially in parallel and covers their own energy needs can become a direct competitor to industrial energy. There are already a lot of cases of refusal of consumers from district heating. In everyday life, a new "boiler" energy system is being formed, changing the need for warm water. Power systems: a complex system of feedback from the consumer to the producer through a number of intermediate owners of the energy cluster.

Many industrial enterprises and social facilities – hospitals, educational institutions-have in their structure stationary and backup power capacities in case of an emergency shutdown of the centralized supply. In the case of equality of the cost of own energy production and centralized supply, it is possible for consumers to abandon the traditional scheme of supply of both electric and thermal energy. On an industrial scale, the problems of air pollution and the environment are still hindering the development of small energy production. But the developing technology of "small energy" will eventually set the monopolists-energy producers the task of "dividing the energy market". At the same time, theoretically, this part of the energy capacity, which functions within the enterprises that consume energy, objectively needs to be considered as part of the country's energy system. But often they cannot even be accounted for, either in statistics or within the national energy system management system.

With the current dynamics of the development of these auxiliary energy production at a certain concentration, the reverse process is theoretically possible - their withdrawal from the management system of this enterprise and work on the terms of outsourcing and further inclusion in the top-level energy complex.

The weak manageability of the cluster can be attributed to the fact that the decisions made in the field of energy have long life cycles, which can be considered as the terms of implementation of management decisions (in

hydropower – "eternal"). But in the conditions of real scientific and technological progress (STP), when the dynamics of technical processes significantly increases, the speed and scale of the emergence of competing technologies within the long terms of implementation of solutions increases dramatically. Each technology is essentially discrete, i.e. it is unchangeable throughout its life cycle (any reconstruction can be considered as the creation of a new technology based on the use of the" old " material and technical base).

In the technical design of long-term facilities, it is impossible to foresee all possible future changes in the external operating conditions of the equipment, as well as the emergence of new types of energy and technologies. It is also impossible to lay down in the project absolute versatility and flexibility. During the life cycle, it is almost always necessary to periodically adapt them to changing conditions of transportation and consumption. Always, over time, there is a moral deterioration or economic obsolescence of each technology of energy production and energy consumption.

The considered factors of weak controllability reflect the process of specialization of different stages of production delivery and sale of energy by individual energy enterprises. At the same time, it should be assumed that all these stages can be carried out outside of it – within the framework of individual enterprises that provide energy supply on their own. An example of this is our own production of firewood, peat, wind energy, etc. In this case, production and consumption takes place outside formally allocated complex and can be considered as an element of uncontrollable energy, though (within the enterprise is a fully managed process). Ie, poor handling can only be viewed in a hierarchy of decisions on the development of the industry. The structure of energy sources is constantly changing with the development of science and applied knowledge. And each of the technology options can, depending on the efficiency of energy production, occupy advanced, and in the future, possibly, outsider positions.

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The task of management is to create an economic mechanism that would create interests or production relations that stimulate this development from the point of view of efficiency. At the same time, new technologies can "close" the old ones, which in this case should be called obsolete. I.e., the death of technologies is the same natural process as the birth of new technologies for energy production and consumption. It is necessary to manage the development of energy systems – that is, the development of energy systems. the transition of the production system from one quality state to another, while this new quality should ensure an increase in production efficiency at the end-user level. The main indicator of production efficiency, despite market fluctuations, is the reduction in the cost of production for the end user. We need to learn how to manage energy efficiency at the level in the interests of consumers.

This understanding of energy cluster management requires a significant change in the mentality of the "energy management for the consumer" system. If now in the conditions of a market economy for producers the important criterion of production efficiency is profit, then for consumers the criterion is to minimize the cost of energy supply.

The development of measures for continuous improvement of energy consumption should be considered as a mandatory management function in the energy management system.

The awareness of the "weak management" in the energy cluster due to the inability to foresee all possible options for the emergence of new (outside of management decisions) energy sources, new means and schemes for delivering energy to the consumer, the formation of new energy balance structures for end users turns into the power of flexible management.

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