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СТРУКТУРА ДОКУМЕНТАЦИИ ПРИ ВНЕДРЕНИИ СИСТЕМ ЭНЕРГОМЕНЕДЖМЕНТА В БЮДЖЕТНЫХ УЧРЕЖДЕНИЯХ

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Аннотация

В статье предложена методика поэтапного внедрения системы энергоменеджмента в соответствии со стандартом ISO 50001 для российских организаций. Её отличительными чертами являются: перечень разрабатываемых документов соответствует российской системе нормативных документов; внедрение системы осуществляется не на базе нового подразделения, а обязанности распределяются между существующим персоналом; в предлагаемой системе основное внимание сосредоточено не на процедурах для конечных исполнителей, регулирующих их основную деятельность, а на документировании процесса получения анализа энергопотребления. Исследования показывают, что предложенная иерархия является оптимальной в реализации процессов наиболее эффективного управления бюджетными организациями на муниципальном, региональном уровне.

Ключевые слова: *энергоменеджмент, энергоэффективность, энергосбережение, стандартизация, сертификация, муниципальные учреждения.*

THE STRUCTURE OF DOCUMENTATION WHEN IMPLEMENTING ENERGY MANAGEMENT SYSTEMS FOR PUBLIC SECTOR INSTITUTIONS

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Abstract

The paper presents the energy management technique within the Russian management system and gradual way of introduction of energy management system in accordance with ISO 50001 for Russian organizations. Its distinctive features are: list of developed documents that suitable in accordance with the Russian recording style and system of normative documents; implementation of the system is carried out not on the basis of the new division, and responsibilities are distributed among the existing personnel; in developed countries should be adopted the terminology with the possibility of replacing by terms and definitions that traditional for our country; in the proposed system the main attention is focused not on the procedures for the final performers, regulating their main activities, from the point of view of improving its energy efficiency, and to document the process of obtaining analysis of energy consumption. Research shows that proposed hierarchy is optimum in the implementation processes of the most effective management within the budgetary organizations at the municipal, regional level

Keywords: *energy management, energy efficiency, energy savings, standardization, certification, municipal institutions.*

Introduction

Today, an important task for any organization is saving energy resources and energy efficiency, because a significant share of their costs is the payment for the fuel and energy resources (FER). World practice shows that energy efficiency can be achieved not by the tech-

nical measures, but also due to organizational changes in the management system of institutions and organizations [1]. Energy management system allows controlling the use of energy resources, identifying the most effective ways to reduce their consumption, thus allowing reducing expenses on fuel, electric power and heat energy and water resources [2].

Energy management according to the definition of GOST R 50001-2012 is the complex of interrelated and interacting elements, aimed at formation of energy policy, objectives and measures development to achieve these goals. This standard is applicable for all types of organizations, and implementation of the system is very effective not only in manufacturing industry but also in municipal institutions. The main goal of energy management from the point of view of the authors is a creation of a mechanism that gives reliable information about the current consumption, dynamics of its changes and creation of awarding system that will generate incentives for all employees who participated in energy saving measures, and not only development of energy efficiency measures improvement.

Energy management system (EnMS) allows to get information about energy efficiency within the organizations and regions and their branches and objects as well, and to identify bottlenecks and areas of the energy resources over-expenditure. All this makes it possible to systematically minimize and optimize financial and other resource costs.

The urgency of this work is caused by requirements of the Federal Law No. 261-FZ "On energy saving and increasing energy efficiency", where is stated the reduction mandatory of energy resources consumption in the municipal institutions. Attempts to solve the problem of energy efficiency in the public sector have been repeatedly confirmed by a considerable number of publications on this subject. But most of these works are concentrated on the private objectives, while insufficient attention is paid to the formulation and implementation system of the energy efficiency tasks at the departmental or municipal level, but not for individual institutions. At the global level, the problem of efficient energy management is that in most cases it is considered at the industrial facilities or on the projects of the buildings, but not on the structures that implements services to the existing buildings. Therefore, the evidence-based system methods of the tasks solution are currently available.

Objective: the creation of systematical and methodological base of an energy management system at the municipal level based on scientific methods of evaluation and monitoring of the energy efficiency and designed for efficiency evaluation of institutions or organizations which implements administrative, educational, social, cultural or other functions and ensure effective investment in energy saving measures.

