



Benchmarking Tariff Regulation as a Mechanism for the Digital Transformation of the Activities of Water Supply and Sewerage Enterprises

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Abstract. The study analyzes tariff regulation mechanisms for a water supply and sewerage enterprise: the existing tariff calculation methods used in foreign countries (Great Britain, the Netherlands, Austria, Germany, Finland, Spain) and calculation methods used in the Russian Federation are studied. The processes of digital transformation of tariff regulation based on mathematical methods of analysis are also considered. One of the currently most used methods for calculating tariffs is benchmarking. The essence of the process is to compare the movement of the water supply and sewerage enterprise in terms of tariff regulation with the best European practice and determine ways to improve on that basis. In addition, the paper investigates the features of other methods of tariff setting: econometric, factor analysis, analysis of the functional environment, and others. Considering foreign experience, we can single out the need to change the principles of setting tariffs for the Russian Federation. The characteristics of regulating the activities of natural monopolies abroad are examined, and the specifics of the legal regulation of Russian companies. Improving the methods of tariff setting and tariff regulation will allow enterprises of the water supply and sewerage sector to objectively build their tariff scales and reduce operating costs of the primary and auxiliary activities. All the methods of tariff setting under consideration are easily transferred to the digital environment and allow forecasting and calculating tariffs accurately, taking into account all external and internal factors.

Keywords: Tariff setting · Benchmarking method · Tariff regulation in the digital field · Digital approaches in tariff regulation

1 Introduction

The concept of “benchmarking” is close to marketing intelligence, which refers to the constant activity of collecting information about changes in the external environment that directly affect the company’s marketing and allows to build of a marketing policy with the subsequent adjustment of marketing strategies and plans. Benchmarking can be a process aimed at long-term reflection and formation of strategic development of an enterprise, based on the best practice in the field under study and cross-industry best practices [1]. The authors suppose that digital transformation could add economic value to several business activities [2] and consider benchmarking as a mechanism for the digital transformation of the activities of water supply and sewerage enterprises.

Benchmarking is used to compare own activities with the best practices and companies in this area. Benchmarking, first of all, provides a guideline for the company’s subsequent development, which is fundamentally different from key indicators that allow monitoring performance and defining approximate ways to improve it [3]. Benchmarking can be divided into [4, 5]:

1. Comparative analysis (allows to collect and analyze qualitative data).
2. Practical analysis (an analysis that will enable conclusions on how the company functions, that is, to evaluate its internal processes).
3. Internal analysis (comparison of performance indicators for branches and divisions of the company).
4. External analysis (involves comparing the practical experience of organizations in the same industry).

The positive aspects of implementing benchmarking can be considered the following:

1. It allows improving product quality by analyzing competitors’ experiences.
2. It allows predicting a loss of profit by analyzing someone else’s bad experience.
3. This method is affordable and does not require any special costs.

The negative aspects of implementing benchmarking methods are:

1. It does not answer how to correctly apply a particular solution for a specific company under changed initial conditions.
2. It is used only for ready-made business process diagrams and is ineffective for innovative and breakthrough developments.

Thus, the principles of benchmarking can be used in tariff regulation and will make it possible to create an effective system in terms of the methodology for calculating the tariff setting.

2 Materials and Methods

Benchmarking as a method for developing tariff policy in domestic and foreign literature is poorly covered. Several scientists note that the experience of tariff regulation within

the country is unique and does not allow transfer within other countries since tariff models contradict the existing legislation to some extent [6, 7].

However, in the works of Onishchenko G.G., Karmazinov F.V., Kuznetsov L.N., other trends can be observed: in the studies of these authors, specific results of the implementation of the principles of benchmarking at water supply and sewerage enterprises are provided, which concern not only the production sector but also affect the financial and economic activities of enterprises. In the works of scientists, models for constructing a system of tariff regulation are provided, factors that constrain and influence this system are reflected, and features of state incentives for introducing an improved tariff scale at modern housing and utility enterprises are revealed [8].

Other authors Likhacheva V.V., Ivanova E.V., Zherukova A.B., Tumenov S.A. present specific benchmarking models of the tariff system that will allow modern domestic enterprises of the water supply and sewerage sector to develop effectively in the contemporary reality: the authors propose to take the reference network model as a basis and combine it with other basic principles of tariff regulation together with domestic legislation and the specifics of tariff setting in this area [9].

Thus, there are few fundamental studies in tariff setting for housing and utility services today. Those works presented in the scientific literature are complicated by cumbersome mathematical models. They have a narrow focus and poor practical value since they are not applicable in the modern realities for calculating tariffs [10].

