

# Methodological approach to identifying priority problems of the industry

VLADIMIR KOKSHAROV<sup>1</sup>, BERIK JAMANBALIN<sup>2</sup>, OLGA KOMISSAROVA<sup>3</sup>,  
NATALYA ALIBEKOVA<sup>4</sup>

Ural State University of Communications<sup>1</sup>, Kostanay Social and Technical University named  
after Academician Z. Aldamzhar<sup>2,3,4</sup>

Emails: [vkoksharov@mail.ru](mailto:vkoksharov@mail.ru)<sup>1</sup>, [pkkstu@mail.ru](mailto:pkkstu@mail.ru)<sup>2</sup>, [olga.komissarova@list.ru](mailto:olga.komissarova@list.ru)<sup>3</sup>,  
[alibekova.natalya@mail.ru](mailto:alibekova.natalya@mail.ru)<sup>4</sup>

Russian Federation<sup>1</sup>, Kazakhstan<sup>2,3,4</sup>

*Abstract:* The article examined indicators that have a certain impact on the energy efficiency of the Kazakhstan economy. Competent management of these factors will help move towards a more sustainable energy future and an energy-efficient economy. In order to innovative develop energy systems in Kazakhstan, a number of programs have been adopted at the legislative level. The state program of industrial and innovative development of the Republic of Kazakhstan was adopted with the aim of improving the competitiveness, financial stability, energy and environmental security of the Kazakhstan economy, as well as increasing the level and quality of life of the population by realizing the potential for energy conservation and improving energy efficiency through modernization, technological development and transition to the rational and environmentally responsible use of energy resources.

Currently, the solution to the problem of highlighting the main problems of the industry is based solely on expert opinions; the organization of working advisory groups at the level of, for example, the governments of the regions and the country as a whole; analysis of reports of the work of individual large enterprises; analysis of trends in individual indicators; analysis of the work of the ministries responsible for the work of the fuel and energy sector. If we generalize the methods used to highlight the main problems, then all of them can be attributed exclusively to the least objective, extremely superficial and unreliable. At the same time, the correct distribution of financial and other always limited resources depends on the quality of this stage of strategic activity, as well as the results of the development of the industry and country as a whole. The complexity of the task is compounded by the many existing problems of the industry at this period of its development.

*Key-words:* gross domestic product (GDP), energy intensity of GDP, gross regional product (GRP), energy efficiency, labor productivity, gross value added, inflation, competitiveness, employment, innovation.

## 1 Introduction

Despite the stable position of the economy of Kazakhstan due to state policy that develops both the basic sectors of the economy and small and medium-sized businesses, there is a number of challenges that require a more objective, deeply and comprehensively than was done until recently, to look at the problems of managing the electric power industry in Kazakhstan and, in particular, the problems of decision-making to increase the competitiveness of electric power enterprises.

## 2 Problem Formulation

The purpose of the study is to develop theoretical foundations and methods for determining the priority problems of the development of the electric power industry in the formation of strategic plans for the country's development. To achieve the

goal, the following tasks were set and solved:

1. To investigate existing methods and propose a conceptual approach to identifying priority problems in the development of the country's electric power industry.

2. To develop and propose an author's approach to identifying priority economic problems of the electric power industry, based on taking into account the links between the organizational and financial form of enterprises with the growth of innovations, the scale of investments and the level of competitiveness

2. To develop a methodological approach to assess the impact of priority problems of the industry on the level of security of the country and the life of its population.

Despite the wide range of studied problems, the scientists left outside the attention of the

questions related to the new theoretical approach to understanding monitoring, which has a strategic, predictive focus. This fact means that many studies of this issue were carried out in the period preceding the current cardinal market transformation of the electric power industry.

### 3 Problem Solution

The consumption of energy resources is the basis of the scientific and technological development of the state, the formation of the material basis for the life of the population. The stability of the development of the country as a whole and its production sector is characterized with energy indicators, including energy intensity. The well-known economic interpretation of energy intensity is a relative indicator that compares the use of energy resources spent on the main and auxiliary technological processes based on a given technological system, and the given results (the cost of manufactured products, work performed, services rendered).

