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Energy-Economic Analysis of Corporate Activities in the System of Energy Management

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Abstract: Introduction of Energy management International Standard ISO 50001 into activity of national enterprises is limited by the number of factors; the key one among them is absence of appropriate methodological support. In the process of this study it was established that this problem exists in world practice too. Foreign scientists propose author methods which allow to solve separate issues connected with realization of standard in practical activity of enterprises. We also developed the method of energy-economic analysis of enterprise activity which can be used in analysis within framework of energy management system.

Key words: Energy management % Direction % Methods % Algorithm % Standard

INTRODUCTION

International standard ISO 50001: 2011 "Energy management - requirements with guidance for use" was adopted in 2011. Since this date and up to April of 2013 13 Russian enterprises were certified to this standard. In Germany during the same period 1394 enterprises were certified. [1]. Since Russia's accession to WTO and increase in competition from the side of foreign producers such low certification rate to this standard signalize about passivity of top-management and reluctance to follow modern trends of world managerial practices. The situation is aggravated by present high rate of energy-consumption of our GDP which does not improve for years. By information from International Energy Agency energy consumption in Russia is 3 times higher than in Germany [2].

Certification to the standard ISO 50001: 2012 means that at the moment of certification the enterprise has developed a system covering all processes connected with purchasing, spending and utilization of energy resources which allows to bring into order the activity of enterprise in the framework of these processes in accordance with the standard's requirements, the necessity of which was emphasized in 2005 in [3]. The advantages which enterprises will get after realization of this standard are as follows: reduction of production costs because of reduction of energy consumption and improvement of functioning of enterprises due to increase in energy efficiency [4]. Consumers, as a rule, will benefit from the use of this standard because of reduction of sales price for goods produced by enterprises. Also consumers' opinion (especially their representatives in different countries of the world) is influenced by the fact that the production of enterprise was produced with the use of energy-saving technologies and without damage to environment. So, if the use of energy management system is so profitable for enterprises why national companies are so reluctant to adopt these technologies?

One of the reasons, in our opinion, lack of information in Internet about national enterprises which has already used this system and about positive results obtained after its implementation. Website for professionals in the sphere of energy management contains very scarce information about practical experience of using this system. Information about how the enterprises can use this system and which results are expected in future is almost absent [5].

One more reason is absence of incentives from state power bodies. In a number of foreign countries the Governments adopt measures to stimulate and provoke interest in introduction of such systems. For example, in France, since 2008 those enterprises which have been certified to ISO 14001 will be inspected only once in 10 years, while the others - once in 5 years. In Saxonia organizations certified to ISO 14001 will get state orders first.

One more reason for low activity of national enterprises in regard to certification to ISO 50002:2011 is their assumption that implementation of the system of

