

# The small municipalities' gasification as a priority task of the national economy in Russia

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**Abstract.** Sustainable development of the regional and municipal economy is possible only by increasing the economic growth rate and living standards of the population. These strategic socio-economic objectives cannot be achieved without solving the problems of gasification and gas supply to settlements. Gas supply is a technologically complex, costly and institutionally multi-stage process. The laying of gas pipelines to the places of the consumers' localization to ensure the uninterrupted supply of natural gas in the required volume requires many significant resources, approvals and involves various economic entities and the population itself as the final consumer of gas in this process. At the same time, the use of natural gas is associated with its price, environmental and technological advantages as a fuel for the functioning of housing and communal facilities, enterprises and organizations of various sectors of the economy. In this regard, gas supply to settlements is one of the urgent tasks of both the national economy of Russia as a whole, and individual regions, and municipalities. The most effective tool for the municipalities' gasification process is the project management, which consists in the development and implementation of specific projects for the construction of gasification facilities, designed to ensure the connection of consumers immediately after the completion of gas pipelines. In a market economy, it is project management that is able to successfully implement a set of measures for gasification of municipalities on the basis of clear coordination of actions of all participants in the process, consolidation of the necessary labor, material, financial and organizational and managerial resources, which will bring a real result, expressed in an increase in the level of gas supply to enterprises, organizations and people.

## 1. Introduction

One of the important components of the population living quality and standard is the level of the settlements' communal improvement, which, among other engineering and communal benefits, includes the gasification availability. Being the most environmentally friendly and cheapest type of fuel, natural gas contributes to a significant improvement in the living conditions of the population, especially in rural settlements, as it brings significant qualitative positive changes in their livelihoods. In addition, the presence of gas as a promising type of fuel in settlements is a factor stimulating the influx of investors and the placement of modern production facilities and housing and communal infrastructure. These features of the gasification process and its important socio-economic importance in municipal and regional development explain the current attention to this research topic.



The problem of the settlements' gasification is investigated both from a technical point of view, and economic. The engineering aspects of the gasification process are related to the solution of gas supply issues and rational use of natural gas as a type of fuel. They are reflected in the works of O.N. Bruchanov, A.I. Pluzhnikov [1], S.A. Zolotarevsky [2], A.S. Sarkisov and N.Yu. Spektor [3, 4], N.N. Osipova and I. V. Zozulya [5]. Economic and managerial aspects of the municipalities' gasification process are associated with the consideration of natural gas as an economic good that has a certain demand, price and consumer properties. Therefore, the gasification of settlements is studied in terms of the residents' solvent demand availability, and the gas supply process itself is considered not only as a set of organizational and technical measures for delivering gas to consumers, but also as a process of stimulating the development of the municipal economy with an important social component. In this regard, the work of such economists as E.I. Efremov [6], V.D. Zubareva and M.V. Spout [7], R.R. Nogovitsyn [8], N.V. Prokhorov [9] are very important. In relation to the North Caucasus, as the region of our study, we note the work of such scientists as S.G. Sheina, A.A. Fedorovskaya, K.Yu. Yudina [10], E.O. Mirgorodskaya and I.V. Novoselova [11].

The object of this study is the gasification system of municipalities of the Russian Federation. The purpose of this article is to determine the significance of the project approach in the development of gasification of municipalities and assess the effectiveness of the implementation of specific gasification projects of small settlements.

To achieve this goal, the following research objectives were set and solved:

- identification of economic and institutional foundations of the municipality gasification process;
- characterization of the nature and significance of the project approach in the process of municipalities gasification;
- study of the small municipal formation gasification mechanism;
- assessment of organizational and economic instruments for gasification of a small municipal formation;
- determination of the transferring possibility advanced from the point of view of economic, organizational and managerial effectiveness of gasification practices of small municipalities to other similar settlements.