2.1 Foreign Methods of Benchmarking

Benchmarking in tariff regulation has been used in Western European countries for quite a long time, already in the 2000s. The main methods used include [11]:

- DEA-analysis (a method of analysis of the functional environment) - in this case, companies are represented as points in space that have their input and output data: then, using the linear programming technique, it determines the optimal ratio of the resources used and the volume of production output/service provision, and then these the data is compared with the input-output data of the company and, depending on the company zone, its efficiency, and, subsequently, the tariff are determined. This method of tariff regulation is used in Norway, Austria, Germany, Finland.
- CFA-analysis is an improved form of economic analysis, as a result of which the boundaries of the costs and production possibilities of the organization are determined. It's used in Germany and Finland.
- TFP-analysis – as a result of using this method, a cumulative assessment of production factors is carried out: it is used with a limited amount of information. Forecasting is carried out using indexes. An index is defined as the ratio of the total volume of the index to the total cost. The method is used in tariff regulation, mainly in the Netherlands.
- Reference network is a technique aimed at minimizing and constantly assessing a company's costs. This method is widely used in Spain [12, 13].

2.2 Russian Methods of Benchmarking in Tariff Regulation

For the area of water supply and sewerage, in tariff regulation, so-called “reference tariffs” are coming into use, implying universal approaches to accounting for the costs of a water supply and sewerage organization and determining methods to stimulate an increase in the efficiency of an organization. The Federal Antimonopoly Service positively assessed the experience of benchmarking in tariff regulation and is preparing a methodological framework for implementing this method in resource-supplying enterprises’ practical activities [14, 15].

The approach to complex unification of costs can be carried out by taking into account the implementation of the following steps [16]:

1. Using the method of comparative cost analysis as one of the methods of tariff regulation.
2. Development of standard values for the following water supply and sewerage expenses: operating, marketing, and production costs.
3. Implementation of the grouping of income and expenses of an organization, taking into account technological limits.
4. Reassessment of the system of quality, reliability, and energy efficiency indicators and a reassessment of the investment activities of a water supply and sewerage company.
5. Step-by-step development of operating costs standards, taking into account the technological limits and processes of the organization.

The main principles of benchmarking include:

1. The compensatory principle of regulation is based on solvent demand and supply balance.
2. Compensatory principle of regulation: tariffs are set based on the costs of the resource supplying enterprise and its internal rate of return. The difference with actual revenue is made in the following periods.
3. The incentive principle of regulation allows cost savings on the resource-supplying organization’s balance sheet in the long term.

Based on these principles, we will consider the possibility of choosing the method of tariff regulation for a water supply and sewerage enterprise.

The authors could identify two main methods of stimulating tariff setting:

1. Shared benefit contract (“sliding scale method”).
2. Using the benchmarking method.

Benchmarking methods are divided into the following:

- a) engineering method: tariffs are calculated for virtual enterprises and subsequently adjusted by technological and economic parameters;
- b) benchmarking of production processes: used for all stages of the production process and allows for identify problem areas;

- c) a benchmarking method based on surveying consumers of products/services.

In the Russian Federation, the indexation method is used to set tariffs. The return-on-investment method is used for concession agreements and public-private partnership schemes in water supply and sanitation. It is necessary to consider legislative and political factors that significantly limit the tariff growth for the population of cities, which leads to the need to use combined methods of tariff formation. Thus, the mechanisms of tariff regulation of water supply and sewerage enterprises are within a strict framework and aim to reduce the internal costs of an organization [17, 18].

3 Results

Application of benchmarking analysis methods based on the experience of tariff regulation in Great Britain.

Stage 1: The parameters are chosen, according to which the comparison of companies will be carried out in the future. The parameters are divided into three groups. The first group includes the volume of services provided - for a water supply and sewerage enterprise - this is the number of consumers of the service, the importance of water supply and sanitation, and the maximum use of the production capacity of the water supply and sewerage enterprise. The second group includes the cost of resources in water treatment, transportation, and purification of water resources and wastewater. This consists of the total amount of fees: fixed assets, machinery, and equipment, labor resources, as well as other types of costs. The third group includes environmental factors - these are factors beyond the control of the enterprise [19].

Stage 2: The cost function is chosen, the Cobb-Douglas functions are applied, and more complex translog procedures.

Stage 3: The cost factors for the function are determined to compare them with the actual values of the services provided. Generally, to determine them, the method of least squares is used.

Stage 4: The coefficient of the benchmarking cost function is calculated.

Stage 5: The efficiency of companies is assessed based on the assessment of deviations of actual costs [20].

Based on the study, the average costs are determined, which correspond to the average performance indicators of the company, and then, using the regression equation, the deviation of the level of the expenses from the actual values is determined. After that, the values are rescaled by the function regulator – the efficiency coefficient is determined, according to which 100% is an efficient company and the optimal level of tariffing, less than 100% – companies are not efficient. They need to reconsider their activities in terms of the cost approach.

3.1 Tariff Setting in the USA

In the United States, tariff regulation is based on regulating the profit rates of organizations: natural monopolies are subject to restrictions on profit rates, which are carried out using extra charges for costs. Tariffs are set based on average costs. All aspects of

the company's activities, i.e., taxes, profitability, and investments, are subject to legal control and state regulation.

The tariff structure is developed to reduce possible discrimination. The tariff setting procedure consists of determining current costs, establishing the required investment limit, and setting the rate of return on investment.

The United States is currently trying as much as possible to move away from the concept of "a natural monopoly" and transfer all significant industries to private investors, strictly regulating the rights and obligations of the latter at the legislative level. Monopolies remain only in a few industries, but this list includes water supply and sewerage enterprises.

