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ОБОСНОВАНИЕ НЕОБХОДИМОСТИ РАЗРАБОТКИ ИНВЕСТИЦИОННОЙ СТРАТЕГИИ МУНИЦИПАЛЬНОГО ТЕПЛОЭНЕРГЕТИЧЕСКОГО КОМПЛЕКСА

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В последние годы отмечается, что отрасль коммунального теплоснабжения в большинстве регионов России стала характеризоваться повышенным износом теплогенерирующей и теплосетевой инфраструктур, дефицитом инвестиционных проектов, системными организационно-экономическими проблемами, которые, в свою очередь, оказывают влияние на качественное и надежное обеспечение коммунальными услугами потребителей муниципальных образований. Для решения данных проблем необходима разработка продуманных и четко сформулированных муниципальных инвестиционных стратегий развития. Для муниципальных объектов теплоэнергетики эти стратегии представляются как основополагающие и наиболее важные, поскольку вопросы реконструкции (модернизации) теплоэнергетической инфраструктуры социально значимы. Так, при отсутствии инвестиционной стратегии будет происходить торможение инвестиционных процессов в отрасли коммунального теплоснабжения, следовательно, заметно снижаться интерес к финансированию, кроме того, это может привести к инвестиционному бездействию со стороны администрации муниципальных образований, что, в свою очередь, может вызвать неблагоприятные последствия, в том числе и системные аварии. Поэтому необходим процесс инициирования инвестиционного процесса в муниципальном теплоэнергетическом комплексе, который повысит надежность и качество теплоснабжения потребителей за счет обновления изношенных основных фондов, а также позволит снизить экономически обоснованный тариф теплоснабжающих организаций в среднесрочной перспективе. Предложены направления инвестиционной стратегии муниципальных образований, на уровне которых будет рассматриваться задача. В последующем эти направления будут основополагающими для формирования и разработки программы действий с обязательным учетом инвестиционного планирования. Рассмотрены сценарии развития муниципального теплоэнергетического комплекса при отсутствии инвестиционной стратегии как при наличии межтарифной разницы, так и при ее отсутствии. Представлены графические модели функционирования муниципального теплоэнергетического комплекса без инвестиционной стратегии двух рассмотренных вариантов развития данного комплекса (динамики тарифов на тепловую энергию) и альтернативная графическая экономическая модель реализации в нем инвестиционной политики. Проведен анализ экономико-математической модели развития энергетического комплекса муниципалитета.

Ключевые слова: теплоэнергетическая инфраструктура; инвестиционная стратегия; тариф; межтарифная разница; экономическая модель

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NECESSITY OF DEVELOPING AN INVESTMENT STRATEGY FOR A MUNICIPAL HEAT-ENERGY SYSTEM

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In recent years, most Russian regions have discovered that the branch of municipal heat supply is characterized by increased wear of the heat-generating and heat-network infrastructure, deficiency of investment projects, system organizational and economic problems, which exert impact on high-quality and reliable providing consumers of municipalities with utilities. In this regard, well-reasoned and accurately formulated municipal investment development strategies should be devised for solving the problems mentioned above. Investment strategies of municipal heat-energy systems are considered as basic and most important for municipalities, since questions of reconstruction (modernization) of the heat energy infrastructure are socially important. Thus, in the absence of an investment strategy, the investment processes in the communal heat supply industry will be slowed down, therefore, interest in financing will be significantly reduced, in addition, it can lead to investment inaction by the municipal administration, which in turn can lead to adverse consequences, including system crashes. Therefore, it is necessary to initiate an investment process in the municipal heat-energy system that will increase the reliability and quality of consumers' heat supply by updating worn-out fixed assets, and will also reduce the economically justified rate of heat supply organizations in the medium term. The problem in the paper is considered at the level of municipalities, with directions of investment strategy suggested for these entities. Further, these directions will be fundamental for the formation and development of an action program, with the mandatory account of investment planning. The scenarios for the development of the municipal heat-energy system are considered in the absence of an investment strategy both in the presence of an inter-tariff difference and in its absence. Also, graphical models for the functioning of the municipal heat-energy systems without the investment strategy of the two options for the development of municipal heat-energy systems (heat tariff dynamics), and an alternative graphic economic model for implementing the investment policy in the municipal heat-energy systems are presented. The analysis of the economic-mathematical model of the development of the energy complex of the municipality is made.