## 2. Results

The main means of solving the problem of providing the settlements of the country with natural gas is the gasification process. Despite the fact that the Russian Federation is the largest country in the world in terms of gas fuel reserves and takes a leading place in its production, the level of gasification of the country's territory is insufficient [12]. This is due to a combination of both natural and economic factors, including the spatial differentiation of the country. At the same time, in recent years, more intensive measures have been taken by the state authorities and PJSC Gazprom, as a company concentrating resources and powers in gas production and transportation, to solve the problem of gasification of municipalities. This also applies to the South Russian macro-region, where the difficulties are associated not only with the remoteness from the country's main fuel base (Western Siberia), which supplies the region with natural gas, but also with the complex mountainous terrain represented by the Caucasus Range. At the same time, a significant concentration of the population in the regions of the North Caucasus requires the gasification process intensification of the settlements, and in the case of the Stavropol Territory, which is chosen as the territory under consideration in this study, this is also of environmental nature protection, since gas is the least polluting.

The gasification of settlements is based on the design method and is expressed in the development and implementation of specific engineering projects for laying low pressure gas pipelines in municipalities included in the gasification program of the region. In the institutional and organizational plan, this process is quite complex, multi-stage and is carried out with the interaction of the state and economic entities of the gas industry, the population, as the end user, and organizations involved in laying gas pipelines. In economic terms, due to the limited budget of small municipalities,

the investor finance is attracted to carry out gasification in the form of the territorial divisions of the «Gazprom» companies' group.

Institutionally, several actors, each of which has its own socially significant interests, powers, functions and priorities can be distinguished in the gasification process (Table 1).

**Table 1.** The main goals of participants in the implementation of gasification of municipalities.

Gasification Process Institutions	Interests and priorities of institutions in the gasification process
Federal government	<ul style="list-style-type: none"> <li>• Growth in energy efficiency of the country's economy</li> <li>• Improving the environmental situation by reducing the degree of air pollution</li> <li>• Improving the budgetary efficiency of the country's energy</li> <li>• Development of energy infrastructure of municipalities</li> <li>• The most efficient use of gas as fuel</li> <li>• Increased availability of natural gas for the population</li> <li>• Improving the population life quality</li> </ul>
Management bodies of the constituent entities of the Russian Federation	<ul style="list-style-type: none"> <li>• Transformation of the fuel and energy balance of the region</li> <li>• Creation of conditions for attracting investments to the region by laying the gas distribution networks to the potential business sites</li> <li>• Improving the economic efficiency of enterprises in the region based on their conversion to gas fuel</li> <li>• Creation of new jobs in the construction and operation of gas pipelines and gas supply facilities</li> <li>• Improving the population life quality in the region</li> </ul>
Gazprom Group Companies	<ul style="list-style-type: none"> <li>• Attracting new solvent consumers</li> <li>• Ensuring the optimal rational load of the gas and gas pipelines under construction and existing</li> </ul>
Enterprises and organizations - gas consumers	<ul style="list-style-type: none"> <li>• Improving the efficiency of production due to the transition to gas fuel</li> <li>• An increase in the level of industrial and environmental safety of production activities</li> </ul>
Population	<ul style="list-style-type: none"> <li>• Improving the comfort of living conditions</li> <li>• Improving the life quality</li> <li>• Decrease in own expenses on gasification of housing</li> </ul>

Gasification of municipalities is a hierarchically complex set of institutional and organizational measures for the interaction between gas producing, gas supplying, gas transportation and other organizations and gas consumers in the face of the population and enterprises of various forms of ownership and activities. In the process of gasification of municipalities, administrative-legal and market methods are combined, a single legal framework, a flexible pricing policy, and security requirements are applied. In the gasification implementation, a clear subordination of institutional structures and the distribution of powers between them, based on the goals pursued, are important (Table 1). So, the federal authorities develop and implement the gasification programs in the country as a whole and in individual regions; regulate the use of gas reserves; supervise and control the safety of gas supply facilities; develop and enforce rules for the supply of natural gas to consumers [13]. Regional authorities (in our study, the Stavropol Territory of the Russian Federation) develop specific gasification projects, carry out the construction of gas pipelines, and transport gas through the gas

distribution networks. At the same time, during the municipalities' gasification, a complex of structures, consisting of gas networks of various pressures, gas distribution stations, gas control points and installations, is created [14]. The result of the gasification projects' implementation in the settlements is the laying of gas pipelines to the borders of the municipality and the bringing of natural gas directly to individual residential buildings, neighborhoods, social facilities [15].

