DETERMINATION OF SECTION-TO-SECTION COSTS FOR MAINTENANCE AND OPERATION OF INFRASTRUCTURE

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ABSTRACT

The network contract as a method of state regulation of rail infrastructure has been used successfully in a number of countries. Its main objectives are guaranteed transport support of socio-economic needs of areas within priority geographical configuration, optimization of internal costs of infrastructure complex owner and maintenance of service availability in transportation system to the public. Special attention is paid to the methodology and the economic model for determining operating costs for infrastructure maintenance of low intensity rail sections. Calculations made on that basis justify required subsidies, budget investments and allocations for implementation of the tasks provided for also by a network contract.

Keywords: railway transport of general use, infrastructure, network contract, methods for calculating the cost, low-intensity lines, operating costs, revenues, financial results.

Background. *Prospects of development of a country's economy and meeting the needs for passenger traffic, elimination of socio-economic backwardness of individual regions are dependent on the state of the railway infrastructure and qualitative work of the transport complex. From this point of view, we need a highly efficient system of state regulation at the transport services market, which could guarantee lawful and fair competition in the transport sector, would raise the industry to a new level and give it an impetus to innovative development.*

Objective. *The objective of the authors is to consider operating costs of railway infrastructure in terms of network contract application.*

Methods. *The authors use general scientific methods, comparative analysis, economic assessment, evaluation approach.*

Results.

Structure according to the contract

As it is known, the development of infrastructure complex of JSC Russian Railways is carried out by state regulation of prices (tariffs, fees and charges) in rail transport, providing subsidies to compensate for losses in revenue, budget investments in the authorized capital of the company and subsidies for infrastructure development of public rail transport.

The existing procedure does not remove, of course, transport infrastructure problems themselves:

– combined organization of freight and passenger traffic on some lines, especially in large metropolitan areas;

– non-harmonized state of different modes of transport;

– lack of clear division of responsibility for transport infrastructure development between the federal center and the regions;

– loss ratio and high return on investment in terms of transport projects (more than 40 years, projects are not paid off even during the life of the main elements of transport systems);

– complexity of formation and implementation of federal and regional target programs for transport system development;

– budget congestion and imperfect schemes of public-private partnership.

State regulation of prices (tariffs) for goods and services of subjects of natural monopolies is carried out primarily in accordance with two models – model of profit rate regulation and model of the upper tariff limit regulation (deflator-X). They are distinguished by the choice of the central control parameter, frequency of revision, the way of its setting, and other relevant factors [1].

In recent years special relevance is obtained by the network infrastructure contract – a new method of public management of railway infrastructure, successfully used abroad [2].

The network contract for guaranteed provision of transport services of the infrastructure complex on the part of its owner is a mechanism of state order of a certain volume of services required for socio-economic development of the country, and determination of the target state of the complex itself sufficient for this purpose. In other words, the network contract inherently is a new regulatory model in the field of public management of railway transport infrastructure complex.

Accordingly, such a contract is intended to formalize the relationship between the state and the infrastructure owner and record:

– target state of the infrastructural complex (state requirements for production capacities, technical state of the railway network, geographical configuration and quality of service);

– list of works and cost estimates for maintenance, operation and development of the infrastructure complex;

– planned volumes and sources of financing costs, the amount of required subsidies, budget investment to provide the desired state of the infrastructure complex.

The objects of the property included in the infrastructure complex of JSC Russian Railways, in the framework of the network contract may include objects that meet the following criteria:

– infrastructure areas related to railway lines and (or) sections having defense and social importance;

– construction of facilities aimed at enhancing infrastructure capacity;

– construction of new railway lines;

– innovations in the infrastructure complex;

– other objects defined by the network contract.

The subject of the network contract will be determination of:

– performance of target state of the infrastructure complex (state requirements for geographical configuration, production capacity, technical condition of the railway network and quality of services of the complex performed by its operation, modernization and reconstruction, new construction and acquisition of fixed assets);

– measures for maintenance and development of infrastructure complex;

Table 1

The main advantages and disadvantages of rail transportation cost calculation methods

Name of the method	Main advantages	Main disadvantages
method of calculation on individual articles of the costs classifier	- detailed calculation of the cost of transportation; - relatively accurate results; - does not require pre-grouping of costs; - ability to change different calculation methods	-relatively low speed of calculation in connection with the maximum volume of initial information and calculation formulas
method of expenditure rates	- detailed calculation of the cost of transportation; - more accurate results	- requires less initial information than calculation on individual articles, while labor costs for information processing are significant
method of influence coefficient	- simplicity of effective calculations	-low accuracy of calculations due to assumptions inherent in the method

– level of tariffs, fees, charges on rail transportation service at the economically reasonable level.