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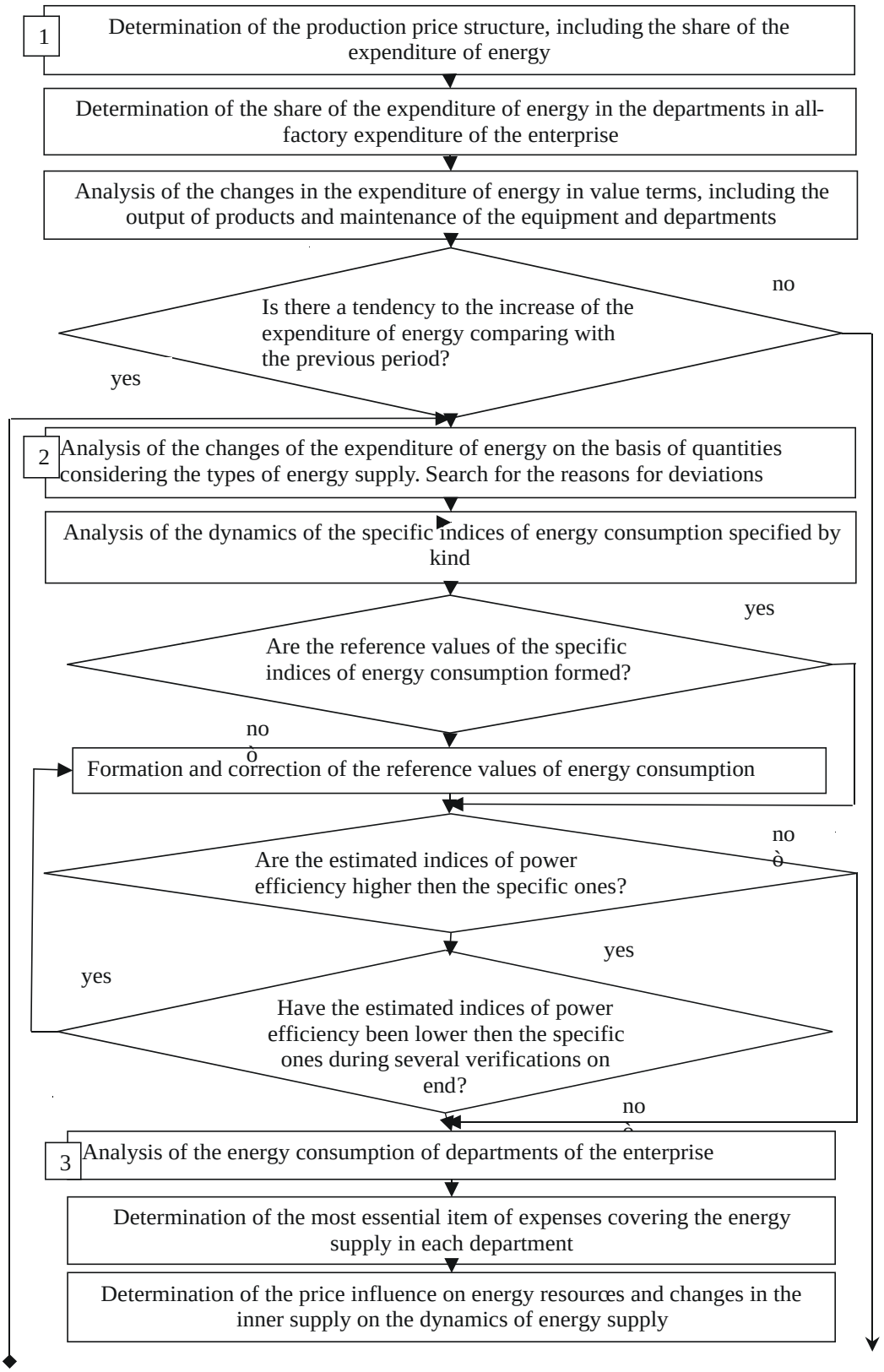

