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USE OF ENERGY MANAGEMENT AS A STRATEGIC DIRECTION OF SUSTAINABLE DEVELOPMENT OF AN ORGANIZATION

Об'єктом дослідження є енергоменеджмент, діяльність якого спрямована на забезпечення раціонального використання паливно-енергетичних ресурсів на підприємстві або в муніципалітетах, що дозволяє значно оптимізувати обсяги енерговитрат. При розробці і впровадженні системи енергоменеджменту організація може зіткнутися з низкою проблем, на яких хотілося б зупинитися докладніше. Перша проблема – це суттєва вартість консалтингових та сертифікаційних послуг. І тут організація повинна для себе вирішити, яким способом вона буде розробляти і впроваджувати цю систему, а також чи є необхідність сертифікувати систему менеджменту і, якщо така необхідність є, то в якому органі (міжнародному або національному). Друга проблема – відсутність або недостатня компетентність фахівців у галузі енергозбереження та енергоефективності. Третя проблема – наявність інвестицій в енергозберігаючі технології. Четверта проблема – «прохолодне» ставлення керівництва компанії до питань розробки та впровадження системи енергоменеджменту.

В ході дослідження використовувалися матеріали внутрішньої звітності підприємств: звіти про проведення енергетичного аудиту, дані з енергетичних балансів окремих виробничих підрозділів, інструкції та стратегічні документи, енергетична політика підприємства.

Провівши аналіз виробництв електроенергії в об'єднаній енергосистемі України та обґрунтувавши необхідність використання енергоменеджменту, встановлено, що виробництво електроенергії в об'єднаній енергосистемі України в 2017 році збільшилась на 2,5 % (на 1 млрд. 884,8 млн. кВт-год) в порівнянні з 2016 року – до 78 млрд. 345,8 млн. кВт-год. Визначені напрямки державної підтримки в області енергозбереження і підвищення енергетичної ефективності. Для забезпечення стабільної економії витрат на енергетичні ресурси запропонована структура і взаємодія елементів енергоменеджменту для підприємств зі стратегічним напрямком розвитку. Завдяки цьому можна без великих фінансових втрат досягти значної економії енергії та зменшити негативні наслідки при поганій роботі опалювальних систем в спорудах.

Ключові слова: принципи енергетичного менеджменту, підвищення енергетичної ефективності, енергетичні ресурси, енергетичні витрати.

1. Introduction

The problems of energy efficiency together with raising ecological safety of enterprises and increasing social responsibility become the central object of studies of the modern theory and practice of management of industrial enterprises. The dynamics of introducing projects for raising efficiency in international companies grows every year, spreading in such fields as projecting energy effective buildings and facilities, elements of production infrastructure. Introduction of such projects is also a priority direction of activity for Ukrainian companies of different types of economic activity.

The increase of urgency of energy saving and using alternative energy sources, connected with global and local resource crises resulted in forming the developed system of international standardization in energy management. It is directed on regulating and elucidating the content of principles of building energy effective business-processes and elaborating the rational policy of enterprises in the field of energy management. Such system of standardization may be considered as a base of realizing strategic energy management at enterprises that is integration and

realization of energy effective solutions in the existent strategy of enterprises.

Formation of the energy management system is a base of the strategic direction of development of an organization that is real for today for all spheres of Ukrainian economy. Especially for such branches of industry as: energetic, oil and gas, nonferrous metallurgy and many other energy-consuming branches.

2. The object of research and its technological audit

The object of research is energy management, which activity is directed on providing the rational use of fuel-energy resources at an enterprise or at municipalities that allows to optimize volumes of energy consumption essentially.

Energy management includes a set of arrangements, directed on saving energetic resources:

- monitoring of energy consumption;
- elaboration of energy budgets;
- analysis of existent parameters as a base of forming new budgets;

- elaboration of the energetic policy;
- planning of new energy-saving arrangements and so on.

Together with positive moments from introducing the system of energy management, an organization may face a series of problems at its elaboration and introduction that must be considered more detail.

The first problem is an essential cost of consulting and certification services. An organization must decide for itself, how will it elaborate and introduce this system (by own forces or involving consultants). It is also necessary to decide, is there a necessity to certify the management system. There it must be warned that in Ukraine the best way to prove the presence of the elaborated and introduced system of energy management is a certificate of correspondence, and if this necessity is present, which body must do it (international or national).

The second problem is the absence or insufficient competence of specialists in the field of energy saving and energy efficiency. At solving it there are several ways: teaching own specialists, involving consultants, involving energy auditors and energy managers, benchmarking.

The third problem is investments in energy saving technologies. Elaboration of the system of energy management itself, despite the high level of conduction, means nothing without introduction. And introduction has a single aim – to shorten energy resources consumption (at least in specific expression). But introduction is connected with dismantling an old equipment, purchasing and setting new one, its checkout, starting and exploitation. Several moments must be taken into account at solving this complicated task:

- term of investment payback;
- penalty for non-fulfilment of aims on shortening consumption of energy resources (possibly even at the level of state and regional programs that an organization may be included in);
- image risks.