The network contract as a single document that defines requirements of the state for volumetric, value and qualitative characteristics of public rail transport infrastructure services should be formed on the basis of specific calculations of the amounts of income, expenses, value of assets, liabilities and equity of JSC Russian Railways to be allocated to its activities related to performance of the contract.

An important part of the network contract is to determine level and direction of investment, which involves development of methodology for planning and reporting on relevant costs and revenues at the disposal of assets.

To ensure interoperability between network contract parties with regard to planning of revenues related to infrastructure and costs arising from operation, maintenance, repair, modernization and development of the complex, it is necessary to consider a number of requirements, including transparency of planning and accounting of actual revenues and costs, creation of common to all the participants order of preparation of information in various analytical sections [3].

The network contract should provide sources of funding necessary to ensure contractual obligations under the contract.

Calculation of cost

Solution of various socio-economic tasks of public rail transport assumes the availability of data on the cost of freight and passenger transportation in different environments:

– types of cars and categories of trains;

– loaded or empty run;

– distance of transportation;

– performance of technical equipment;

– specific areas and sections of the rail network.

Currently five main methods are used to calculate cost and to determine a degree of influence of performance (time) on manufacturing operations and the value of meters:

– method of calculation on individual articles of the costs classifier (included in the nomenclature of revenues and costs of natural monopolies in the field of rail transportation);

– method of expenditure rates;

– method of change factors of average road cost of transportation;

– method of specific expenditure weights;

– method of influence coefficient [4].

The main advantages and disadvantages of cost calculation methods are shown in Table 1.

JSC Russian Railways as a versatile company in addition to the tasks regulated by the network contract, performs a significant amount of work related to transportation and other activities. On the stages of planning and formation of reports on actual costs incurred it is necessary to ensure a sufficient level of detalization of information about the costs directly attributable to the network contract. It is necessary to find a share of these costs by calculation while preserving full transparency of the method.

To simplify planning and analysis of the relationship between set target parameters of work within execution of the network contract it is necessary to detail cost items to a level that allows to identify this relationship [5].

The initial data for compiling expenditure part of the medium-term plan are used:

management reporting on activities;

management reporting on the costs of transportation in the context of tariff components;

forecast of operating costs for transportation (operating costs in the context of cost elements and types of transportation);

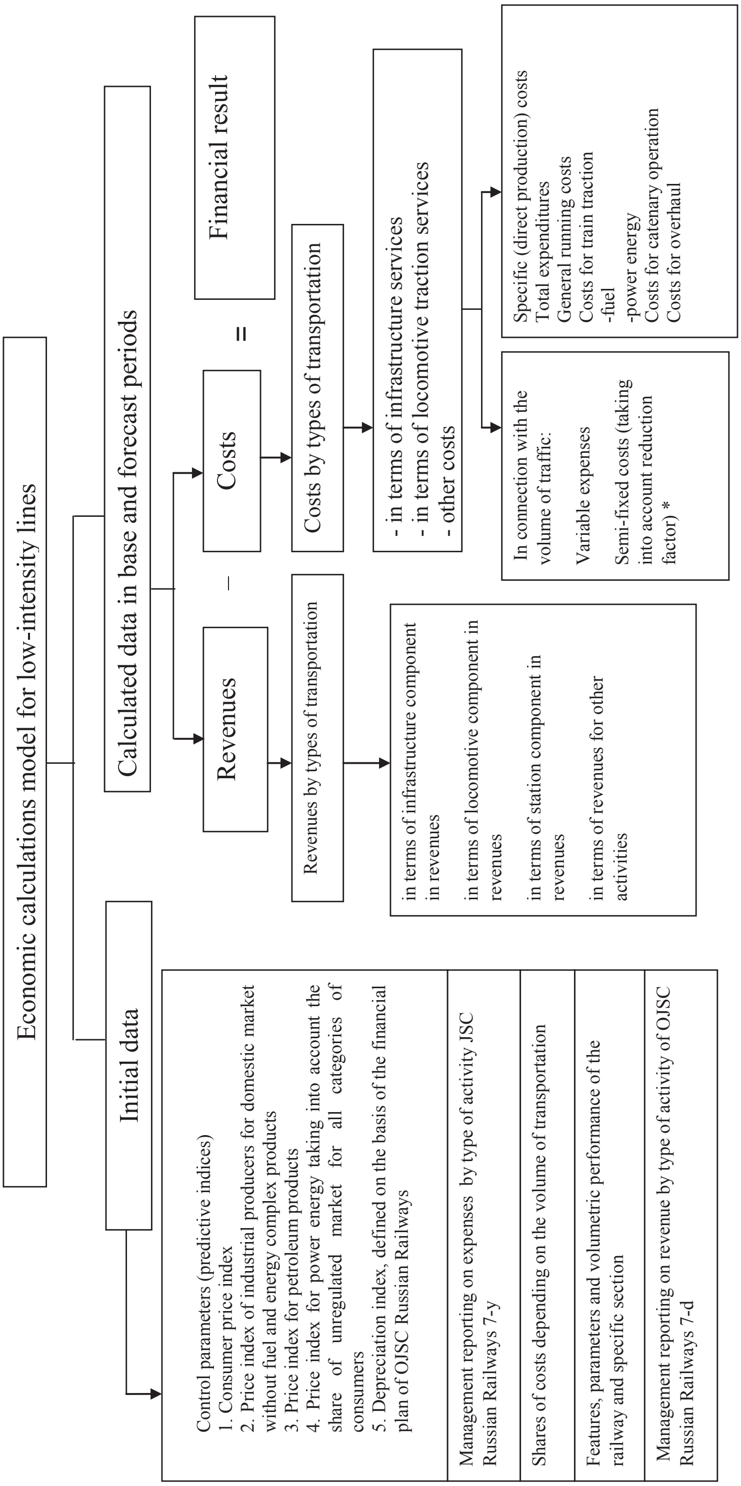
forecast of operating costs for other types of activities (expenses in the context of cost elements and activities) for three years.