Keywords: heat energy infrastructure; investment strategy; tariff; inter-tariff gap; economic model

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Introduction. Resolving the systematic problems of the heat-energy system, attracting investment resources are complex tasks which demand financing and accurate organizational structuring, which is why an action program has to be created.

It is our opinion that developing the action program is possible only through strategic municipal investment planning, based on formation of the full investment development strategy of the municipal heat-energy system [1]. At the same time, the goals will not be achieved and investment programs and projects with the maximum effect will not be carried out without investment planning.

A strategic investment approach has to be applied for the municipal heat-energy system, which is proved by the following key arguments [2–4]:

1. High social importance of the sphere of heat supply.

2. Duration of investment process in the sphere of heat supply.

3. Existence of various expectations and interests of the main interested parties means that their mutually acceptable balance has to be reached.

4. High degree of instability and uncertainty and also serious systematic and non-systematic risks of operational functioning and development of municipal heat-energy system organizations [5].

5. Deficiency of investments into the branch with considerable investment requirements of the municipal heat-energy system.

An existing investment strategy of the municipal heat-energy system also has a huge practical value [6] for forming an investment policy from municipal Administrations that will give the chance to use the budgetary investment resources with maximum efficiency and to limit financing of non-core investment projects by law.

Lack of investment strategy in municipalities [7]:

1. Causes the administrations of municipalities to pursue a policy of investment inaction that increases wear of fixed assets in the branch, increases the number of system accidents and reduces the quality of the provided services of heat supply.

2. Causes an imbalance of the relations between the main participants of the branch.

3. Substantially reduces the investment attractiveness of the municipal heat-energy system for third-party participants (investors, banks, leasing companies and so forth) and slows down investment processes in the branch.

Characterization and analysis of the model of the system's behavior with graphical representation of the municipal heat-energy system's functioning with and without an investment strategy

Without an investment strategy in a municipality, the development of municipal heat-energy system with a high probability will be carried out by the following basic scenarios [8]:

1. Model of the system's behavior with a graphical representation of the functioning of the municipal heat-energy system without an investment strategy and with an inter-tariff gap (MTP) (Fig. 1).

2. Model of system's behavior with a graphical representation of the functioning of the municipal heat-energy system without an investment strategy and without an inter-tariff gap (Fig. 1a)

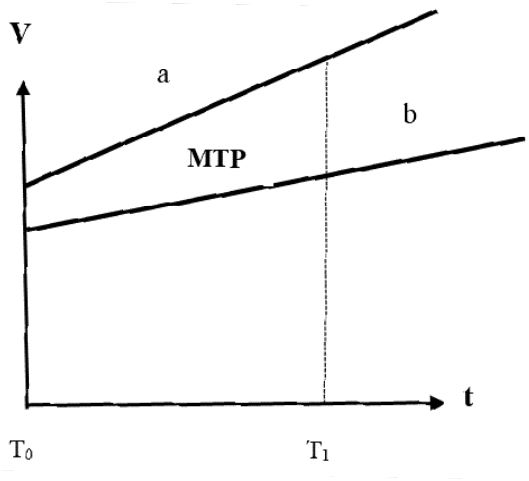

Рис. 1. Модель поведения системы с помощью графического представления функционирования МТЭК при отсутствии инвестиционной стратегии (наличие межтарифной разницы)

Fig. 1. Model of the system's behavior with a graphical representation of the functioning of the municipal heat-energy system without an investment strategy (with an inter-tariff gap)

In the figure:

a – dynamics of the economically reasonable tariff for thermal energy in the municipality, to an equal tariff for other consumers (except for the population and categories equivalent to them);

b – dynamics of the tariff for thermal energy for the population (and the categories equivalent to them);

T – time, years.