As it is shown by practice, this problem is a main one at elaboration and introduction of the energy management system, so formation of a budget (investment programs) must be realized most detail with involving most competent co-workers or even contracting organizations at its solving.

The fourth problem is the «cool» attitude of leaders of companies to questions of elaboration and introduction of the energy management system. It must be noted, that successful introduction of the system of energy management depends on a leaders' position. Most often at conducting works on introducing any management system we may observe the following picture. Leaders appoint an executor (in the best case from the number of middle link managers), gives him/her a function of managing the system without additionally motivating, and the interest of high leaders to management systems is off at that. It may be stated unambiguously, that this approach to introducing management systems will give no results in the middle- and long-term perspective. As it is shown by practice, essential results may be achieved only at the positive attitude of leaders and involvement of the staff.

3. The aim and objectives of research

The aim of research – to elaborate the system of energy management at industrial enterprises that will favor realization of energy efficiency principles at the strategic level.

The following tasks must be realized for attaining the set aim:

1. To conduct the analysis of electric energy capacities in the combined energy system (CES) of Ukraine and to ground the necessity of using energy management.
2. To elaborate the structure and interaction of elements of energy management for enterprises with the strategic direction of development.

4. Research of existing solutions of the problem

The world practice testifies that the growth of energy efficiency is achieved mainly at the expanse of organizational changes in the system of energy economy management that is at the expanse of improving the system of energy management. Questions, connected with elaboration of models and means of improving the level of effectiveness of energy consumption at educational institutions under conditions of the complex approach are considered in detail in the modern scientific works of other specialists [1–3]. Especially, work [1] is devoted to the development of methods and models of assessing energy efficiency of budget institutions taking into account the influence of weather conditions and totality of actual exploitation conditions. Work [2] offers the construction of the conceptual model of managing processes of energy consumption and energy saving in the field of education that provides separation of three levels of management: branch – native – local. The use of multi-criteria models and means of managing energy consumption at educational institutions, offered in work [3], allows to improve prognostication of results and to make managerial decisions in the sphere of energy efficiency on-the-fly. That is why for solving questions of raising energy efficiency at enterprises, the system of energy management is introduced at enterprises, according to the international standard ISO 50001 [4].

The system of energy management is an innovative solution, directed on decreasing specific indices of consumption of fuel-energy resources and optimal use of limited financial resources for realizing projects on raising energy efficiency.

The system of energy management is a system of management, based on standardized measurements and check-up, that provides such working mode, at which energy, necessary for production only, is consumed. Energy management is an instrument that provides company leaders with continuous information about energy distribution and consumption, and also about using energy for both production aims and heating, and other non-production needs.

The system of energy management allows to trace consumption of different types of energy and in such a way gives a possibility to compare energy consumption of production with indices of other enterprises, and also to assess more precisely profits from possible projects on energy saving.

The standard ISO 50001 helps organizations to elaborate a strategy that allows to increase the energy efficiency, to decrease consumption and to improve the ecological component of activity. One of essential advantages of introducing the system of energy management is also the increase of investment attractiveness of a company [4].

Introduction of the standard must result in shortening financial costs, hotbed gases emissions and other influences

on the environment by the systematic management of energy (energy management). Successful realization of the strategy depends on involving all levels and functions of management of this organization.

The standard ISO 50001 includes requirements to elaboration and introduction of the energetic policy, aims, tasks and plans of actions in the field of energy management, taking into account legislative normative-legal acts. The standard will be a base one for an organization of any type, together with standards of the quality management system ISO 9001 [5] and ecology management system ISO 14001 [6].

The functions of the system of energy management include:

- online control of energy consumption, volumes and nomenclature of the output of products and other factors that influence the value of energy consumption;
- determination of the normalized (planned) level of energy consumption;
- comparison of actual and normalized levels;
- diagnostics of causes of exceeding the actual level of energy consumption over the normalized one;
- forecasting of energy consumption;
- making online managerial decisions that provide the decrease of energy consumption and management of projects for raising energy efficiency.

Work [7] is devoted to problems of the energy effective functioning of production systems and using energy resources. The sphere of strategic energy management remains little studied, because most questions are solved within the international standard on energy management systems that only regulates main principles of organizing business-processes of energy consumption and energy saving [8]. Elaboration of energy management system, based on the standard, taking into account the specificity of one or another company, is often simple [9]. At the same time the potential of strategic energy management may be realized through the sphere of managing the human capital of an enterprise at the expense of involving an intellectual and creative potential of workers in solving tasks of energy saving [10].