The high energy intensity is primarily due to the structure of Kazakhstan's economy. The country's industrial sector, which accounts for nearly 30% of total GDP, includes energy-intensive industries such as mining and non-ferrous metals. The climate of Kazakhstan with severe winter colds determines a high share of heating costs, and the wide extent of its territory implies a high share of the transport component per unit of GDP. Other factors of high ene

Other factors of high energy intensity are the relatively low level of implementation of energy efficient technologies and a high degree of equipment wear. Kazakhstan consumes about 25-30% more fuel to produce one unit of energy than more developed countries. The main reasons are worn out equipment and low efficiency of technological processes [1,2]. The electricity sector accounts for more than 80% of total greenhouse gas emissions. Kazakhstan intends to reduce the energy intensity of the national economy by a quarter of 2020.

Consider the possible directions for the development of GDP energy intensity:

1. With an increase in the volume of consumed energy and a decrease in the volume of GDP, the value of energy intensity increases. Such a scenario would be considered ineffective.
2. With an increase in energy consumption and an increase in GDP, energy intensity may decrease if GDP grows at a faster pace, or it may increase if the growth rate of energy consumption exceeds the GDP growth rate.
3. The most energy efficient scenario is an increase in GDP, accompanied by a decrease in energy consumption. In this case, the energy consumption decreases [3].

Analysis of productivity at the regional level will allow each industry to identify the most successful regions.

In order to compare regions with approximately the same price level, an indicator of labor productivity is sufficient. If prices differ, it is necessary to include labor productivity per one tenge of wages in the analysis.

The high competitiveness of the economy of Kazakhstan is possible as a result of an increase in its efficiency, this is associated with highly productive labor in all sectors through the introduction of the latest technologies.

As a result of the provision of systemic support measures to enterprises within the framework of the state program, the launch of new production facilities, the modernization and expansion of existing enterprises continues. For 6 months of 2018, within the framework of the Industrialization Map, 18 projects were introduced for the amount of about 187 billion tenge, more than 1.8 thousand permanent jobs were created.

The largest contribution to the country's GDP was made by the manufacturing industries: metallurgy (5.1% of GDP), food processing (1.7% of GDP), oil refining (1.3% of GDP) and production of construction materials (0.8% of GDP). In the total volume of GVA of the manufacturing industry, prevailing are: metallurgy (39.9%), food industry (13.4%), oil refining (10.4%), production of building materials (6.3%).

The forecast for the development of economic sectors is presented in Table 1.

Table 1

Forecast of development of economic sectors,% to the previous year

Name	2018	2019	2020	2021	2022	2023
	Evaluation			Forecast		
PRODUCTION OF GOODS	103,4	103,3	103,9	103,6	103,4	104,8

Agriculture	103,6	106,2	108,0	105,2	106,3	106,3
Industry	103,3	102,7	103,3	103,2	102,7	104,6
Mining industry	101,9	102,1	102,1	102,4	101,4	106,9
Mining of coal and lignite	100,0	99,0	98,0	96,0	94,0	92,0
Oil production	100,9	101,1	101,1	101,1	100,0	110,0
Extraction of natural gas	101,0	101,1	101,1	101,1	100,0	110,0
Processing industry	105,1	103,8	105,0	104,4	104,3	103,0
Food	105,0	106,2	106,7	107,0	107,7	108,6
Refining	108,3	99,7	99,7	99,7	99,7	99,7
Chemistry	105,8	102,8	111,8	112,6	110,7	100,4
Non-metallic mineral products	105,8	104,5	105,5	105,4	104,7	104,7
Metallurgy	104,7	103,9	105,1	103,1	102,3	100,2
Mechanical engineering	107,0	104,9	105,8	104,8	105,6	105,2

