Organization of investment support for entrepreneurial activity in energy construction

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Abstract. Process of reforming and forming a new model of the heat energy market in Russia is associated with the increasing role of interaction between private business and the state in the development of Russian energy sector and achieving energy security. Due to the long overdue need to attract private investment to the industry, the issues of investing activities financing of heat supply organizations are relevant and of great research interest. The article analyzes the effectiveness of the state policy on attracting private investment in the heat supply industry and builds a model for optimizing sources of financing for investment activities of heat supply enterprises.

1. Introduction
Problems of infrastructure projects implementing in the field of heat power have been forming for a long period, and are systemic in nature. Today, to modernize the communal infrastructure in Russia, a course has been taken to attract private investment [1].

In this area, infrastructure modernization is carried out through the implementation of public-private partnership infrastructure projects. Increase in total number of public-private partnership projects is primarily due to the development of legislation on public-private partnerships and the interest of public partners to applying this mechanism for the infrastructure development and modernization [2]. It should be noted that until recently, the legislation has seen serious shortcomings in part of stimulating the attraction of private investment to modernization of communal infrastructure, including the heat supply field [3].

The main prerequisites for attracting private investment to the field of heat supply are: limited state revenues for large-scale modernization; emergence of private owners in this sector of the economy associated with the process of the energy industry liberalization; lack of effective management and strategic planning in the country regions.

Solving the issues of attracting affordable sources of financing investing activities of heat supply organizations plays a significant role to ensuring the necessary pace of industry modernization.

2. Materials and methods
Currently, large-scale processes are taking place in Russian market of infrastructure utilities. All inefficient municipal unitary enterprises in housing and communal services are transferred to private business through concession agreements [1].
The current trend is the emergence of active dialogue regimes between business and government, international organizations and national business entities. Since 2016, long-term tariffs have been introduced for heat, hot and cold water, water disposal for a period of at least 3 years at first use and at least 5 years thereafter. In 2014–2015, regions could voluntarily apply long-term tariff regulation, since 2016, long-term tariffs have become mandatory for all subjects of the Russian Federation [2].

On July 31, 2017, the federal law “On heat supply” and certain legislative acts of the Russian Federation on improving the system of relations in the field of heat supply №279-FZ were published. The document was signed on July 29, 2017 by the President of the Russian Federation Vladimir Putin. The law establishes new rules for regulating tariff formation, with the transition from state regulation of tariffs to the establishment of a maximum level of the price of thermal energy for the consumer - the level of "alternative boiler room". It is expected that such changes will continue to effectively reform the industry and create better conditions for attracting investment to heat supply modernization.

To assess the effectiveness of public policy and identify role of private investment in Russia heat supply sector, it is advisable to analyze the dynamics of financing concessions sources in heat supply over the past 5 years.

A striking example of a concession for heat supply is the city of Irkutsk. Heat supply systems were concessioned to Baikalenergo JSC (a subsidiary of Irkutskenergo OJSC) in accordance with the concession agreement dated 26.02.2007 No. 010-64-83 / 7 in 2007 even before the approval of the model concession agreement by the Government of the Russian Federation. A comparative analysis of the activities of the Irkutskteploenergo MPTP until 2007 and Baikalenergo JSC (PJSC Irkutskenergo) in the period 2007–2015, one can observe a significant improvement in the indicators of municipal property management shown in the table. From 2007 to 2018, 15 inefficient municipal boiler houses (11 coal; 2 fuel oil; 1 electric boiler; 1 diesel boiler) were closed (transferred to the reserve), which led to a significant reduction in the volume of pollutant emissions into the atmosphere and a decrease in the fuel component in tariffs. The total economic effect for consumers from the implementation of measures aimed at saving resources, increasing energy efficiency and reducing operating expenses of Baikalenergo JSC amounted to 116 million rubles [2].

For the period 2018-2022, an investment program with an investment volume of 854 million rubles, financed by profit and depreciation, is operating in the city of Irkutsk under the concession agreement. Based on this investment program, it is proposed to build a model for optimizing the available sources of investment financing.

3. Results
To assess the effectiveness of public policy and identify role of private investment in financing of heat supply in Russia, a schedule was constructed reflecting the share of private investment in the total investment in the heat supply industry on the basis of concession agreements. The dynamics of the number concluded concession agreements is also analyzed.
Analyzing the dynamics of the number of concluded concession agreements in the field of heat supply in figure 1, we can say about the constant increase in the volume of such agreements. Nevertheless, the increase in concessions since 2018 decreased from 60% per year to 10%. Considering that the volume of investments in the heat supply sector is growing at a faster rate than the number of concessions, it can be concluded that the number of large investors is growing, which has a positive effect on the development of the industry.