The concept of energy management remains rather new, and the literature has no common idea as to realization of this instrument in the economical practice. That is why it is necessary to explain the importance of energy management for enterprises and organizations, to determine main arrangements as to introduction of energy management systems. It allows to increase the energy efficiency of enterprises.

5. Methods of research

The following scientific methods were used at the study:

- method of analysis at studying the essence of energy management;
- method of classification at principles of activity regulation in the field of energy saving and increasing energy efficiency;
- method of structuring at studying production of electric energy in the combined energetic system of Ukraine in 2016–2017.

6. Research results

For today formation of the system of managing energy consumption and energy saving processes (ESP) in the educational branch of Ukraine is realized non-systematically and is usually manifested as partial, non-coordinated solu-

tions in its separate elements. It is mainly caused by the complexity of solved managerial tasks, incompleteness and non-trustworthiness of information about energetic and exploitation parameters of dependent objects.

Electric energy production in the combined energetic system (CES) of Ukraine in 2017 increased by 2.5 % (by 1 bil 884.8 mil kW-hour) comparing with 2016 – to 78 bil 345.8 mil kW-hour. Nuclear power plants (NPP) increased electric energy production by 13.5 % – to 45 bil. 617.1 mil. kW-hour. Especially electric energy production at Zaporizhzhya NPP was 19 bil. 178.4 mil. kW-hour (+33.4 % to January of 2016), Southern-Ukrainian – 8 bil. 366.3 mil. kW-hour (+6.4 %), Rivne – 9 bil. 706.1 mil. kW-hour (+3.5 %), Khmelnytsky – 8 bil. 366.3 mil. kW-hour (–2.5 %) [10].

Heat power plants (HPP) and also central heating and power plants (CHPP) and cogenerating settings (CS) decreased production by 14.8 % – to 25 bil. 177.6 mil. kW-hour. Including, HPP companies decreased production by 16.4 % – to 19 bil. 453.9 mil. kW-hour, and CHPP and CS – by 8.7 %, to 5 bil. 723.7 mil. kW-hour [10].

Hydroelectric power plants (HEPP and HNPP) in 2017 increased production by 14.6 %– to 5.941 bil. kW-hour, whereas block-plants decreased production by 4.9 %– to 721.9 mil. kW-hour. Electric energy production by alternative sources (WPP, SPP, biomass) for this period increased by 14.9 % – to 888.2 mil. kW-hour. The share of NPP in the structure of electric energy production was 58.2 % (in 2016 year – 52.6 %), HPP, CHPP and CS – 32.1 % (38.6 %), HEPP and HNPP – 7.6 % (6.8 %), block-stations – 0.9 % (1 %), alternative sources – 1.1 % (1 %).

Electric energy production in CES of Ukraine in 2017 increased by 2.5 % (by 276.2 mil. kW-hour) comparing with 2016 – to 11.407 bil. kW-hour. At that the increase of NPP production in 2017 was 23.5 % (by 1 bil. 280.6 mil. kW-hour) comparing with the previous year with share 59 %, whereas HPP GC decreased production by 23.4 % (by 987.4 mil. kW-hour) with share 28.3 %. The heating energy output in 2017 year decreased by 5 % (by 668.8 thousand Gcal) comparing with 2016 year – to 12 mil. 840.4 thousand Gcal. As it was informed, electric energy production in CES of Ukraine in 2016 decreased by 1.8 % (by 2.848 bil. kW-hour) comparing with 2015 year – to 154 bil. 817.2 mil. kW-hour. Including, NPP produced 80.950 bil. kW-hour (–7.6 %), HPP GC – 49 bil. 902.3 mil. kW-hour (+1 %), CHPP – 6 bil. 709.3 mil. kW-hour (+10.4 %), HPP and HNPP – 9 bil. 118.8 mil. kW-hour (+33.9 %), municipal CHPP and block-plants – 6 bil. 576.8 mil. kW-hour (+6.5 %), WPP, SPP and biomass – to 1.560 bil. kW-hour (–2 %) [10].

The structure of electric energy production in CES of Ukraine in 2016–2017 is presented in Table 1.

For providing the sustainable economy of costs for energetic resources, it is necessary to introduce the system of energy management in the management of energetic economy of an enterprise that is rather successfully applied in the world practice. Introduction of such systems at foreign enterprises gives 5–15 % of economy of energetic resources of enterprises of different profiles [1]. At the same time energy management cannot be an occasional arrangement, but needs continuous realization of arrangements on energy saving, monitoring of achieved results for realization of effective management of activity of an enterprise in the sphere of increasing energy efficiency.