Taking into account the priorities of economic policy, the driving force behind the growth of economic activity in the medium term will be the processing and agro-industrial complex, the construction industry, the transport and logistics sector and the service economy. Thanks to the implementation of the SPIID and the agro-industrial complex projects, the diversification of the economy will continue due to the accelerated development of high value added industries, an increase in non-resource exports and the attraction of foreign direct investment in non-resource sectors. [9]. Increasing the competitiveness of the manufacturing industry is the main task of the country and will be one of the most important factors in the development of the economy in the medium term, since it is the manufacturing industry that makes it possible to achieve technological modernization of the economy, generates the largest number of jobs, and also reduces the level of influence of external economic factors on national economy.

The complexity of the task is aggravated by the multitude of existing problems of the industry at this period of its development. As an example of industry challenges, a small sample of this list is provided below:

Problems of reproduction of fixed assets: large wear and tear of energy capacities; shortage of generating capacities in the energy system caused by the lack of mechanisms to ensure the construction of new generating capacities and the reconstruction and overhaul of existing energy sources; lack of private investment in the industry; the problem of organic integration of alternative, relatively inexpensive sources of generation into the existing power supply system; increased costs for the modernization of energy facilities and the development of new networks.

Problems of innovation: the lack of

incentives for energy producers to innovate; practically no implementation of high-tech solutions in the industry; lack of incentives for power grid enterprises to introduce new technology. [11]

Problems of the formation of the electric energy market: reduction of the competitive environment among energy producing organizations that "divided" among themselves the consumers of the wholesale market (up to 50% of Kazakhstan's electric energy supplies are now concentrated at three power plants); those affiliated with these three power plants are given the priority right to conclude contracts and supply energy, which significantly violates the rights of energy consumers; power supply organizations dictate their terms and conditions, in terms of supply volumes, and in terms of payments when concluding bilateral agreements; lack of a full and timely analysis of the current situation on the electricity market in Kazakhstan; the lack of regulations describing the volumes, timing, frequency and procedure for providing information on the electricity market creates a problem for the functioning of the energy system; in fact, the balancing electricity market does not function due to the lack of a sufficient volume of reserve, flexible capacities in the power system.

Energy efficiency problems of the functioning of power systems:

- increase and complication of energy flows;
- the problem of growing requirements for energy efficiency and "environmental cleanliness" of production;
- Kazakhstan is dependent on the supply of "peak" electricity from the Russian Federation and from Kyrgyzstan;
- large losses of electricity in electrical networks, etc.

Pricing problems: the problem of improving the tariff system in the wholesale market, taking into

account also the streamlining of the tariff setting system in the retail market; problems of cross-cutting social subsidies (covering the costs of supplying the population with electricity at the expense of higher tariffs for industrial consumers than required by calculations); an increase in energy prices for the end consumer due to difficulties in organizing financial flows (when receiving electricity from a power plant connected to the electric grids of one REC, through the networks of the system operator of the market, consumers located in the electrical networks of another REC must pay: energy through the networks by both RECs, as well as the tariff of the system operator); inconsistency in the purchase / sale price of imported / exported electricity (for example, if there is cheap electricity from Kyrgyzstan, Kazakhstan generators sell electricity to Russia at prices lower than the average selling price of electricity within the country); when developing a strategy for the development of the electric power industry in Kazakhstan, there is a lack of objective information on the prospective prices for electricity; decrease in collection of payments due to the increase in the cost of electricity; there is no difference in cost between "base" and "peak" electricity; the problem of creating differentiated tariffs for electricity has not been fully resolved

Even from this brief selection of problems it is clear:

- a) the usual "vagueness" of the wording of the problems;
- b) economic and organizational-management orientation of most of the current problems;
- c) often strong aggregation of each problem;
- d) most likely, the variability of ways to solve them;
- e) "multilevel" problems (i.e. problems are located at different levels of the hierarchical tree: "problems - for problems - causes of their occurrence - for reasons - sets of measures - specific measures");
- f) the latter circumstance also makes it impossible to select priority problems from this list by simple expert methods (for example, by the method of concordance, etc.). [14,15]