The gasification projects of municipalities are being developed on the basis of promising regional gas supply schemes, master plans for the development of municipalities, location schemes for economic sectors and district planning projects taking into account the municipalities' development for the future. At the same time, the gasification system should ensure uninterrupted gas supply to consumers, be safe to operate, simple and convenient to maintain, provide for the possibility of disconnecting its individual elements or sections of gas pipelines for repair and emergency work, in case of emergency [16].

The gasification project is a set of measures aimed at the transfer of potential consumers to the use of natural gas by connecting the capital construction facility to the networks of engineering and technical support for natural gas, maintaining a reliable and safe gas supply to consumers. In order to finance the gasification project of individual municipalities in the region of their localization, in accordance with the procedure established by the federal government of Russia, the gas supplying companies, in addition to tariffs for gas transportation services, special allowances are introduced with the obligation to pay them to the consumers. These premiums to the tariffs go to the budget of the gas distribution organizations and are spent purposefully on the construction and commissioning of the new gas supply facilities [17, 18].

### 3. Discussion

The specific gasification project of a small municipality, considered during our study, was the construction of gas distribution networks in the village of Pravoberezovsky, Stavropol Territory. Geographically, this settlement belongs to the Piedmont municipal district of the Stavropol Territory. However, the close proximity to the resort city of Kislovodsk led to engineering work on laying a gas pipeline to the village from the city border. This choice of the project's route significantly reduced the gasification project's cost, the total cost of which amounted to 2.1 million rubles (Table 2).

The implementation of the gasification project of the Pravoberezovsky village organizationally included three stages (Table 2) and was carried out for a long time - in 2013-2016, which was due to the limited funds of the municipality to finance the work. Boosting the implementation of the project became possible only after it was included in the gasification program for the settlements of the Stavropol Territory and the allocation of the necessary funds in a targeted manner specifically for the given municipality from the regional budget.

**Table 2.** Calculation of the gasification cost of the village municipality Pravoberezovsky, Stavropol Territory

Project stage	Engineering work	Cost of work, thousand rubles
Preparatory and geodetic works	<ul style="list-style-type: none"> <li>• Obtaining the coordinates of the points of the reference boundary network and the state geodetic network for cadastral work;</li> <li>• Surveying on the ground;</li> <li>• Coordination of the axis of gas distribution networks;</li> <li>• Determination of the boundaries and areas of land under gas supply facilities;</li> <li>• Vertical layout and clearing of the strip under the gas pipeline;</li> <li>• Creation of temporary storage facilities</li> </ul>	526

Construction and installation work	<ul style="list-style-type: none"> <li>• Excavation and dumping by excavators;</li> <li>• Arrangement of trenches for laying pipes and racks of the gas pipeline;</li> <li>• Filling and compaction of soil in places of pits and pits;</li> <li>• Installation of metal supports;</li> <li>• Laying steel pipes, dragging them into a protective case;</li> <li>• Arrangement of flanged pipe joints;</li> <li>• Purging the piping system with air to detect leaky joints;</li> <li>• Gas pipe coating with corrosion resistant materials</li> </ul>	1120
Arrangement of a security zone of gas distribution networks	<ul style="list-style-type: none"> <li>• Defining the boundaries of protected areas;</li> <li>• Preparation of a map of the gas pipeline and the security zone for it;</li> <li>• Designation of the axis of the gas pipeline and the border of the security zone on the ground with special warning signs;</li> <li>• Providing information about the gas pipeline to local authorities and to the territorial cadastral registration authority for applying it to regional land use maps and preventing unauthorized business operations near the gas pipeline</li> </ul>	479
Total		2125

