

## Existing Approaches to Energetic Survey of Fuel and Energy Complex Organizations

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**Abstract:** The study demonstrates the studies in the field of energy and resource saving during the production of thermal energy within the transportation of heat and energy carriers in power systems and complexes. A new structure of energy passport was proposed by heat supply organization.

**Key words:** Energy audit, energy efficiency, heat supply company, organization, heat supply

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### INTRODUCTION

The energy audit concept and requirements were introduced by the Federal Law number 261 “On energy saving and energy efficiency improvements and on the amendments to certain legislative acts of Russian Federation” issued on 23.11.2009. Energy audit is the collection and the processing of information on the use of energy resources in order to obtain its credibility concerning the amount of used energy resources, about energy efficiency values, the determination of energy saving opportunities for energy conservation and energy efficiency increase with the reflection of the obtained results in the energy passport (Federal Law, 2009).

### MATERIALS AND METHODS

**Energetic survey of company:** In accordance with the FL-261 an energetic audit can be carried out in respect of buildings, structures, constructions, energy-consuming equipment, power facilities, thermal energy sources, heating networks, central heating systems, the centralized systems of cold water supply and (or) drainage and other utility infrastructure objects, the technological processes and also in respect of legal entities and individual entrepreneurs (Ministry of Energy of the Russian Federation, 2011). The main objectives of energy audits are:

- The obtaining of objective data on the volume of used energy resources
- The determination of energy efficiency
- The determination energy saving and energy efficiency potential
- The development of energy conservation measure list, the energy efficiency increase and the performance of their cost evaluation

Energy data sheet drawn up according to the results of energy audits, shall contain the following information:

- The availability of metering devices which record used energy resources
- The amount of used energy resources and its change
- The indicators of energy efficiency
- The amount of losses concerning the transferred energy resources (for the organizations engaged in the transfer of such resources)
- The energy-saving potential, including the assessment of possible energy resource savings in a natural expression
- The list of measures of energy saving measures, energy efficiency increase and their cost valuation

The performance of an energy audit is required, except for the case when the total cost of natural gas, fuel oil, heat, coal, electric power, except for motor fuels, shall not exceed the amount of the respective energy resources in terms of costs, established by the Russian Government for the following persons:

- State authorities, local government bodies, endowed with legal entity rights
- An organization with the participation of a state or a municipality
- The organizations engaged in regulated activities
- The organizations engaged in the production and (or) water, natural gas, thermal energy, electricity transportation, natural gas, oil, coal extraction, petroleum product manufacturing, natural gas and petroleum processing, the transportation of oil and oil products

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- Organizations, the total cost of which for the consumption of natural gas, diesel and other fuels (excluding motor fuel), fuel oil, thermal energy, coal, electric power exceeds the amount of the relevant energy resources in terms of value, established by the Russian Federation Government during the calendar year preceding the last year before the expiration of the subsequent mandatory energy audit
- The organizations conducting the activities in the field of energy saving and energy efficiency increase, financed totally or partly by federal, Russian Federation subjects and local budgets (Ministry of Energy of Russian Federation, 2011)

In accordance with the Federal Law No. 261 “On energy saving and energy efficiency improvements and on the amendments to the Russian Federation legislative acts” issued on November 23, 2009 they developed the following; Order of the Ministry of Energy of the Russian Federation number 182 “On approval of requirements for energy performance certificate drawn up as a result of mandatory energy audit and energy performance certificate, drawn up on the basis of project documentation and copy sending procedure concerning the rules of energy certificates, drawn up according to mandatory energy audit” issued on 19.04.2010.

The order of RF Ministry of Energy No. 577 “On the amendments to the requirements for the energy data sheet, drawn up according to mandatory energy audit and the energy certificate, drawn up on the basis of project documentation and copy sending procedure concerning the rules of energy certificates, drawn up according to mandatory energy audit, approved by order number 182 of the Russian Ministry on 19.04.2010” issued on 08.12.2011.