The proposed methodological approach to identifying priority problems aimed at improving the quality of the considered stage of developing strategic plans for the industry should:

Firstly, to increase the objectivity of the selection of priority problems of the industry;

Secondly, - to unify and formalize as much

as possible the procedure for this selection, i.e. make it as usable as possible not only in the industry considered as an example - the electric power industry, but also in all other large sectors of the economy; thirdly, not to lead to an increase in the complexity of this procedure.

In order to increase the objectivity of the selection of industry problems, the first idea is: a) to take into account the goals and priority problems of the country ("super-goals"); b) taking into account the organizational goals of the industry; c) in the use of fairly objective assessments of the world rating of the country's competitiveness.

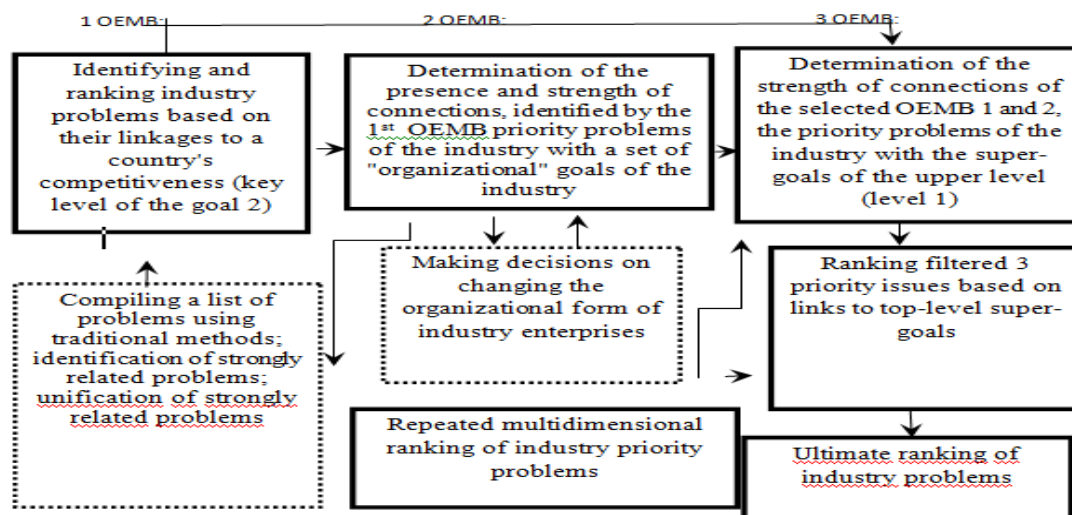
In order to unify the procedure for selecting priority problems, the second idea consists in: a) maximum formalization of links, both between the goals of the country and between the goals of the country and the problems of the industry; b) in a clear algorithmization of all calculations and constructions. [16]

In order to minimize the complexity of the algorithm for selecting priority problems in the industry, a third idea is proposed: the selection of problems takes place in three consecutive stages.

At the first stage, the problems of the industry are selected as priorities from the point of view of one of the important economic goals of the country - the country's competitiveness.

At the second stage, problems are selected from the point of view of a set of strongly related industry goals (this set of goals is strongly related to the organizational and financial form of the industry). At the third stage, some of the previously selected problems pass through one more OEMB and are ranked in terms of the strength of their influence on the ultimate goals of the country of the highest level. Picture 1 shows an enlarged methodological scheme for identifying priority problems of the industry, which can also serve as an enlarged logical scheme of work.

This logical scheme can at the same time serve as a methodological scheme for identifying priority problems: in it, elements are highlighted in bold lines, according to which certain methods have been developed in the work. One of the elements of the scheme - "Compiling a list of problems by traditional methods" - is included in the scheme due to the presence, as a rule, of a wide range of problems that are usually identified in the course of the current activities of industry enterprises and the industry as a whole. In particular, this applies to the current state of the electric power industry in Kazakhstan.