V – size of the tariff, rub/Gcal.

An economically reasonable tariff is a tariff formed from such cost values that allow to cover all necessary expenses related to the provision of services in the quantity necessary for consumers and with the quality requirements fulfilled.

In the T_0–T_1 period of time, the increasing trend for the economically reasonable tariff of the heat-supplying organization in the municipality surpasses the trend for the approved tariff for thermal energy for the population (and the consumers equivalent to them) [9].

It is connected with the fact that tariff growth for the population «has been artificially frozen» in recent years, and the index of tariff growth for the population is formed by the principle established by the Federal Antimonopoly Service by the principle «inflation minus» (3–6 % a year).

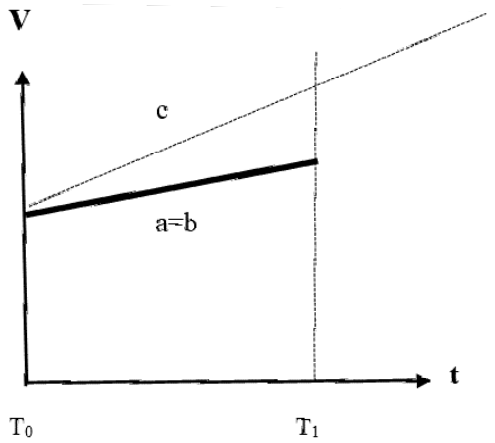

Рис. 1а. Модель поведения системы функционирования МТЭК при отсутствии инвестиционной стратегии (отсутствие межтарифной разницы) с помощью графического представления

Fig. 1a. Model of the system's behavior with a graphical representation of the functioning of the municipal heat-energy system without an investment strategy (without an inter-tariff gap)

At the same time, the economically reasonable tariff annually increases by higher rates (9–15 %), than the tariff for the population as:

· costs of repairs considerably increase annually as a result of a lack of a pursued investment policy in the municipality and, as a result, heavy wear of capital stock and the worn-out heat-energy infrastructure becoming obsolete;

· costs of fuel increase annually on average by 8–12 % a year [10];

· costs of the electric power and a number of costs increase annually on average by 6–10 % a year [10].

The difference between the economically reasonable tariff and the approved tariff for the population (a so-called inter-tariff difference which is subsidized from the regional budget) accumulates and as a result, the expenses of the regional budget also constantly increase [11].

The main economic consequences of the specified model:

• the volumes of financing of the inter-tariff difference from the regional budget are increasing, unjustified budget expenditures are increasing;

• the current expenses of the heat-supplying organization for maintaining satisfactory conditions of the municipal heat supply industry (repairs) are increasing [12];

• the probability accidents occurring in separate elements of the heat-energy infrastructure of the municipal heat supply is increasing;

• the quality of the provided heat supply services is declining.

The model presented below is a variation of the above graphic model, without an inter-tariff difference.

In this case, the tariff for all categories of consumers is uniform [13], that is, the straight line for the economically reasonable tariff for other consumers (a) coincides with the straight line for the tariff for thermal energy for the population (b).

However, in this case, the heat-supplying organization is permanently underfunded, since the tariff approved for the heat supply organization is lower than the economically justified tariff (line c) of the heat supply organization (such tariff level at which the heat supply organization operates in loss-free mode) [14], but administratively it is not possible to index the specified tariff above the value coordinated by the regional tariff agency.

The revenue part, collected by the heat supply organization, is lower than the expenditure part (the approved tariff is not sufficient to cover all current (operating) costs) [15], which predetermines the growth of the fund deficit in the heat supply organization.

As a result, in order to reduce the difference between economically justified and actually approved tariff levels, the heat supply organization justifies the increasing value of the index of annual tariff growth when approving the tariff, which causes discontent among the consumers of thermal energy.