Figure 2 shows that over the past 5 years, the volume of investments under concession agreements in heat supply has increased 5.5 times and amounted to 193 billion rubles in 2020 or 92% of the total investment. Basically, this growth is achieved due to an increase in private investment in the industry. For the period from 2016 to 2020, the share of public investment decreased from 16% to 8%. The volume of public investment in 2020 amounted to 15 billion rubles.

Thus, we can say that the main problems of the implementation of infrastructure projects in the field of thermal energy with the use of extra-budgetary funds are solved using:

1. implementation of concession agreements that reduce the political and legal risks of non-fulfillment by a state of obligations under an agreement with a private partner;
2. establishing long-term and understandable to a private partner rules of tariff regulation and tariff setting in the field of heat supply.

Profit and depreciation are traditional sources of financing investment programs aimed at increasing equity. Considering the growing role of private investments in the heat supply sector, in addition to own funds, as part of off-budget sources, the following sources can be distinguished: loans, bond loans, organization loans, funds of external investors, the use of leasing from which investment loans and loans are widely used in practice. Being the most traditional source of financing investment programs in the heat power industry, bank lending is distinguished by such characteristic features as the possibility of refinancing it in the future, quick terms for issuing loans with significant volumes and their relatively low cost [3].

In order to build a model for optimizing the structure of financing investing sources in the heat supply industry, it is necessary to solve the task of finding the best ratio of own and borrowed funds to finance investments.

Required for search variable is the share of loan funds for financing investments \( x \) in the field of definition from 0 to 1. The main optimization criterion will be the maximization of borrowed investment capital:

\[
 f_1(x) = LCx \rightarrow \max
\]

LC, borrowed investment capital.

The second criterion is selected based on the need to minimize the weighted average cost of capital when attracting borrowed funds to finance investments:

\[
 f_2(x) = %x(1 - Tax) + ROE(1 - x) \rightarrow \min
\]

\%, borrowed funds cost; Tax, profit tax; ROE, return of equity.

Given the specifics of the heat supply industry, which is characterized by continuous operation, heat supply organizations are trying to minimize the time to attract financing to investment. Thus, one more optimization criterion can be designated:

\[
 f_3(x) = (1 - x)t \rightarrow \min
\]

t, term of mobilization own sources financing.

The last used criterion Debt burden ratio is selected based on the need to ensure the normative level of solvency of the company:

\[
 f_4(x) = \left\{\frac{LC + ICx}{EBITDA + (IC - ICx)} - K_{norm}\right\}^{1/2} \rightarrow \min
\]

IC, necessary investment capital; \( K_{norm} \), recommended value Debt burden ratio.

Based on the list of selected additional criteria and a given focus, the required level of achievement for them is 0.

Thus, to solve the problem, there is a possible to use the decision-making algorithm of choosing the best alternative to additional optimization criteria that meets the necessary levels (Figure 3).

In order to simultaneously bring the selected optimization criteria to the established levels, it is necessary to minimize the following additive function:

\[
 f_{ad} = \sqrt{t_i^2 + w_i^2 + (d_i - d_{opt})^2} \rightarrow \min
\]

t, term of mobilization own sources financing; \( w \), WACC; \( d \), Debt burden ratio.
According to calculations results based on the investment program until 2022, the optimal share of borrowed funds (credit) for the organization of Baikalenergo JSC is 60%. The additional effect of the optimization can be estimated using the financial leverage indicator.

| Leverage ratio       | WACC   | DBR | t   | DFL, % |
|----------------------|--------|-----|-----|--------|
| Actual value, 0%     | 7.31   | 6.08| 8   | 0      |
| Optimized value, 60% | 7.95   | 7.82| 3.2 | 27.64  |

**Figure 3.** Decision-making algorithm for choosing the best alternative to additional optimization criteria

With the optimized value and minimization of the additive function, the weighted average cost of capital and the ratio of borrowed capital to EBITDA increased insignificantly with a significant reduction in the term for attracting financing. The obtained value of borrowed capital for financing investments allows to significantly increase the return on equity.

**4. Conclusion**
Analysis of the state policy effectiveness to attract private investment in the field of heat supply showed that the use of concession agreements practice for the modernization of the heat supply systems infrastructure is fully justified. Implementation of concession agreements allows to reduce political and legal risks of non-fulfillment by a state of obligations under an agreement with a private partner. In addition, in private investment growth is due to the establishment of long-term rules for tariff regulation and tariff setting in the field of heat supply that are understandable to a private partner.

For the most effective investment programs implementation, private investors in the field of heat supply are invited to use as sources of financing investments a reasonable amount of borrowed sources of financing calculated on the presented model basis.

Calculations presented in this article for example of Irkutsk city heat supply organization suggest that the proposed model can be used by heat supply organizations to make a decision about choosing optimal structure of sources of financing investment activity.

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