Table 1

The structure of electric energy production in the combined energetic system of Ukraine in 2016–2017

Producers of electric energy	2016, mil. kW-hour	2016, share of total production, %	2017, mil. kW-hour	2017, share of total production, %	Change, mil. kW-hour	Change, %
NPP	40201.4	52.6	45617.1	58.2	5415.7	13.5
HPP GC	23271.3	30.4	19453.9	24.8	-3817.4	-16.4
CHPP and cogenerating settings	6271.7	8.2	5723.7	7.3	-548	-8.7
HPP	4419.8	5.8	5149.80	6.6	730	16.5
HNPP	765.4	1	791.2	1	25.8	3.4
Block-plants	758.7	1	721.9	0.9	-36.8	-4.9
Alternative sources (WPP, SPP, biomass)	772.7	1	888.2	1.1	115.5	14.9
Totally	76461.0	100	78345.8	100	1884.8	2.5

Note: data are taken from [10].

The scientists in work [2] consider energetic management as a multi-level system that includes energy production and energy consumption management. They note that the service of energy management, headed by an energy manager, is created at an enterprise. His/her functions include management of functioning of the service and provision of attaining planned effects of energy saving. At that the service of energy management connects an enterprise with inspections that supervise the effective use of energy resources. They also note that organization of the energy management service is the main task of state and regional management, and not a separate enterprise, and gives a scheme of the multi-level structure of energy management.

Problems of increasing the effectiveness of activity of organizations in the field of consumption of fuel-energetic resources are rather actively discussed at the state level. The increase of energy efficiency of Ukrainian economy at the expanse of rationalization of energy resources consumption, use of energy saving technologies and equipment is one of main positions of the Energetic strategy of Ukraine for the period till 2030, accepted in 2014 [10].

The state support in the field of energy saving and increase of energy efficiency may be realized by the following directions:

1) favoring realization of investment activity in the sphere of energy saving and increase of energy efficiency;

2) favoring elaboration and use of objects, technologies with the high energetic efficiency;

3) support of regional, municipal programs in the field of energy saving and increase of energy efficiency that provide, especially, achievement of the highest purpose indices of energy saving and increase of energy efficiency;

4) at realization of programs of stimulating production and sale of goods, consumption of energy resources may be inefficient. They have the high energy efficiency, for providing them in amount that satisfy the demand of consumers, at prohibition of limitation of production and turnover of goods, analogous by the aim of consumption;

5) state support of programs of energy saving and increase of energy efficiency may be realized, especially:

– by using stimulating arrangements, provided by the legislation about taxes and dues;

– by compensating a part of costs for interest payment for credits, loans, received in Ukrainian credit organizations.

This all proves the increase of the interest of Ukrainian organizations in solving problems of energy efficiency by

elaborating and realizing such programs. At the same time, these programs may be put in the base of formation of the modern energy management system in an organization, which functioning may later create a strong fundamental base for the continuous increase of energy efficiency on an organization.

In whole regulation of activity in the sphere of energy saving and increase of energy efficiency is based on the following principles:

1) effective and rational use of energy resources;

2) support and stimulation of energy saving and increase of energy efficiency;

3) system and complex arrangements on energy saving and increase of energy efficiency;

4) planning of energy saving and increase of energy efficiency;

5) use of energetic resources taking into account resource, production-technological, ecological and social conditions.

The named principles allow to determine that formation of energy management system in an organization has the brightly expressed strategic directionality, because this type of activity is oriented on the sustainable improvement of indices of energy efficiency and realization of principles of sustainable development of an organization, based on modern requirements.

The following methodology is offered for introducing the principles of energetic management as a strategic instrument of the sustainable development of an organization:

1. Control over energy consumption. Here it is necessary to not only take into account initial parameters (connection points of electric energy, heat, water), but also connect resources consumption with the output of final products (services).

2. Formation of offers as to investment in energy saving. Most enterprises have own programs. There are programs on energy saving or complex programs for increasing energy efficiency. They give a very good result, because the rigid planning of activity, based on the present volume of costs, is realized.

3. Realization of arrangements and support of control of energy efficiency. Because if this control is lost, and leaders or responsible persons stop to manage energy consumption systematically, an organization will step back inevitably. It is necessary for preventing it:

a) to create a resource accounting system, including separation of energy consuming objects in subdivisions –

in such a way the full energetic model of an organization with all energy-consuming power expressed will be received;

b) to conduct the primary energetic inspection, then to conduct the energetic monitoring and to repeat the energy inspection periodically;

c) then technical-economic and financial calculations must be done, and the list of investment arrangements, necessary for further development, is created, based on them;

d) to plan electric energy consumption, taking into account graphs of loading the equipment and other important factors;

e) to use the optimal construction of agreements on energy supply.

Let's note, that specialists in this field of activity emphasize that Ukraine pays the very minimal attention to such important instrument of attaining the sustainable development of an organization as energy management, although it is already very efficient in the international practice.

The effectiveness and results of functioning of the energy management system depends on the level of management of energy resource consumption of an organization. That is why elaboration and introduction of the system must be grounded on the analysis of a current situation, formed in an organization as to attained results of managing such consumption.