The order of RF Ministry of Energy No. 400 “On the approval of requirements for the energy audit and its results and the rules of energy certificate copy sending, drawn up as the result of mandatory energy audit” issued on 30/06/2014.

Currently, energy audits are carried out in accordance with the Order number 400 which establishes the following requirements for them. The main processes of information processing and analysis obtained as the result of information collection about an energy audit facility include:

- The analysis of customer contracts with resource supplying organizations
- The analysis of actually used of energy resource supply systems

- The determination of used energy resource consumption dynamics structure and analysis of consumption in physical and value terms for the accounting (basic) year and for two years preceding the accounting (basic) one, according to the systems of energy resource use in general
- The determination of the structure and the analysis of consumption dynamics for each type used energy resources as a percentage ratio for the accounting (basic) year and two years preceding the accounting (basic) one and according to the systems of energy resource use in general
- The development of balances for each type of used energy resources during the accounting (basic) year and during two years preceding the accounting (basic) one, according to the systems of energy resource use in general

Based on the analysis of data obtained as the result of data collection concerning the energy audit facility, an energy auditor determines an inspection plan which is a visual review program agreed with a client and an instrumental examination (hereinafter-the program).

The main processes of information processing and analysis obtained as the result of data collection concerning energetic survey facility, a visual inspection and an instrumental examination of this object include; The calculation of the actual consumption of used energy resources separately according to the elements of their application.

The evaluation of energy resource use efficiency separately according to the elements of their application systems. The calculation and the assessment of an unaccounted capacity concerning used energy resources in physical and value terms separately according to the elements of their application systems.

The determination of the structure and the analysis of consumption and loss dynamics for each type of used energy resources for the accounting (basic) year and for 2 years preceding the accounting (basic) one, separately for each element of their application systems. The drawing up of a balance concerning each type of used energy resources for the accounting (basic) year and 2 years preceding the accounting (basic) one, separately for each element of their application systems.

The calculation of an actual and a standard consumption of used energy resources during an accounting (basic) year separately for each element of their application systems.

The calculation and the evaluation of energy resource use during the accounting (basic) year separately for each element of their application systems.

The capacity calculation and evaluation aimed at energy conservation and energy efficiency increase for each type of energy resources used separately according to the elements of their application systems.

Besides, it should be noted that during the check of the Energy datasheet the self-regulated organizations in the field of energy survey consider the list of the Order No. 400 applications exhaustive ones and they do not allow the inclusion of additional tables into it, treating them as a shift from the requirements of RF Ministry of Energy. The additional materials may be included in the inspection report about the energetic survey but taking into account the fact that the energetic datasheet is the main document, this is clearly not enough to eliminate the drawbacks of the existing techniques. Let's also note that, although the structure of the annex to the Order of RF Ministry of Energy is not formally an energetic audit procedure, the filling in of the provided forms actually fixes it as the energy audit method. A typical energy auditor, whose main objective becomes the filling of mandatory applications using the software package (most Self-Regulatory Organizations (SRO) do not take energy certificates generated by not recommended software package), conducts an energy audit only within the forms which he has to fill by Order of the Ministry of Energy of the Russian Federation (2010).

## RESULTS AND DISCUSSION

**Existing faults of energy audit:** Generality is the main disadvantage of this technique, from which all others derive. The order number 400 regulates energy audit issues of any organization-from apartment buildings to large industrial enterprises. The specifics of the sector is taken into account in other forms only for the organizations engaged in the extraction of natural gas (gas condensate and crude oil), its underground storage and processing for gas transportation companies.

The specificity of a thermal power enterprise in these standard forms is not taken into account. The formalism during the audit and the approval of energy certificates in a SRO does not allow the inclusion of the table from the application number 29 of the Order which is related to the data filled in only for organizations engaged in natural gas production (gas condensate and crude oil), its underground storage, processing but contains the information on boilers, their equipment and heat generation.