The disadvantages of the American system of tariff regulation include the following:

- The state has tightened tariff regulations and constantly covers this process in the media.
- Low efficiency and high cost of judicial settlement of issues related to tariff setting mechanisms. Regulation guarantees profit and protection of the regulated industry, allowing it to curb the existing competition in various areas.
- At present, no mechanisms have been developed to stimulate the increase in the efficiency of companies since their activities are aimed at constraining costs and thus curbing tariffs.
- There is no clear relationship between federal and state tariff regulation, which does not allow for creating a transparent interconnected infrastructure.

Thus, the tariff setting system in the United States is based on state regulation of the mechanisms and features of the activities of "natural monopolies" in a constantly changing economic environment.

3.2 Russian Features of Tariff Regulation

Benchmarking for a water supply and sewerage enterprise is to search for reference practices in similar and related fields of activity to form a strategic development plan for the enterprise. Benchmarking is a multifaceted process and can extend its impact to the factors and conditions that affect the process.

The Tariff Committee regulates tariff-setting activities at the regional level.

The activities of the Tariff Committee in Saint Petersburg are aimed at:

- Improving the quality of life and the urban environment of the population of Saint Petersburg.
- Decreasing the growth rate of tariffs in regulated areas.
- Creating the process of automation of tariff regulation.
- Reducing the negative impact of the price factor on the economy of Saint Petersburg.
- Maintaining the economic balance between consumers and resource-supplying organizations of Saint Petersburg.
- Increasing the efficiency of the use of energy resources.

One of the components of tariff regulation is the measures included in the investment program; their cost is also included in the tariff [19, 21].

When evaluating the effectiveness of investment program measures, it is necessary to take into account:

- a) risks of non-fulfillment of these measures;
- b) determining the priority of measures during the implementation of the investment program.

Due to a change in regulatory legal acts, a water supply and sewerage enterprise now requires a transition to a system of integrated technological regulation. This scheme includes:

1. The gradual change of an enterprise of the water supply and sewerage sector to regulation based on indicators of the best available technologies for technologically regulated substances;
2. Sharing of responsibility between water supply and sewerage enterprises and consumers for indicators of quality of wastewater discharged (shown in Table 1).

Table 1. Requirements on responsibility in connection with changes in the Federal Law No. 225 “On Amendments to the Law on Water Supply and Sanitation”

Responsibility for the water supply and sewerage company	Responsibility of consumers
1. Compliance with established discharge standards for technologically regulated substances	1. Compliance with the composition of wastewater for specific industrial pollutants
2. Implement environmental programs and plans only to achieve standards for technologically standardized substances (BOD, COD, nitrogen and phosphorus compounds, microorganisms)	2. Implementation of the plan on reducing discharges to achieve the standard on wastewater composition for specific industrial pollutants (oil products, phenols, metals)

Thus, for enterprises in the water supply and sewerage sector, strict regulatory regulation of activities in the field of tariffs is carried out. The need for maximum investments in the investment program associated with production costs and technology improvement is determined to minimize the negative impact on the environment [3, 20, 22].

4 Discussion

Benchmarking is a continuous process that starts with comparing performance indicators and ends with actual results for an enterprise. These results improve the quality of services and increase production efficiency.

The most striking examples of the effectiveness of benchmarking are the following achievements of our company. From 2005 to 2008, works were carried out jointly with the enterprises of the water supply and sewerage sector in Finland, aimed at reducing the costs and losses of water during transportation.

Let's compare tariffs in Saint Petersburg and the European and Baltic cities, from which we conclude that the lowest tariff values are observed in Saint Petersburg (0.3 Euros per m³), Riga (0.63 Euros per m³), and Tallinn (0.95 Euros per m³).

St. Petersburg complies with HELCOM recommendations on the quality of cleaning from biogenic elements. Russia approved the 1992 Helsinki Convention in October 1998. This set new challenges for Saint Petersburg to improve the city's wastewater treatment system to the HELCOM recommendations.

Modernization of wastewater treatment facilities using the technology of deep removal of biogenic elements. The introduction of a chemical method for removing phosphorus and phosphates results from joint work with specialists from the Baltic countries and studying their experience.

Let's carry out a comparative analysis of the tariffs for cold water supply in the "Population" category in the cities of Russia, from which we can conclude that the lowest tariff value is typical for the city of Novosibirsk (19.46 rubles per m³), Chelyabinsk (25.16 rubles per m³), St. Petersburg (32.53 rubles per m³).

5 Conclusion

According to the conducted study, the following general conclusions can be made:

- tariff setting mechanisms differ significantly in Russia, Europe, and America;
- there is a significant number of tariff setting methods, but the most commonly used and widespread is the benchmarking method;
- the principles of tariff setting, typical for Russian water supply and sewerage enterprises, are presented in the study;
- a comparison of tariffs in foreign cities and Russian cities have been carried out, and the lowest values have been identified, which include: Saint Petersburg, Riga, Tallinn, Novosibirsk, and Chelyabinsk.

Despite the reduction in water consumption and the improvement in the quality of services, the level of tariffs for consumers in Saint Petersburg remains low compared to the leading cities of the Russian Federation and European countries.

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