The assessment of correspondence of an organization to a concrete level, which characteristic is given in Table 2, may be used for it.

The level of energy consumption management gives grounds to judge about the economy of energy resources and efficiency of functioning of the formed energy management system of an organization. It is necessary to provide interaction of elements of this system at enterprises with the strategic direction of development for creating the effective energy management system. The structure of elements of energy management system and their interaction is presented on Fig. 1.

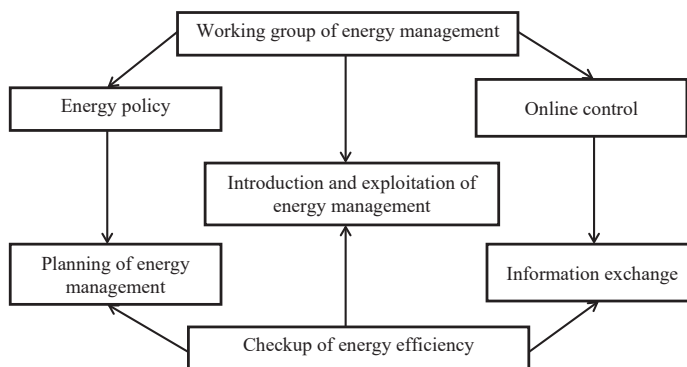


Fig. 1. The structure and interaction of elements of energy management

Table 2

Levels of management of energetic resources

Management level	Characteristic
Level 0	Absence of the energy policy, energy management or any formal delegation of responsibility for energy consumption. An organization doesn't account energy consumption, doesn't propagate energy saving among workers and doesn't invest costs in increasing energy efficiency
Level 1	The energy policy is also absent (there is only a set of recommendations, not fixed in written form). But there are created elementary information systems, based on accounting systems, low-cost arrangements are introduced, unofficial contacts are used to propagate energy saving
Level 2	The energy policy is established by an energy manager, or another specialist, responsible for this direction, but is not accepted officially. Reports of purpose monitoring are based on indications of commercial meters. Separate workers are taught energy saving, and investment takes place only at a short term of recoupment
Level 3	Is determined by the presence of the official energy policy (but highest leaders are not interested in it). Investment in the increase of energy efficiency is realized by the same recoupment criteria than all other types of investments. The program of «consciousness increase» is elaborated for the staff
Level 4	The energy policy, plan of actions and regular analysis of results are understood by highest leaders as a part of the general strategy. The distinct delegation of responsibility for energy saving takes place. There acts a comprehensive information system that allows to set aims, to look after consumption and to reveal breaches. There is conducted the detail estimation of investments in all variants of new building and modernization

Analyzing the structure of energy management, presented on Fig. 1, we may note that strategic questions as to setting and attaining energetic aims of an organization are solved principally and most deeply at stages of forming the energy policy and realizing strategic planning. Let's consider these moments more detail.

The energy policy of a modern organization is a formal statement of leaders of an enterprise about the general direction of actions in the field of energy saving, decrease of energy consumption of an enterprise and saving, strengthening and development of energetic safety of functioning of an enterprise, according to its strategic interests, long-term aims and nearest tasks.

According to it, the energetic policy must include:

1. Leading aims (duties) on the continuous decrease of energy consumption (increase of energy efficiency) and so on.
2. Resources, necessary for attaining set aims and tasks of energy saving, increase of reliability, safety and quality of energy supply.
3. Methods of attaining correspondence to legal duties, taken by an enterprise in the field of energy saving and energy safety.

Based on it, it may be assumed, that purpose criteria of the energy policy are determined, based on requirements of competitiveness by revealing best indices in analogous enterprises that work in the same market sector. The important condition of choice and establishing of criteria is also the depth of understanding of own internal problems and some acceptable (safe) risk level. The important role in determining purpose criteria is played also by the analysis and determination of long-term duties and plans of the development of an enterprise.

At industrial enterprises it is important to create the principle of energy policy, aimed at coordination of interactions between structural subdivisions for decreasing energy resources consumption. It is expedient to include representatives of the following structural subdivi-

sions to the working group on elaboration of the energy policy:

1) division of economy and planning is responsible for economic calculations as to decreasing costs for energy resources and planning costs for realization of arrangements as to decreasing energy consumption;

2) production-technical division, which competence must include the plan of arrangements as to the effective and rational use of energy resources;

3) main power engineering specialist – the function of organization and control of arrangements of energy saving must be within his/her responsibility.