Materials and Methods

Energy management system allows controlling the use of energy resources, identifying the most effective ways to reduce their consumption, thus allowing reducing the institutions and organizations costs for fuel, electric power, and thermal energy and water resources [3].

After the introduction of EnMS at metallurgical factory "Zapovednik-rostal" (Ukraine) they have managed to reduce the consumption of natural gas by 3% in the first half of the year and about 5% by the second year. Introduction of energy management system into the municipal institutions of Kamensk-Uralsky City have resulted 5% of energy savings per year. These results are not isolated, and can be achieved in all enterprises and organizations [4].

Nowadays it is more than 400 organizations in the world that have implemented energy management system and already certified under the international standard ISO 50001.

By itself, ISO 50001 means continuous improvement. The cycle consists of the following phases: 1) planning; 2) implementation; 3) inspection; 4) development. Thereby, the company will receive a structured guide of the energy consumption optimization and management system of this process.

The process of energy management system implementation lasts of at least nine months in general. By the expiration time, analyzing the functioning of the energy management system proceeds internal audit. And then, if the company or organization wants to get the certificate the precertification and certification audits are carried out. After receiving the certificate, consulting audit for the following three years may be conducted and later the recertification audit in order to confirm the proper functioning of the system.

It is important to note that potential of the energy management system is very high, and certification under the international standard allows having successful partnership. Even at the initial phase with zero investment in EnMS implementation allows achieving significant savings, due to energy consumption that takes on average about 25% of the total municipal institutions.

The final task for EnMS is reducing of the energy costs, that systematically minimize and optimize the financial and resource costs, and, therefore, the target is to accomplish the investments in the most efficient measures to achieve benefits and returning of invested funds as much as it possible (Fig.1).