Pic.1. Scheme for identifying priority problems of the industry (bold lines indicate blocks for which detailed methods have been developed; dotted lines - those that are not the purpose of this study), "OEMB - organizational and economic management barrier"

The expected effects from the application of this methodological approach are due to the following considerations:

1) an objective choice of priority problems of the industry, most likely, should lead to a decrease in the total volume of necessary investments for the development of the industry, since when using the proposed methodological approach, there will be no erroneous dispersion of funds on secondary problems or problems that are not currently priority ones, or which in the future can "self-resolve", or which, for various reasons, can be temporary.

2) This is due to the fact that the reliance on the country's goals, which are both long-term and sustainable, also ensures the sustainability of the very range of ranking of the industry's problems;

3) since one of the country's goals is the need to increase its competitiveness, which, among other

4) things, is assessed by the global world rating, an increase in this rating can lead to an increase in foreign investment, then to an increase in GDP, improvement of other goals of the country, etc.;

5) the methodological approach presupposes, as a first step, the compilation of the most complete list of industry problems using the maximum possible list of information sources, which will apparently allow avoiding "gaps" in the analysis of problems at subsequent steps. In addition, the methodology in 1 OEMB allows identifying additional problems, thereby expanding the list of industry problems.

Analysis in 3 OEMB also allows in some cases to see additional problems that should be included in the list of industry problems. The problems of the industry with the proposed approach pass several rankings and the results of these rankings in the general case, of course, do not coincide. [17, 18] The number of problems that pass the ranking at different stages may also differ. In order to overcome its cumbersome perception, some important details are deliberately omitted, namely:

1) it does not indicate the ranking series that can be built as a result of an action according to the block diagram. These ranks are shown in Pic. 2;

2) in barrier 1: in addition to the indicated problems related to the country's competitiveness and forming the K-series of ranking, in the general case, there may be problems that are not related to it. The latter form part of the T-series of the ranking;

3) in barrier 3: problems not related to the two super-goals of the country are not shown. A number of ranking of industry problems associated with the country's super-problems in this barrier are indicated in Pic. 2 as B-row ranking.

4) in barrier 2: when deciding on the need to change the organizational form of the industry, the problems associated with "organizational" goals-factors, under the conditions specified in the text, are transformed into one problem - "The problem of the need to change the organizational information of the industry", therefore the number of problems for further ranking in this case, the previous ranking decreases. [19] (K-rankings) is deformed accordingly and hereinafter referred to as A-