The energy policy, elaborated and accepted by higher leaders of an enterprise is a ground for deployment of works on realization of the strategic planning of activity of an organization in the field of providing energy efficiency of functioning for the long period. The planning of strategic directions of activity within functioning of the energy management system in an organization is attaining planned indices, calculated for the long period by the division of economy and planning together with production-technical services. The most important planned index of the energy policy of an enterprise is an index of energy consumption, because it favors the decrease of energy consumption and saving costs from the realized energy policy. For attaining the planned index of energy consumption, members of the working group of energy policy must be guided by the correspondent principle and existent legislation in the field of energy saving. Taking into account the current state and peculiarities of the

development of the modern Ukrainian economy, growing role of alternative power industry, caused by the increasing role and importance of ecological problems, and strategic meaning of energetic safety for the economy of Ukraine, the important role is gained by the development of the methodology of management of the development of power industry. It will allow to attain the qualitative increase of the Ukrainian power industry and to create progressive capacities on electric energy production. The methodology of managing the development of the power industry branch, based on the state support, must be the complex coordinated approach to the assessment, management and planning of arrangements on providing the power industry development under modern conditions under the influence of internal and external factors (Fig. 2).

The structural transformation of the Ukrainian power industry for attaining its development must be realized under conditions of not only economic, but also ecological and social crisis that determines the specificity of this transformation, role and place of the state in the system of providing conditions of the development of the branch, economy and society in whole. Today economic problems are solved most often not only without taking into account ecological factors, social needs, including life activity in normal ecological conditions, but also at the expense of over-exploitation of natural resources that is extremely urgent for energetics. It conditioned the necessity of elaborating a set of instruments for taking into account ecological and social components at forming the mechanism of state stimulation of the power industry development.

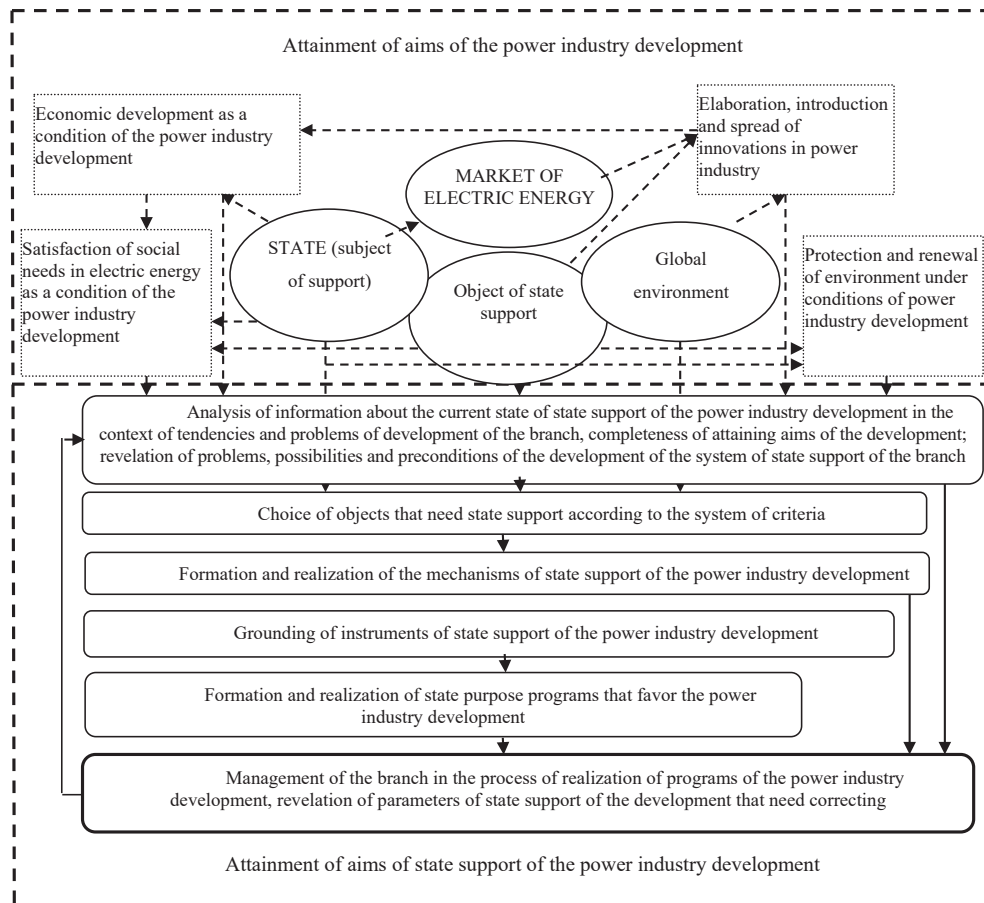


Fig. 2. The structural scheme of methodology of management of development of power industry branch, based on state support

For taking into account ecological and social components at forming the mechanism of state support of the power industry development, the author systematized instruments of economic, ecological and social policy, regarding their synergetic effect, according to laws and regularities of functioning of the national economy.