Forecasting cost structure should be carried out by extrapolating base year data in accordance with forecast data on volume and structure of transportation, prospects of allocation of subsidiaries and affiliates, market development tendencies.

In the calculation as a base a year is taken for which there is evidence regarding the cost structure.

The costs for the base period should be divided by type of activity and tariff components. The allocation of costs is made after processing summary data of forms of management reporting by branches and divisions of JSC Russian Railways according to the procedure for determining costs and revenues for the network sections of the Russian railways, related to transportation, provision of services of infrastructure and locomotive traction.

The methodology of accounting of costs and expenses must be built in compliance with the principle of common processes of costs planning, as well as overall systems for planning, budgeting and accounting in JSC Russian Railways [6]. In addition, coordination with other documents of methodical and regulation support, as well as with elements of cost management system is required:



Pic. 1. The structure of economic calculations model for low-intensity lines

*Note. Due to lower standards when operating low-inte nsity sections to the obtained values of costs (excluding costs for electricity for train traction) by types of traffic the coefficient of 0,7125 is used. This correction factor is calculated on the basis of:

– The ratio of the norms of labor costs of workers involved in current track maintenance when average network freight traffic density exceeding 25,0 million tons • km gross per year and track service life of 16,7–20,0 years and freight traffic density up to 2,5 million tons • km gross per year and track service life of 16,7–20,0 years;

– Correction factor to the norms of the labor costs of workers involved in current track maintenance at sections that are not equipped with automatic block system.

– target key performance indicators of the network contract;

– norms and regulations;

– motivation and staff assessment;

– classification of technical and economic information.

Criteria for classification as low-intensity sections

Low-intensity lines (sections) are characterized by low volumes of work and persistently negative financial results of operations. Typically, they are single-track sections and single-track with double-

Table 2

Characteristics of low-intensity sections of October Railway

Name	Operational length, km	Freight traffic volume, t	Average distance of freight transportation, km	Pairs of passenger trains per day	
				long-distance	commuter
Section 1	68,0	0	0	0	1
Section 2	101,5	12009	1297	0	0
Total	169,5	12009	1297	0	1

Table 3

An example of calculation of revenues and expenses for low-intensity sections of October Railway, mln rubles

Name	Expenses from ordinary types of activity				Revenues from ordinary types of activity			
	2014 *	2015	2016	2017	2014 **	2015	2016	2017
Section 1	170	155	162	169	6	5	6	6
Section 2	271	246	257	268	1	1	1	1
Всего	441	401	418	437	7	6	7	7

*with account of other expenses
** with account of other revenues

Table 4

Example of calculation of the financial result for low-intensity sections of October Railway, mln rubles

Name	Financial result			
	2014	2015	2016	2017
Section 1	–164	–150	–156	–163
Section 2	–270	–245	–256	–267

track inserts. Low-intensity areas and lines of social, defense and other national importance, become the scope of the network contract. In this participation of the state is limited to subsidizing of operations, ensuring functioning of sections and the implementation of tasks of national importance.

