

## THE MASTER METHOD OF THE TARIFF CALCULATION ON HEAT ENERGY AS MECHANISM OF INCREASING THE EFFICIENCY OF THE TARIFF FORMING

© 2008 I.V. Nikiforova, T.V. Lesnukhina\*

**Key words:** economically proved tariff, economically proved expenses, the necessary total proceeds, the heat energy, the master method, the constant expenses, the variable expenses.

State pricing on product and facilities enterprises, realizing controlled type of activity, is the most important factor defining their viability. Most often used expensive principle of forming the tariff on energy companies causes the ensemble of the equitable censures on the part of analyst because of its discrepancy to modern market requirements to economy and efficiency of the management. In this article the new approach is suggested to the price establishment on heat energy on the base of the master method.

The reference method of setting the tariff for thermal energy is a way of calculation of the price of the thermal energy, based on the consecutive comparison of the parameters of activity of the enterprise which are carrying out a regulated activity with the parameters of the enterprise recognized as the standard for reference. The revealed dependences of the levels of the articles of expenses of the reference enterprise are compared then to the charges of the compared enterprise. The basic stages of calculation of total income necessary for formation of the tariff on the basis of a reference method are as follows:

- 1) formation of representative set of the enterprises for comparison on the basis of the criteria providing validity;
- 2) selection of parameters (parameters of activity) of comparison to determine the reference enterprise on the basis of comparison of the most significant parameters of the activity;
- 3) the analysis of the financial condition and tariff policy of the most successful enterprise, definition of the optimal structure of the expenses, revealing of dependence of components of required total income from to the volume of release heat;
- 4) the calculation of the economically justified tariff of the enterprise which is carrying out an regulated of activity, proceeding from the received necessary total income calculated on the basis of dependences of relatively constant and relatively variable expenses, revealed from the reference enterprise;
- 5) the recommendations to the organizations on the adjustment of the parameters of

own activity to the parameters of activity of the reference enterprise.

Each stage should be carefully described.

1. Formation of the representative set of the enterprises for the comparison on the basis of the criteria providing the validity of the sample. The criteria are as following:

geographical site of the enterprises: the compared organizations should be in one climatic zone with identical (an error of 3-5 % is possible) duration of the cold season;

similarity of equipment: it is impossible to carry out the comparison between thermal power station and regional boiler-houses because of absolutely different characteristics of the heat power equipment;

number of subscribers or the corresponding volume of the released thermal energy: the deviation of volumes of the released thermal energy should not exceed 15 % depending on the corresponding status of the zone serviced by a heat supplying organization - city, town, settlement, etc.).

2. Selection of the parameters (parameters of activity) for comparison to find a reference enterprise on the basis of comparison of the most significant parameters of the activity (see the table).

In case of similarity of the parameter to its optimal value, the enterprise receives 1 point, the rest receive 0 points; in case of the maximal quantity of the parameter which does not have a fixed optimal value, 1 point is given to the enterprise whose parameter corresponds this tendency as much as possible, the rests get 0 points. The enterprise, which received the max-

\* Iraida V. Nikiforova, Ph. D. in Economics, associate professor at Penza State University; Tatiana V. Lesnukhina, past graduate student at Penza State University.

**The basic parameters of activity of the enterprises, according to the reference enterprise (a rough list)**

№	Parameters of comparison, $z_{1,i}$	Unit of measurement	The compared enterprises			Optimal value of parameter
			$z_1$	$z_2$	$z_n$	
1	2	3	4	5	6	7
1. Not compared parameters						
1	Volume of release	Gcal				
2	The established capacity	Gcal per hour				
3	Used capacity	Gcal per hour				
4	Peak capacity	Gcal per hour / ?				
5	Length of pipes	km				
6	Size of the tariff of the base period	roubles for Gcal				
7	Efficiency of the used equipment (types of the used boilers)	%				
8	Ratio of relatively variable and relatively constant expenses during the base period	%				
2. Compared parameters						
9	Ratio of the established and used capacity	%				100%
10	Number of failures for the last heating season	unit.				0
11	Number of breaks	unit.				0
12	The specific charge of fuel	m <sup>3</sup> per Gcal				With tendency to decrease
13	Specific size of constant expenses	roubles for Gcal				With tendency to decrease
14	Specific size of variable expenses	roubles for Gcal				With tendency to decrease
15	Frequency of updating of heating systems (after the capital repair)	%				the less often the better
16	Average service life of capitally repaired pipes	years				With tendency to decrease
17	Average percent of deterioration of the equipment	%				With tendency to decrease
18	Net profit for 1 rouble of released production	–				With tendency to decrease
19	Net profit for 1 Gcal	roubles for Gcal				With tendency to decrease
20	Net profit for 1 person. (actual number)	roubles per person				With tendency to decrease
21	Net profit for 1 person. (normative number)	roubles per person.				With tendency to decrease
22	The specific self-cost	roubles for Gcal				With tendency to decrease
23	Ratio of the actual and normative number of employees	%				100% , if the actual number does not exceed the normative number, the percent is added to 100%
24	debtor indebtedness turnover	times				With tendency to decrease
25	creditor indebtedness turnover	time				With tendency to decrease

imal number of points, is selected as the reference enterprise.