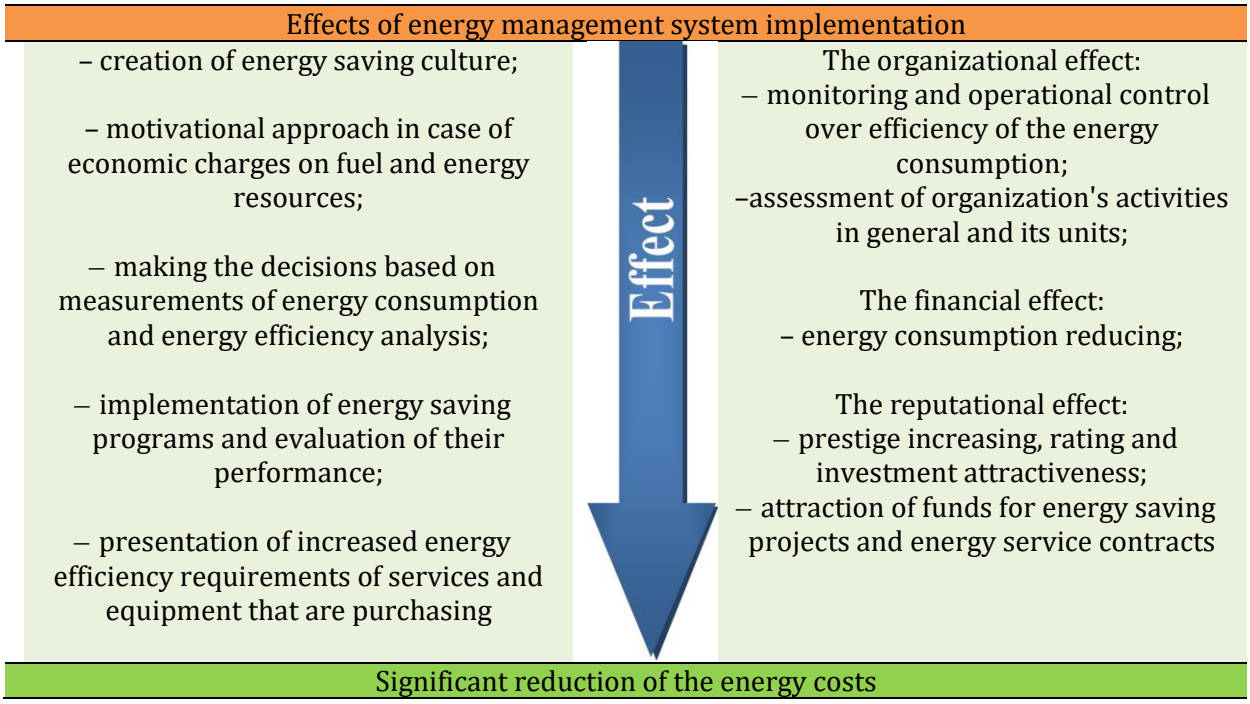

Fig. 1. Effect of the introduction of energy management system

ISO 50001:2011 does not contain pre-established energy efficiency indicators and the energy management is carried out towards primarily to the significant energy consumers, for that type of consumers with significant amounts of energy or possibility of energy efficiency increasing.

Implementation includes the following stages [5]:

1. The diagnostic audit which is related to the requirements of international standard ISO 50001. Audit consists of documents analysis, verification of its compliance with the necessary requirements, and practical procedures standard rather than just a "technical" surveys of equipment and facilities.
2. Training for the institutions employees.
3. Development and implementation of individual energy management system.
4. Confirmation of tasks execution by internal and precertification audit.
5. The certification audit by international certification company.

The issued certificate is valid for three years. For its confirmation it is necessary to precede the supervisory audit after 11 and 24 months. At the end of certificate period validity, it can be prolonged after a recertification audit.

Quality management system (QMS) is a management approach that relies on participation of all employees (staff in all divisions and at all levels of organizational structure). Standard GOST R ISO 50001:2012 sets up the requirements which applicable to energy use and consumption mode, including measurements, documentation and reporting, designing and practices on procuring the equipment, systems, processes and stuffs in the field of energy for organization necessary functioning. Therefore, approach for developing EnMS system should be different than in case of QMS. In EnMS the main thing is not regulation of technological and business processes, but monitoring and analysis of energy consumption.

Energy management systems are based on the national and international standards. The development of international standards, as a rule, based on the national projects, and managed to prove its effectiveness in the issue of energy saving. Predecessors of ISO 50001:2011 were "Energy management systems. Requirements with guidance for use" have been standards of the several countries: USA (ANSI/MSE 2000:2008), South Korea (KS A 4000:2007), China (GB/T 23331:20009), and PanEuropean energy management standard EN 16001:2009. Implementation of energy management systems based on requirements of ISO 50001 has already obtained the national status in sixteen European countries.

Russia applies the domestic standardization system, so it was decided to create a technical committee that will develop a national standard to adopt internationally well-known approach. Representatives of our country were not involved in the international organization standardization discussion process of ISO 50001 therefore the situation with creating a national approach became significantly complicated from the position of borrowing and developing the best suitable practices for domestic organizations and institutions. Further it is considered the peculiarities of the Russian national standard GOST R ISO 50001:2012 causing difficulties by the using of methodology in energy management systems field, international organization, in accordance with the existing regulations of the Federal legislation.

In fact, GOST R 50001 is a translation of the main ISO 50001provisions. The problem is correctness of translation into Russian of the number of terms and disagreements with applicable laws and regulations in accordance with GOST R 53905-2010 energy saving. Terms and definitions", where are fixed and determined 108 terms, and some of the definitions differ from those that indicated in GOST R 50001.

In the adopted Russian standard GOST R 50001:2011 there are a number of differences in terms and definitions in comparison with other Russian laws and regulations. This complicates the implementation of the energy management system at Russian enterprises and organizations. Therefore, during the certification process it should be given the coordinate discrepancies of the work with the national legal system, all the provisions and requirements as well as clear understanding of the used terms, which will significantly simplify the process of implementing GOST R 50001:2011.

Results and Discussion

International organization for standardization develops and produces the requirements and guidance for use regarding countries of the Western market. Therefore, Russian standards are not always adapted to national conditions.

In [6] presents the proposed implementation plan of EnMS which adapted to the specifics of the Russian system of the institutions and organizations governance.