Fig. 1: Continued

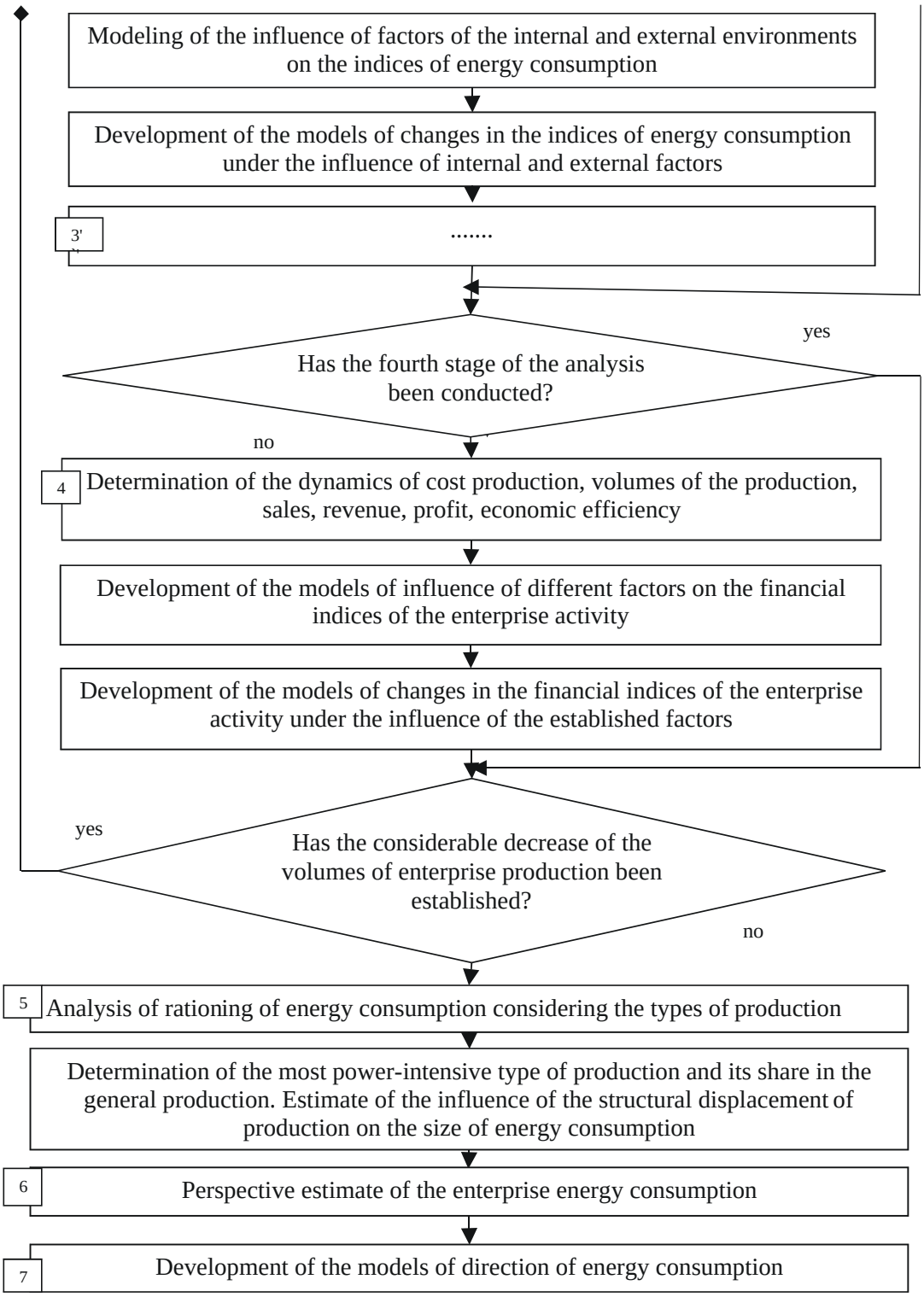

Fig. 1: Algorithm of energy-economic analysis of enterprises activity

energy management must be done only by specialized organizations because already in the very beginning of works to the standard the enterprises face difficulties connected, first of all, with understanding of terminology of the standard and , secondly, with realization of some stages mentioned in the standard - documentalization and informational support. The situation gets a bit less complex if some other system has been already adopted at the enterprises, for example the Quality Management or Ecologic Management system [6, 7]. Standards of these systems are built in the same rules and include the same sequence of actions. In spite of this, most part of enterprises ask third party which provides services in the sphere of energy management and which can give practical recommendations how to develop this system. Some practical aid in regard to implementation of the system is considered in [4] and [8]. The [9] proposes implementation of energy management at enterprises using the model "integration-energy-practice". The [10] considers how sphere of interests of enterprises can be broadened while interacting with energy resources suppliers thanks to implementation of the system of energy management.

Main Text: Practical aid, in our opinion, must include at least methodological support, algorithm of works and documentalization. Analysis of ISO 50002:2011 allowed to say that realization of some stages suggests use of appropriate methodological support. Performance of energy analysis of the enterprise is one of these stages. The particularities of doing such analysis were described in works of national and foreign experts [11-14].

Present work proposes the method of cross-factor energy-economic analysis of enterprise activity, which significantly improves potential of analytical activity in the system of energy management necessity of which was emphasized at [15] and [16].

Methodology and Results: The algorithm in Figure 1 demonstrates some stages of energy-economic analysis.

The 1st stage is evaluation of dynamics of changes in enterprises costs. Focus is on dynamics in energy consumption.

Here energy consumption is evaluated both totally and separately, for production of goods and feeding equipment, workshops and the offices with electric energy. If the analysis has discovered growth of energy consumption in any analytical variant then the second stage of analysis must be performed.

At the second stage the values of energy consumption are analyzed in natural form. It is done in order to eliminate influence of price factor and focus on internal aspects of production activity. At this stage the dynamics of energy consumption is analyzed by their kinds. The main purpose of the 2nd stage is identification of the level of energy efficiency of the enterprise for the analyzed period of time. This is achieved by comparison of current indicators of energy consumption with the corresponding values formed as energy base line. If this stage of analysis is carried out for the first time then energy base line of the enterprise must be formed at this stage.