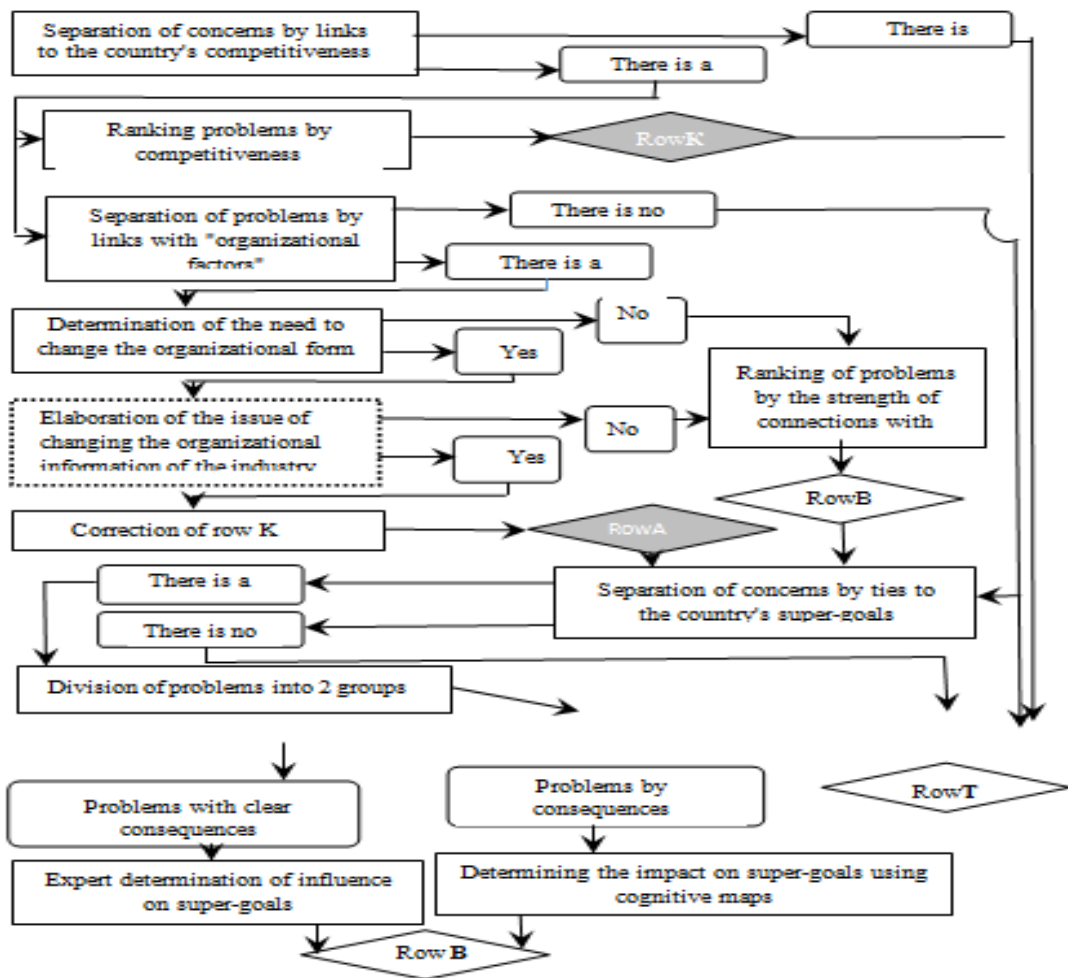
rankings. When deciding whether to leave the organizational financial form of the industry unchanged, in addition to the K-series of ranking, one more (B-series of ranking problems) is added, connected with the study of the relationship of industry problems with "organizational" goals-factors;

5) the problems that are not directly related to the country's competitiveness (for example, purely technical or technological, maybe some of the environmental problems, etc.) are separately highlighted and collected in another ranking ("T-series of ranking"); that are not related to "industry target"; which are not related to the country's super-goals. The ranking of problems in this series should

be carried out by traditional expert methods without analyzing the relationship with sectoral goals and the goals of the country.

It proposes a classification of industry problems according to 10 criteria that serve as a necessary and important stage in the preliminary analysis of the initial information, namely: a) analysis of the sources of industry problems, which allows to identify additional industry problems; b) preliminary sorting of the list of problems in the industry, which can speed up both the process of preparing for ranking problems and passing through the stages of this ranking. [20]

In fig. 2 is a detailed block diagram of obtaining a plurality of series of ranking problems.



Pic.2. A block diagram of the implementation of the proposed approach (obtaining the ranks of ranking industry problems: rows V, B, T, K or A)

The resulting several series of ranking problems should be further combined into one final series, the algorithm for obtaining which is

clear from the fragment given in Table 2. [21]

The complexities of multidimensional ranking in this case are associated with: different lengths of different ranking series; the presence of

alternative rows and their different number (depending on the identified need to change the organizational form of the industry or when leaving

the existing organizational form, either row **A** or row **K** is used); different significance of rows, etc.