As a result of this project, the new gas distribution networks were built with a total length of 5820 m, of which 1052 m of the above-ground gas pipeline and 76 m of the underground gas pipeline within the borders of the Pravoberezovsky village. The implementation evaluation of this project showed its effectiveness both from the economic and non-economic point of view. In financial terms, due to the competition through the electronic bidding system on the portal of the Unified Information System in the field of procurement, the project became cheaper. This allowed to save the budget funds in the amount of 576 thousand rubles, i.e. 19.2% of its initial value. The non-economic effect, given the social importance of the project, is expressed in a significant improvement in the population life quality of the municipality due to the transfer of housing to gas fuel. Gasification also became an additional infrastructure advantage for the prospective deployment of the new production and engineering facilities in the village, and the use of gas fuel contributed to the environmental situation's improvement in this resort area.

#### 4. Summary

The purpose of the municipalities' territories gasification is to transfer the population and economic facilities located on their territory to more efficient, environmentally friendly and pricing stable fuel. This goal is one of the priorities in improving the socio-economic development conditions of municipalities, increasing the level and quality of life for the population living in them.

Various public and business institutions are involved in the gasification process implementation – the state and regional government bodies, local municipal administrations, gas supplying organizations of the Gazprom companies' group, the population as a consumer of natural gas and housing gasification services. The presence of a large number of the gasification process subjects determines its organizational and economic complexity and creates certain difficulties of an objective and subjective nature in its implementation and management.

The most effective method of the municipalities' gasification can be recognized as the design method [19]. It is expressed in the development and implementation of projects for laying the gas distribution networks from a gas supply source to the final consumer and is a technically and organizationally-complex management process. When implementing municipal gasification projects, it is necessary to determine:

- Who will be the main contractor for laying the gas pipelines?
- What resources will be used to implement them?
- What changes will the gasification project bring?

All this complex of issues allows to solve the problems of gasification of settlements, and the final result in the form of connecting the consumers to gas supply networks depends on the effectiveness of the gasification project.

The gasification projects of the municipalities in the regions of Russia are of complex importance. The laying of new gas supply networks and the creation of new gasification facilities helps to increase the welfare of the population, the development of the economy of the municipality through the use of natural gas. Comfortable living conditions, improving the living conditions and production activities of the population are impossible without increasing the level of gasification of the municipality. The main work on gas supply to the territory of municipalities is currently aimed at reconstructing existing or laying the new gas distribution networks in order to increase the reliability of their work in modern operating conditions. Gasification projects of this kind have positive consequences for the future. So, their implementation allows to ensure an increase in the rate of gasification in the region as a whole, which increases the possibilities of supplying municipal, residential and social facilities with environmentally friendly and convenient gas fuel in use.

The implementation of the small municipalities' gasification in the Russian Federation is directly related to the efficient use of local and regional budgets, since they cover most of the costs for the design and installation of gas pipelines, commissioning for putting them into operation. In this regard, the project method makes it possible to consolidate sources of budget financing, forms a multiplier effect, expressed in increasing the gasification level of the settlements through which gas pipelines run. In addition, the municipalities gasification is one of the aspects of a more favorable investment environment, since the presence of gas pipelines is an attractive factor for business facilities and enterprises of various industries and sectors of the economy in placing their activities on specially prepared sites.

The theoretical and practical aspects of the small settlements' gasification process in the Russian Federation presented in this article are of great practical importance, since they reveal the proposals for improving the gasification process at the municipal level on the basis of the project for laying gas distribution networks in a small population center. Further scientific research in this area is related to determining the directions for improving the mechanism of the municipalities' gasification through the use of innovative organizational and management technologies and tools, improving the quality of service for the natural gas consumers.

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