The efficiency of state support of the power industry branch development depends on balance of its structure and efficiency of functioning of separate components. At that the strategic paradigm of the power industry development may be characterized by three key aspects:

1. Non-linearity of the development (linear development may be observed at the short time interval only).
2. Multi-variant, alternative character of the development (branch economic system passes through a great number of bifurcation points, the change of a development trajectory is possible in each of them).
3. Ability of power industry to the qualitative development (accumulated indignations in the system may cause a transfer from one level to another).

The effectiveness of instruments of providing the power industry development is influenced by external (relative to the branch) factors, among which, ones of the global environment must be separated:

- globalization processes and competition at world energy markets;
- crisis tendencies of the world financial system;
- change of the conjuncture at world energy markets;
- level of shading of the world financial system;
- transnationalization of economy.

7. SWOT analysis of research results

Strengths. Formation of the energy policy, based on organizational moments, software and technical equipment allows leaders of an enterprise to make decisions as to

managing energy resources, directed on decreasing fuel-energetic resources.

Weaknesses. Ukrainian enterprises that are most consumers of energy resources face an acute problem of effective management of their energy economies. That is why it is necessary to create energy management services at enterprises and to involve specialists of the correspondent qualification for elaborating arrangements as to introducing energy management systems that will allow to decrease costs for using energy resources.

Opportunities. The problem of technical re-equipment of enterprises and reconstruction is typical not only for Ukraine, but for many countries with the continental type of climate. In EU countries solving energy problems is one of first-turn problems. The typical example is the development of Scandinavian countries. According to plans of the development of power industry in these countries for nearest decades, it is provided that the increase of the energy efficiency level at the expanse of investment in technique and technology may be compared with increasing the energy efficiency level as a result of arrangements, connected with EMS introduction. Thus, the base of successful functioning of an energy effective enterprise is two components: at first, technical one – proper equipment, technologies and infrastructure, at second, managerial one – rational management of an organization. These two components determine an economic result of activity of an enterprise and its investment attractiveness.

Introduction of energy management systems that correspond to requirements of modern international standards in Ukrainian organizations may create a completely effective system that will provide realization of separate principles of the sustainable development of an organization at the strategic level.

Threats. The following risks and problems may be separated among unsolved ones of the Ukrainian power industry (Fig. 3).

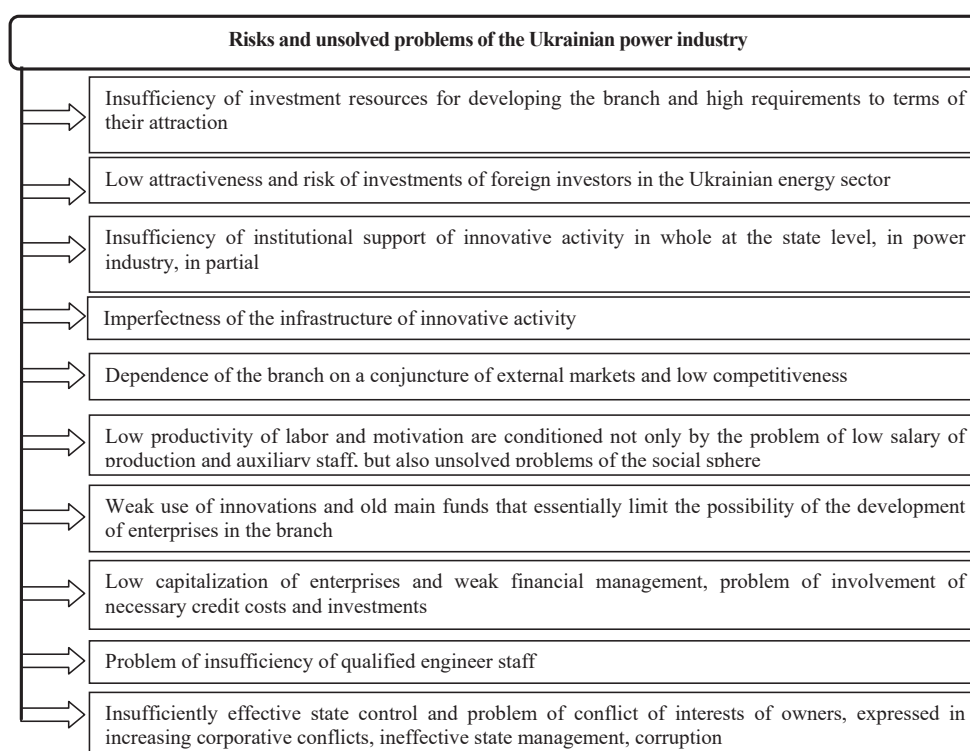


Fig. 3. Problems that restrain the development of Ukrainian power industry

The urgency of the problem of insufficiency of investment resources for the development of the branch and requirements to terms for their attraction is conditioned, in first turn, by the fact that, on one hand, formation of investment resources is a financial base for realizing a strategy of the development of both separate projects, development programs and energy sector in whole. On another hand, it is an independent block of this strategy (financial one) that determines strategic purpose criteria of choice and acceptance of an object of investments.