The first step is the decision of the company management about integration of the system and definition of the organizational structure. At this stage it is important to define the areas of responsibility of the senior management and to appoint the EnMS responsible man-

ager, as well as to develop a list of specific documentation. At the first stage it is necessary an organization order about the designation of the responsible coordinators for developing and supporting of EnMS. Then it is necessary to analyze the energy resources consumption data and to develop the energy balance of organization, its departments, or objects (selecting of the objects and units must be based on the significance of the indicator in total energy consumption). Obtained results are presented in the energy passport of the organization. Further energy policy of the organization and energy efficiency indicators are developing: definition of controlled indices and the attained level. By itself, the energy policy is a document which fixes the position on the main goals and focus of the activities in the field of energy efficiency.

The next step is to define the responsibilities of the responsible manager for the developing and implementation of EnMS and writing his job descriptions. The first step for EnMS responsible employee is the creation of organizational structure, ensuring the formation and functioning of EnMS in departments and objects with the help of organizational personnel structure of the energy management system provisions. After working up EnMS job descriptions for responsible employees at the departments and facilities the responsible manager must certify the competence of all authorized staff in organizations and, if it is necessary, to carry out training.

The second stage on the way of increasing efficiency will be developing a monitoring system of the energy consumption and energy efficiency. It consists of a data collection mechanism for EnMS, including the identification of controlled indices, the method and frequency of their receipt, storage technologies. The information obtained is recorded in the regulations of the monitoring data EnMS and in the methodology of conducting and storage of documentation. Control system of the environmental and regulatory requirements associated with the implementation of energy policy, which will take into account compliance with legal and environmental constraints also should be spelt out.

The third stage is the development of the energy saving program, which includes a measures program for achieving the required values and the classification of anticipated savings, payback period and the period of implementation of planned measures; distribution of responsibilities between the responsible executors and deadlines, the financial mechanism. Thus, the schedule of events realization is carried out. One of the most important points for compliance is to determine the energy efficiency requirements of purchased goods and services, there are necessary to make changes/additions to the regulation on procurement of goods, works and services.

The fourth stage is the determination of the EnMS order actions. This stage involves the creation of regulations for the energy efficiency indicators control and implementation of energy saving measures, that is, internal audit, which will determine the procedure for monitoring energy efficiency and the implementation of energy saving measures, comparison of our performance with the regulatory and similar organizations data, including the monitoring frequency, types and forms of reporting documentation. The important point on achievement of the planned activities is the coordination of the staff interaction at all levels. Such motivation of employees is reinforced by the bonuses and responsibility provision for defined indicators achievements in the framework of the energy management system.

As it is clear, the main aspect in the system of energy management is a clear structured documentation at all stages of the EnMS action. Therefore, the establishment of a regulation on publishing information about energy policy and the performance of its implementation must be set forth in public sources. The information intervals for updating should be taken into account, but the existing channels of information distribution are also be relied on.

According to ISO 50001 and GOST R 50001 the definition of the special documents package is left to the discretion of the organization. Comparing the list of documents of the international standard that defined in the guide to implementing ISO 50001:2011 by the U.S.

Department of Energy, and the proposed structure, it can be noted in the last substantial simplification of the system implementation process by reducing the volume of documentation. The differences between these two approaches are given in Table 1.

Table 1

Comprising of the documents systems

U.S. Department of Energy	Proposed structure
1. Getting Started 1.1. Make the business case 1.1.1. Identify key internal influencers 1.1.2. Understand your business drivers 1.1.3. Prepare sales pitch 1.1.4. Brief top management 1.2. Secure top management commitment 1.2.1. Establish the scope and boundaries 1.2.2. Appoint a management representative 1.2.3. Assign the members of the energy team 1.2.4. Define the energy policy 1.2.5. Create organizational awareness 1.2.6. Ensure continual improvement	1.Order of organization in charge of determining the focal points for development and supporting EnMS
1.3. Establish the structure for EnMS 1.3.1. Set the timeframe for implementation 1.3.2. Develop the implementation plan 1.3.3. Establish communication channels 1.3.4. Celebrate success often 1.4. Understand EnMS documentation 1.4.1. Energy Manual Guidelines 1.4.2. EnMS Documentation Guidance Table 1.4.3. Examples of documents 1.4.4. Examples of records 1.4.5. Making Decisions on EnMS Documentation Checklist	2. Organization energy passport
2. Profile Your Energy Situation 2.1. Identify, evaluate and track legal and other requirements 2.2. Acquire, analyze and track energy data	3. Energy policy – regulations on the goals and directions of activity in the field of energy efficiency
2.3. Determine significant energy uses 2.4. Identify energy opportunities 2.5. Prioritize energy opportunities	4. Job Description for Responsible Manager
2.6. Establish baseline and determine Energy Performance 2.6.1. Get stakeholder requirements for measuring performance	5. Regulation on the organizational structure of personnel EnMS
2.6.2. Establish a baseline 2.6.3. Develop a list of possible EnMS 2.6.4. Determine factors that affect EnMS 2.6.5. Select and test EnMS 2.6.6. Analyze EnMS to determine performance	6. Job descriptions responsible for EnMS in units and facilities
3. Develop Objectives, Targets and Action Plans 3.1. Establish energy objectives and targets 3.2. Formulate energy management action plans	7. Certificate of internal auditors