In particular, with the growth rate of tariffs for the population:

· a significant amount of the population of the municipality officially living below the poverty line is not in a position to increase the expenses on heating energy at an increasing tariff;

· the most solvent consumers, especially the financially secure groups of the population will try to switch to using autonomous sources of thermal energy generation (mini-boiler houses, distributed generation facilities, etc.) with a constant increase in tariffs with no improvement of the quality of heat supply services.

· the population living in apartment blocks will acquire autonomous sources in common share ownership through associations in house partnerships or on other conditions.

Thus, the presented graphic economic model clearly indicates the necessity and expediency of taking concrete steps to change the mechanisms of extensive investment processes of heat power systems existing in a significant amount of municipalities, and of overcoming the accumulated technical and technological problems.

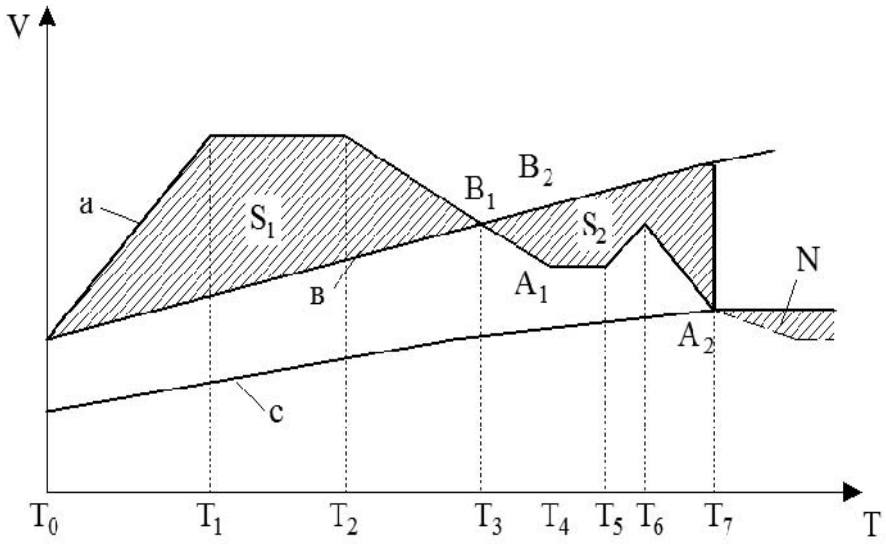

Рис. 2. Модель реализации инвестиционной политики в МТЭК в виде графического представления
Fig. 2. Model of implementing the investment policy in the municipal heat-energy system in the form of a graphic representation

Fig. 2 below presents an alternative graphic economic model for implementing the investment policy in the municipal heat-energy system.

In the figure:

a – economically reasonable tariff for heat supply services of the heat supply organization in the municipality including operational expenses and also return of raised funds with the investment policy carried out;

b – economically reasonable tariff for heat supply services of the heat supply organization in the municipality including operational expenses without carrying out the investment policy;

c – the approved tariff for the population in the municipality;

T – time, years.

V – size of the tariff, rub/Gcal

When carrying out the investment policy in the municipality, the economically reasonable tariff of the heat supply organization (straight line a) is formed on the basis of operational production costs (transportation, sale) of heat energy [16] and also investment expenses (in the form of the tariff investment component) resulting from the implementation of investment projects of reconstruction (modernization) of the heat-energy infrastructure (reconstruction and modernization, modernization or new construction, boiler rooms, reconstruction of thermal networks).

In the short-term period ($T_0 - T_1$), attraction of investments (implementation of the investment program of heat supply organization) on a returnable basis leads to a short-term increase of the economically reasonable tariff for thermal energy.

Investments can be attracted in the following forms:

- credit at a financial institution (bank);
- lease financing;
- financing of a power service company;
- an inverstor's own joint financing.