8. Conclusions

1. Having conducted the analysis of electric energy production in the combined energy system of Ukraine and grounded the necessity of using energy management, it was established, that electric energy production in the combined energy system (CES) of Ukraine in 2017 increased by 2.5 % (by 1 bil 884.8 mil kW-hour) comparing with 2016 – to 78 bil 345.8 mil kW-hour. Nuclear power plants (NPP) increased electric energy production by 13.5 % – до 45 bil. 617.1 mil. kW-hour. Especially electric energy production at Zaporizhzhya NPP was 19 bil. 178.4 mil. kW-hour (+33.4 % to January of 2016), Southern-Ukrainian – 8 bil. 366.3 mil. kW-hour (+6.4 %), Rivne – 9 bil. 706.1 mil. kW-hour (+3.5 %), Khmelnytsky – 8 bil. 366.3 mil. kW-hour (–2.5 %). For providing the sustainable economy of costs for energetic resources, it is necessary to introduce the system of energy management in the management of energetic economy of an enterprise that is rather successfully applied in the world practice. Introduction of such systems at foreign enterprises gives 5–15 % of economy of energetic resources of enterprises of different profiles [1]. At the same time energy management cannot by an occasional arrangement, but needs continuous realization of arrangements on energy saving, monitoring of achieved results for realization of effective management of activity of an enterprise in the sphere of increasing energy efficiency.

2. It was shown that the energy policy, elaborated and accepted by higher leaders of an enterprise is a ground for deployment of works on realization of the strategic planning of activity of an organization in the field of providing energy efficiency of functioning for the long period.

The planning of strategic directions of activity within functioning of the energy management system in an organization is attaining planned indices, calculated for the long period by the division of economy and planning together with production-technical services. The most important

planned index of the energy policy of an enterprise is an index of energy consumption, because it favors the decrease of energy consumption and saving costs from the realized energy policy. For attaining the planned index of energy consumption, members of the working group of energy policy must be guided by the correspondent principle and existent legislation in the field of energy saving.

References

1. Dehtiarova O. O., Pudycheva H. O. Orhanizatsiia enerhomenedzhmentu v systemi upravlinnia enerhetychnym hospodarstvom // Visnyk sotsialno-ekonomichnykh doslidzhen. 2012. Vol. 4. P. 289–295.
2. Dziadykevych Yu. V., Hevko R. B., Rozum, R. I. Buriak M. V. Upravlinnia protsesamy efektyvnoho enerhoberezhennia // Innovatsiina ekonomika. 2010. No. 17. P. 151–154.
3. Dosvid stvorennia ta funktsionuvannia systemy enerhomenedzhmentu u VNZ / Deshko V. I. et al. // Enerhetyka: ekonomika, tekhnolohii, ekolohiia. 2016. No. 2. P. 34–45.
4. Yücel M., Halis M. ISO 50001 based integrated energy management system and organization performance // Journal of Advances in Technology and Engineering Research. 2016. Vol. 2, No. 2. doi: <http://doi.org/10.20474/jater-2.2.5>
5. Wagner K. W., Käfer R. ISO 9001 als Hilfsmittel und Checkliste // PQM – Prozessorientiertes Qualitätsmanagement. CarlHanserVerlagGmbH&Co. KG, 2017. P. 145–274. doi: <http://doi.org/10.3139/9783446452688.010>
6. ISO 14001. Environmental Systems Handbook. London: Routledge, 2012. 272 p. doi: <http://doi.org/10.4324/9780080478807>
7. Davydenko L. V. Upravlinska funktsiia benchmarkinhu enerhoeffektyvnosti ta yoho rol v systemi enerhomenedzhmentu pidpriemstva // Suchasni napriamky tekhnolohii ta mekhanizatsii protsesiv pererobnykh i kharchovykh vyrobnytstv. 2015. No. 165. P. 116–117. URL: <http://journals.uran.ua/index.php/wissn021/article/view/63934>
8. Shveda N. M. Formuvannia systemy upravlinnia mashynobudivnymy pidpriemstvamy na zasadakh benchmarkinhu: Thesis of Doctor of Economical Sciences. Ternopil, 2015. 245 p. URL: http://elartu.tntu.edu.ua/bitstream/123456789/5473/12/dysertacija_SHveda.pdf
9. Nakhodov V. E., Borychenko O. V., Ivanko D. O. Kontrol efektyvnosti enerhovykorystannia v systemi enerhetychnoho menedzhmentu // Visnyk KNUVD. 2013. Vol. 6. P. 67–77.
10. Enerhetychna stratehiia Ukrainy na period do 2030 r. URL: <http://www.a-e-s.com.ua/pdf/rasporozhenie-kmu-ob-odobrenii-energeticheskoy-strategii-ukrainyi-na-period-do-2030-goda.pdf>

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