3. The analysis of the financial condition and tariff policy of most effective enterprises, the definition of the optimal structure of expenses, revealing of the dependence of the components of required total income from volume of the released heat.

The analysis of the financial condition of the enterprise is logically based on the parameters of financial stability, credit status and business activity which reflect a real current financial position of the enterprise in full. Studying of the basic indicators of the financial well-being of the researched organization allows to ratify it as the reference enterprise or to exclude it from the list of applicants.

As various components in the estimates of charges look like a formalized reflection and are expressed in concrete numerical values, it is logical to present the formation of the required total income as an economic-mathematical model by means of which forecasted sizes of charges and value of the most required total income (RTI) are formed.

It is possible to present RTI (Y) as system of two dependences:

$$Y = \left\{ \frac{F(a_1, a_2, \dots, a_i)}{f(x_1, x_2, \dots, x_n; y_1, y_2, \dots, y_m)} \right\},$$

$F(a_1, a_2, \dots, a_i)$  - dependence of the size of settlement of the expected income on the parameters indirectly influencing its size (see the table);  $f(x_1, x_2, \dots, x_n; y_1, y_2, \dots, y_m)$  - dependence of RTI on the set of the parameters directly influencing its level (set of the conditional-constant expenses  $(x_n)$  and relatively variable  $(y_m)$  expenses).

The reference of the expenses to relatively constant and conditional-variable is relative: relatively variable charges can denote the expenses for the purchase of the burnt fuel (natural gas or coal), charges for chemically cleared water, for the electric power (these kinds of expenses should be referred to variables as the increase in expenses for the electric energy for pumps depends on the season - during the heating period the given charges are two and more times more, than during the interheating period).

The materials, the amortization, the wages of the employees and other charges refer to the relatively constant charges. To make the comparison of structure of charges objective we exclude from the analysis such article of ex-

penses as rent as this factor is rather relative since in general it depends on the reassessment of the cost of the rented equipment and the enterprise itself cannot influence it in any way.

$f(x_1, x_2, \dots, x_n; y_1, y_2, \dots, y_m) = \sum (x_{nep} \cdot Q) + \sum x_{nocm}$ , where the sum of products of the specific charge of relatively variable expenses ( $x_{nep}$ ) on release of the thermal energy (Q);  $\sum x_{nocm}$  - the sum of conditional - constant charges, roubles.

On the basis of the data of our retrospective analysis of the estimates of charges of the heat supplying enterprises of the Penza Region (boiler-houses) providing the regional centers with a heat supply, it is possible to draw a conclusion, that variable expenses have direct linear dependence on the change of the volume of thermal energy realization which can be presented as the following function

$$x_{nep} = \beta \cdot Q + C,$$

where  $C = 0$  as at the zero volume of production and release of heat variable expenses are absent.

Having determined the reference enterprise and having analyzed estimates of the charges for the regulated activity, it is possible to define the correction factor  $\beta$ , allowing to calculate the necessary size of the variable expenses for any volume of production of other enterprises working in conditions similar to the conditions of the reference enterprise:

$$\beta = \frac{X_{nep_{\text{эп}}}}{Q_{\text{эп}}},$$

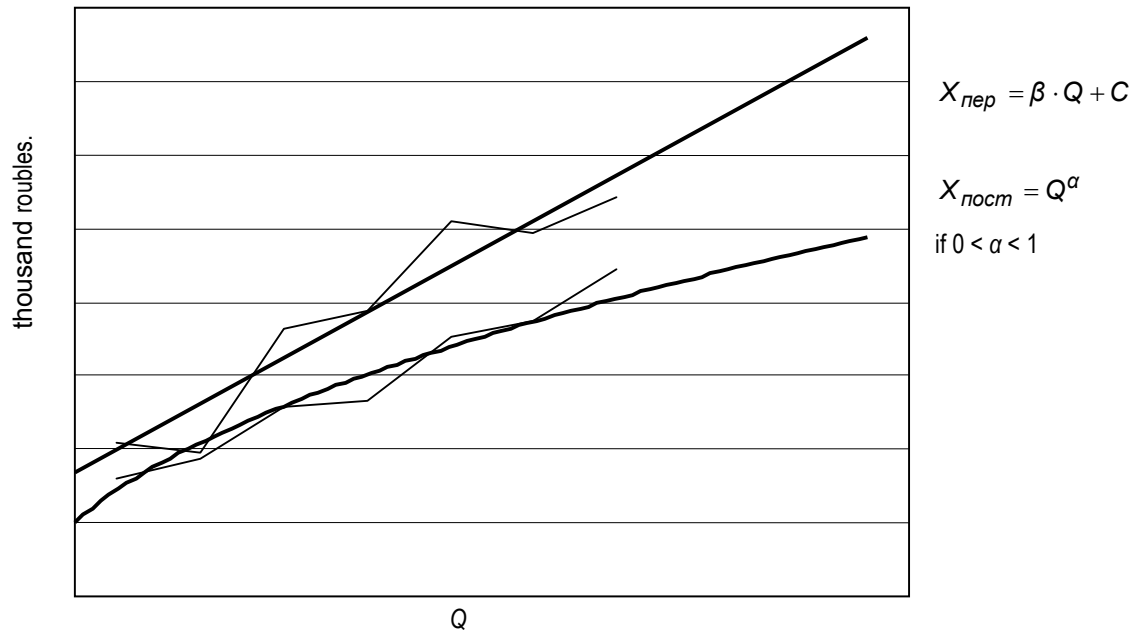
where  $X_{nep_{\text{эп}}}$  - the sum of variable charges of the reference enterprise during the period of regulation, in roubles;  $Q_{\text{эп}}$  - volume of the release of thermal energy of the reference enterprise during the period of regulation, Gcal.

The dependence of relatively constant expenses on the volume of the realization of thermal energy represents the following function:

$$X_{nocm} = Q^\alpha, \text{ при } 0 < \alpha < 1.$$

Knowing the sales volume of the researched enterprise it is possible to calculate the amount of the relatively constant expenses which provide for the optimal performance of the company:

$$\alpha = \log_{Q_{\text{эп}}} (X_{nocm_{\text{эп}}}),$$



**Fig. The scheme of change of relatively variable and relatively constant expenses of the heat supplying enterprises in case of the increase of the release of the thermal energy**

where  $X_{nocm_{эм}}$  - the size of conditional-constant charges of the reference enterprise, accepted during the period of regulation, in roubles;  $Q_{эТ}$  - the volume of release of the thermal energy by the reference enterprise during the period of regulation, Gcal.

In graphical form the change of expenses is displayed on the figure.

These dependences are obvious as with the increase of the heat consumption relatively constant expenses change insignificantly which can be explained by the fact that the given charges were already stabilized and the essential increase in sales volumes provides only insignificant growth of relatively constant costs. Besides, with growth of volumes of realization the lag between the relatively variable and relatively constant expenses will be more and more essential. This fact also confirms the correctness of linear and sedate dependences of relatively variable and relatively constant expenses from the volumes of heat consumption.

4. The calculation of the economically justified tariff of the enterprise which is carrying out a regulated kind of activity, depending on the received required total income calculated on the basis of the dependences of relatively constant and relatively variable expenses, found at the reference enterprise.

5. The recommendations of the heat supplying organizations to bring the parameters of

own activity to the parameters of activity of the reference enterprise.

The suggested variant of the calculation of the economically justified tariff on the basis of the revealed economic-mathematical dependence has the following advantages:

- ◆ mathematical modeling of the tariffs for the thermal energy, as many researchers notice<sup>1</sup>, eliminates the subjective influence on the level of the tariff of both the regulating body and heat supplying the enterprise itself;

- ◆ it is possible to predict a prospective tariff level depending on the planned volumes of realization of heat;

- ◆ there is an opportunity to calculate the tariff on the basis of the parameters of the most advanced and successful enterprises that creates preconditions for a competition for the right to set own model of business as the standard among other heat supplying enterprises;

- ◆ the all-round analysis of the business-processes of the enterprise allows to reveal the bottlenecks of the business with the purpose of their further elimination, i.e. the model of the calculation of the economically justified tariff on the basis of a reference method coordinates economic and financial processes at the level of key economic parameters.

<sup>1</sup> Bodrov E.A. Economic modeling of the cost price of thermal and electric power // Bulletin of Samara State Economic University. Samara, 2007. № 4 (30). P. 54-59.