Accordingly, the following payments can be made using the economically justified tariff as part of the investment component of the tariff:

- principal amount of a loan;
- lease payments;
- energy service payments;
- funds granted by the investor with return on invested capital.

This will entail a justified increase in the economically reasonable tariff for the generated thermal energy for consumers.

In the period of time $T_1 - T_2$, the growth of the economically justified tariff of the heat supply organization (curve a) stops due to the onset of a relative equilibrium (balance) between the gradually decreasing economically justified tariff (as a result of a reduction in costs for repairs, fuel, electricity (as a result of a higher efficiency of boiler houses after modernization) due to the reconstructions (modernization) carried out and financial payments on attracted investments).

Since the T_2 moment, the effect from the decrease in the economically justified tariff covers the volume of financial payments as part of the tariff, which leads to a gradual decrease of curve a. In the period of time T3, curve a intersects with line b.

Starting from the T_3 time period, the implementation of the investment policy in the heat supply area of the municipality has a positive effect [17]. For example, in the time period T_4, the effect in numerical terms is:

$$E = SA_1B_1B_2 \cdot O, \quad (1)$$

where E is the effect of carrying out the investment policy in the municipality; $SA_1B_1B_2$ is the area of the $A_1B_1B_2$triangle;

O is the useful heat supply for the municipality under consideration in the period of time $T_3 - T_4$.

During the period of time T_4, the stabilization of the level of the economically justified tariff is probable due to exhaustion of potential reserves.

Further reduction of the economically justified tariff is realistic through implementing new investment measures (for example, implementing additional resource-saving projects) [18] that require new investment costs and, accordingly, an increased economically justified tariff. Therefore, the line a can again increase (the period of time T_5–T_6), and then again decrease (the period of time T_6–T_7).

Finally, it is possible that in the time period T_7, the value of the economically justified tariff (line a) is equal to the tariff level for the population (line c) at point A_2. Then two variants are possible: the first one is the coincidence of the curves a and c parallel to the X axis, the second variant is a possible further reduction of line a (interval N) in the long-term period through implementing new investment projects [19].

It is possible to define a period of payback (T_n) of investments within the framework of the investment policy in the municipality, where n is the period of time during which $\mathbf{S_2 = S_1}$. (For example, in Fig. 2 $T_n = T_7$).

At the same time, the payback base is the volume of inter-tariff difference subsidized from the regional budget.

Conclusion. Based on the above model of the system's behavior with graphical representation, it is possible to formulate a key conclusion: initiating the investment process in the municipal heat-energy system will allow:

- to lower the economically reasonable tariff of the heat supply organization in the medium term and to minimize or liquidate subsidizing of the intertariff difference for the regional budget;
- to accelerate the process of updating the spent capital stock, and consequently to increase the reliability and quality of the heat supply for the consumers.

Creating and subsequently implementing an investment strategy of the heat-energy system of separate municipalities within regions will stimulate the formation of investment strategies for developing the heat-energy systems of territorial subjects of the federation as the regions cannot be developed separately [20–21], but the specific functioning and strategic development of the individual municipal heat-energy systems must be taken into account.

A well-thought-out and well-developed investment strategy within the municipalities will provide an opportunity to reasonably choose the strategic direction for the long-term investment development of the municipal heat-energy system, as well as to balance the organizational and economic interests of the key participants:

- consumers of thermal energy;
- heat supply organizations;
- administration of the municipality;
- investor organizations (banks, leasing companies, etc.).

At the same time, the lack of an investment strategy generated within municipalities often leads to a deterioration in the relations between the individual participants. In practice, this leads to a decrease in the efficiency of the functioning of municipal heat-energy system and, consequently, to a decrease of the investment attractiveness of the industry as a whole.

The persisting problems in the branch and the deficit of investment projects and municipal heat-energy system programs are, first of all, results of a lack of strategic investment planning at the branch level. In this article, the organizational and economic inefficiency of the existing approaches to reforming the heat engineering of municipalities is substantiated, with conclusions about the expediency of applying strategic investment planning.

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