End of table 1

U.S. Department of Energy	Proposed structure
4. Reality Check: Stop! Look! Can I Go? 4.1. Review the status of your efforts 4.2. Perform a sanity check on resources 4.3. Identify accomplishments and lessons learned 4.4. Conduct a management review 4.5. Communicate across the organization	8. Regulations of the monitoring EnMS data and methodology of maintaining the documentation
5. Manage Current State and Improvements 5.1. Manage and control information 5.2. Determine operational controls 5.3. Ensure competence of personnel	9. Instruction of environmental control and regulatory requirements associated with the implementation of energy policy
5.4. Ensure awareness of personnel 5.5. Define purchasing specifications for energy supply	10. Implementation schedule of events
5.6. Incorporate energy considerations in procurement 5.7. Manage energy considerations in design 5.8. Communicate internally 5.9. Decide on external communications	11. Changes/additions to the regulation on procurement of goods, works, services
6. Check the System 6.1. Monitor, measure and analyze key characteristics 6.2. Calibrate monitoring and measuring equipment 6.3. Evaluate legal and other compliance 6.4. Plan and conduct internal audits 6.5. Take action to correct and prevent nonconformities 6.6. Check and use the evidence	12. Schedule of energy efficiency indicators monitoring and implementation of energy saving measures (internal audit)
7. Sustain And Improve The System 7.1. Collect information for management review	13. Provision of employees motivation within EnMS
7.2.Conduct management reviews 7.3. Ensure continual improvement	14. Regulations on information placement of the energy policy and its implementation in public sources

After the implementation of all four stages of the energy management system organization can reduce many of the costs and avoid up to 10% of the energy costs during the first couple of years, thanks to the continuous identification of the weak points in terms of energy consumption and acceptance of the basic measures. Investments in energy saving technologies will be repaid on average less than in two years by reducing power consumption by 5-50%.

Conclusion

The paper presents the energy management technique within the Russian management system and gradual way of introduction of energy management system in accordance with ISO 50001 for Russian organizations. Its distinctive features are:

- list of developed documents that suitable in accordance with the Russian recording style and system of normative documents;
- implementation of the system is carried out not on the basis of the new division, and responsibilities are distributed among the existing personnel;

• in developed countries should be adopted the terminology with the possibility of replacing by terms and definitions that traditional for our country;

• in the proposed system the main attention is focused not on the procedures for the final performers, regulating their main activities, from the point of view of improving its energy efficiency, and to document the process of obtaining analysis of energy consumption;

• the structure responsible for the definition of the duties of commissioners responsible for each site that gives a more streamlined and structured process of obtaining information specific to each sector and thus to be more clear, well organized, effective and targeted methods of regulation.

Research shows that proposed hierarchy is optimum in the implementation processes of the most effective management within the budgetary organizations at the municipal, regional level, with the possibility of further use at the federal level. Therefore, it is required implementation of intended interaction between users of all levels. It was revealed that the existing methods of energy efficiency management do not account all peculiarities of the public sector.

All the mention facts prove the necessity of mutual permanent connection of all the structure elements to effective systematic of the energy management system on purpose of planned reduction of utilities cost for consumers, increasing of energy efficiency in budgetary institutions, ensuring long-term structural changes in public services in general and an effective investment in energy-saving measures at the regional level.

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