Table 2  
 Multidimensional ranking of industry problems (fragment)

	Row designation, see pic. 2	Ranking row weight, $\mu$	Industry problems and their ranks ( $P_{IR}$ )									
			$P_{31}$	$P_2$	$P_{169}$	$P_{46}$	$P_{57}$	$P_{77}$	$P_{107}$	$P_{115}$	$P_{102}$	$P_{99}$
Ranking	<b>V</b>	0,16	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>8</b>		
	<b>K</b>	0,24		<b>5</b>			<b>4</b>	<b>1,5</b>	<b>1,5</b>	<b>3</b>		
	<b>B</b>	0,12	<b>4</b>		<b>5</b>		<b>1</b>	<b>3</b>		<b>2</b>		
	<b>T</b>	0,48									<b>1</b>	<b>2</b>
Multiplying the weight of the series by the corresponding ranks of the problems:												
$\mu * P_{IR}$			0,16	0,32	0,48	0,64	0,96	0,96	0,96	1,28		
				1,20			0,96	0,36	0,36	0,72		
			0,48		0,60		0,12	0,36		0,24		
											0,48	0,96
Sum by lines			0,64	1,52	1,08	0,64	2,04	1,68	1,32	2,24	0,48	0,96
Final row of ranking			<b>2,5</b>	<b>7</b>	<b>5</b>	<b>2,5</b>	<b>9</b>	<b>8</b>	<b>6</b>	<b>10</b>	<b>1</b>	<b>4</b>

#### 4 Conclusion

The expected effects of the application of this methodological approach are due to the following considerations.

1. By linking the operation of ranking the problems of the industry and highlighting the main ones with the goals of the country, which also represent an unequal, ranked set. Without such a linkage, that is, with an isolated procedure for ranking problems, this procedure loses in many respects its validity, is in a sense random and may not only fail to improve the goals of the top management level in relation to the industry, that is, the country, but also postpone the achievement of these goals. Since in the proposed methodological approach, when developing a strategy for the development of the electric power industry, emphasis is placed on taking into account the country's goals, this can serve as a unifying moment in the preparation (and so-called updating) of regional energy programs by making a single decision on the priorities of action and, on this basis, accelerate progress towards achieving the goals country.

2. An objective choice of the main problems of the industry, most likely, should lead to a decrease in the total volume of necessary investments for the development of the industry, since when using the proposed methodological approach, there will be no erroneous dispersion of funds on secondary problems or problems that are not currently priority ones, or which in the future may "self-dissolve", or which for various reasons

may be temporary. This is due to the fact that reliance on the country's goals, which are both long-term and sustainable, also ensures the sustainability of the very range of ranking of industry problems.

3) Since one of the country's goals is the need to increase its competitiveness, which, among other things, is assessed by the global world rating, an increase in this rating can lead to an increase in foreign investment, then to an increase in GDP, improvement of other goals of the country, etc.

4) Developed detailed and clearly structured algorithms for calculations and making intermediate and final decisions to highlight the main problems of the industry will allow the use of IT technologies and, on this basis, facilitate and simplify the process of drawing up strategic programs for the development of the industry, relieve program developers from the routine part of work, make this process less time consuming.

5) The proposed methodological approach will allow: to increase the objectivity, validity and additional reasoning of the choice of the really main problems of the industry, to increase the confidence of workers in the industry and the government at the level of both regions and the country as a whole in the correctness of strategic decisions.

6) The methodological approach presupposes, as a first step, drawing up the most complete list of industry problems using the maximum possible list of information sources, which will apparently allow avoiding "gaps" in analyzing problems at subsequent steps.

7) The use of IT technology in the

development of strategic programs for the industry should increase, among other things, the culture of management in terms of preparing responsible decisions.

8) The proposed methodological approach to the selection of the main problems of the electric power industry may allow the use of ideas and some parts of this approach in a number of other complex or complex sectors of the economy.

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### **Contribution of individual authors to the creation of a scientific article (ghostwriting policy)**

Vladimir Koksharov, Berik Jamanbalin research concept, information gathering

Olga Komissarova material processing, statistics

Natalya Alibekova material processing, translation of the text