Railway lines of public use that are branches of the main directions of freight and passenger flows, are ranked as low-intensity sections, if they satisfy one of three criteria:

– net freight traffic density at the section is 1,0 million tons • km net / km per year and not less than 0,01; while the total volume of cargo transportation with the participation of these sections does not exceed 5% of the total volume of goods transported on the rail network;

– amount of traffic of passenger trains on the schedule does not exceed 8 pairs of trains a day.

Railway lines of common use except for those that are branches from the main directions are low-intensity if they simultaneously meet the following criteria:

– gross freight traffic density at the section is 2,0 million tons • km gross / km per year or less;

– total amount of traffic of freight and passenger trains on the schedule does not exceed 8 pairs per day.

It should be noted that those sections of the rail network are representative, in which the operational length is in the range from 15 to 120 km, and the range of reduced freight traffic density varies from 0,01 to 1,0 tones • km gross / km per year.

Low intensity (low-density) lines are classified according to their location: transit, dead-end, border, port. At the same time, as of July 1, 2014 such lines totaled 225 sections with a total length of 11964 km. The largest share on the extent of low-density lines is occupied by Gorky, South-East, Moscow, October (Oktyabrskaya) and Kaliningrad railways [7].

The parameters of the financial result

For calculation of operating costs and solution of challenges associated with development of basic parameters of the network contract for provision of a guaranteed transport support of rail transportation by the infrastructure complex, methodological approaches were formed, focused on the specifics of low-intensity lines. At the same time existing methods used for calculating revenues, expenditures and financial results were used, as well as own conceptual framework was offered. Combining these approaches into a single unit to simplify the process of technical and economic calculations became the main purpose of this technique [8].

The main requirements that are reflected in the methodology were:

– use of available sources of information on revenues, expenditures and physical indicators of JSC Russian Railways;

– determination of economically sound meters for distribution of costs and revenues;

– providing logical links of meters used for formation of expenses and income with proportionally distributed groups of items of income and expenses;

– use of conventional forecasting methods used by federal executive bodies with indexation of tariffs for services of infrastructure of public railway transport.

The most complete and accurate results of calculation and forecast of operating costs are obtained when using the method of direct calculation and method of expenditure rates in determining the cost of transportation in specific conditions.

All calculations can be performed and presented in the form of financial economic model (Pic. 1), which can be divided into two main units:

– data input unit (control parameters, input data);

– unit of calculations and forecast of revenues and expenditures, as well as calculation of the financial result of low-intensity sections.

The model determines basic provisions on the calculation of:

– expenses from ordinary activities related to manufacture, purchase and sale of goods and products, as well as other expenses;

– revenues from ordinary activities, defined as revenue from the sale of goods and products, revenues from work performed, services rendered and other income;

– financial results of low-intensity sections.

Example of calculation

Calculations of operating costs for infrastructure services are performed on an example of two representative low-intensity sections of October Railway: socially significant section 1 and section 2 having defense significance.

Low-intensity section 2 is characterized by:

– one pair of passenger trains a day;

– operational length – 68 km (Table 2).

Low-intensity railway section 1:

– reduced freight traffic density –0,15 million tons • km gross / km per year;

– operational length – 101,5 km (Table 2).

The results of calculations of revenues, expenditures and financial results of low-intensity sections are shown in Tables 3 and 4.

Calculation of financial results of low-intensity sections of October Railway is determined as the difference between forecast revenues and expenses.

This economic model for calculating operating costs for the network infrastructure contract as a whole and given a table of the financial result of the work of low-intensity sections in particular adequately justify the need for the year 2017 for annual subsidies and budget investment by the state, on average amounting to 158 million rubles for maintenance of low-intensity section 1 of social significance and in the amount of 259,5 million rubles – section 2 having defense significance.

For the forecast period 2014–2017 to ensure the target state of the infrastructure complex low-intensity section 2 requires total budget investment and subsidies in the amount of 633 million rubles, and the section 1 – in the amount of 1038 mln rubles.

Conclusions. *The main advantages for JSC Russian Railways from the application of this technique and the economic model for determining operating costs for maintenance and operation of infrastructure for low-intensity railway sections are transparency, completeness of accounting and high precision of calculations of costs. Calculation made by this method justify required amount of subsidies, budget investments and allocations for the execution of works to ensure the target state of the infrastructure complex.*

For full qualitative transition to a new system of public rail transport management and, in particular, its infrastructure in the coming years the following steps seem to be appropriate:

1. The use of the network contract mechanism.

2. Formation of the regulatory framework for tariffs for railway transportation, capable of ensuring their stable existence for five years.

3. The transition to a system of public transport contract for long-term subsidies of inter-regional passenger transportation.

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