Standard ISO 50001:2011 defines energy base line is quality values for some period of time for comparison of energy efficiency levels. [17]. Developed by us method suggests that energy base line is the best values of specific indicators showing energy efficiency of enterprise for analyzed period of time.

The best values of specific indicators of consumption of energy resources will be used by us as benchmark values (energy base line) for comparison of calculated values of energy efficiency with them and identification of trends in changing of efficiency of energy resources consumption at the enterprise.

The values of energy base line can be checked and adjusted if after 2 and more times of conducting energy-economic analysis they were worse than calculated values of energy resources consumption.

If at the 1st stage of analysis the trend in growth of energy consumption was not found this can signalize about the increase in energy efficiency of enterprise activity if the current rate of production will not change. This boundary condition is checked at 4th stage of energy-economic analysis. This stage is devoted to analysis of the main production and financial-economic indicators of enterprise activity, how they are influenced by external and internal environmental factors of the enterprise. If 4th stage of analysis discloses significant reduction in volumes of production activity, then reduction of energy consumption which was found out at the 1st stage can not be considered as the result of energy efficiency operation of the enterprise. In this case additional 2nd and 3rd stages are needed. The degree of significance will be judged by price growth rates for energy-resources. If reduction of production is more than

these rates then it means that at enterprise reduction of production volumes takes place. Energy resources which will be taken into account must be chosen in such a way that their specific weigh in energy consumption of the enterprise should be maximal.

At 4th stage not only analytical tasks can be solved but the tasks of strategic management as well. For example, at this stage the economic-mathematical models which show influence of different factors, including energy, on end financial and economic results of the enterprise can be built. Such models will allow in future to form scenarios of changes of the indicators in question under the influence of energy factor reflected in economic-mathematical models.

Returning to Figure 1 on which the algorithm of energy-economic analysis is shown we shall now consider 3rd stage of the analysis. This stage suggests analytical work on evaluation of energy consumption by every workshop, every process and piece of equipment. Depth of analytical work performed at this stage is determined by the results which will be obtained in the process of realization of this stage. At initial stage the reasons for increased energy-consumption by divisions (workshops) are identified. If given data do not clarify the reasons similar analysis must be performed at the level of production processes. Most detailed analysis of energy consumption is done at the level of production equipment. 3rd stage can also be used for solution of strategic management problems. Here the same set of tools can be used including mathematic simulation and scenario approach. International agencies of energy planning also propose some tools for strategic management but because of insufficient information about them industrial enterprises use them rather rarely [18]. At this stage it is appropriate to build models of influence of internal and external factors on the energy consumption and scenarios of changing of energy consumption when the current dependencies will remain the same and with due regard to energy-saving measures and realization of perspective energy projects.

5th stage of energy-economic analysis is intended for evaluation of factual and planned (expected) energy consumption rates for production of goods. At this stage the most energy-consuming products will be identified. The influence of changes in the structure of produced goods on energy consumption can also be established.

6th stage is intended for identification of factors which influence energy consumption. Among them there can be factors which were already found at the earlier stages of analysis and other factors whose influence were not identified before. Mathematic models and scenario method must be used here: they will allow to identify the degree of influence of mentioned factors on efficiency of energy consumption, to identify the reserve of increment in energy efficiency of the enterprise under the influence of these factors.

The last stage of energy-economic analysis is completely devoted to solution of any tasks of strategic management. At this stage forecast changing of energy base line values can be achieved under influence of some factors, changing of production and other financial-economic indicators of enterprises in order to achieve planned values of energy efficiency of enterprises. At this stage optimization tasks can also be solved - for example to get high profit due to rational energy consumption management at the enterprise.

CONCLUSION

Proposed method of energy-economic analysis allows to solve some problems connected with absence of methodological support in regard to implementation of the energy management system at industrial enterprises.

Realization of all stages of this analysis will allow to solve not only operational tasks (in the framework of ISO 50001:2011 but strategic tasks of management as well. Solution of these tasks will allow significantly broaden the limits of activity of energy departments of the enterprise and evaluate the efficiency of their work in terms of targeted functioning of the whole enterprise.

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