The main shortcomings of the energy audit existing methods for a thermal power enterprise resulting from the lack of activity specifics consideration are the following ones:

- The absence of a common methodological approach to the evaluation of energy saving potential for a heat-supply plant
- The economic effect resulting from the implementation of the proposed energy-saving measures which is estimated to reduce the total consumption of energy resources

RF Ministry of Energy Order No. 400 to the main data obtained as the result of the energy audit, considers the calculation and the assessment of the potential aimed for energy saving and energy efficiency increase for each type of used energy resources separately and according to the elements of their application systems.

At that there is no method of the energy-saving potential determination. Usually, during the performance of the first energy audit they determine first of all the measures on energy saving and the amount of energy resource consumption reduction as the introduction result. This value is treated as an energy-saving potential. It comes to the fact that the approval of an energetic certificate by SRO this fact is treated as a comment if the measure introduction effect differs from the energy-saving potential (Ministry of Energy of the Russian Federation, 2008).

Due to the fact that the Order allows to use this technique for carrying out energy audits of any companies, including state ones, the economic effect from the introduction of measures is defined only in terms of energy consumption reduction.

It makes sense for budgetary institutions, especially during the use of energy service mechanism as the source of energy saving measures financing. Thus, in Art. 108 "The peculiarities of energy service contract conclusion" of the Federal Law number 44 "About contract system in the procurement of goods, works and services for state and municipal needs" issued on 04/05/2013, the Resolution of the Russian Federation number 636 "On the requirements to an energy service contract conditions and about the features of an initial (maximum) price of energy service contract (lot price) determination" issued on from 18.08.2010 explicitly prohibit to consider customer's cost reduction in resource saving during the evaluation of energy saving measures efficiency except for energy consumption reduction.

At that the basic idea of energy audits is the assessment and the reduction of energy consumption. At the same time, heat supply almost has no measures, the effectiveness of which can be evaluated only by the reduction of energy consumption. Typically, there is the combination of several effects. For example, the reconstruction of boiler rooms by installing energy

Table 1: The system of technical and economic characteristics integrated assessment in respect of a company heat supply

Energetic examination aim	Energetic passport annexes	Improved methodology
The obtaining of objective data on the amount of used energy resources	No. No. 2-9, 11, 13, 15-19	Without changes
Determination of energy efficiency values	Information about energy efficiency performance. Information about the amount of losses in respect of transferred energy resources Information about the prospective development	The development of heat loss standard determination) The calculation of RET in the justification of switching with the liquidation of inefficient boilers The determination of an enterprise energy saving total potential)
Determination of energy saving potential and energy efficiency	Information on the balance of electric energy and its changes. Information on the heat balance and its changes. Information on fuel oil consumption balance and its changes. Information on water balance and its changes. Indicators of electrical energy use for lighting purposes. A brief description of an object (buildings and structures)	
The development of energy-saving measures	Information on water balance and its changes	Energy-saving solutions for water treatment systems
Determination of financing sources for energy saving measures		Multi-criteria comparative reliability analysis of heat supply indicators

efficient equipment reduces energy consumption but the wage fund, repair costs, operating costs are also reduced and depreciation is increased. The procedure is necessary which allows to assess the effects of energy saving measures introduction comprehensively, taking into account all the consequences.

**Summary:** They revealed the basic disadvantages of the current energy audit methods in respect of heat and power enterprise: the absence of a common methodological approach to the evaluation of energy-saving heat-supply enterprise potential; the economic effect resulting from the implementation of the proposed energy-saving measures which is estimated only by total consumption reduction of energy resources. The development of new calculation methods for the energy saving potential, the determination of heat supply organization reliability, the determination of an effective heating radius and the determination of thermal loss standards allowed to propose and test a new methodology of energy audit performance for heating companies and the development of energy certificate new structure. This technique was used during the energy audit by OJSC “Kazenergo” (Kazan) (Table 1).

### CONCLUSION

The development of an improved integrated assessment system concerning the technical and economic characteristics of the heat supply organization is an effective mechanism for energy saving in heat supply sector. After the analysis of the the energy audit methods concerning a heat supply organization, the additional activities and techniques were proposed.

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