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THE PROBLEM OF CHOICE OF THE UNIT COST INDICATORS OF ENERGY EQUIPMENT IN TERMS OF INFLATION

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ПРОБЛЕМА ВЫБОРА УДЕЛЬНЫХ ПОКАЗАТЕЛЕЙ СТОИМОСТИ ЭНЕРГЕТИЧЕСКОГО ОБОРУДОВАНИЯ В УСЛОВИЯХ ИНФЛЯЦИИ

The paper considers the problem of justification of specific indicators of power equipment for transmission lines and substations arising from the feasibility study of energy facilities. It analyzes the impact of inflation on the specific parameters of the cost.

SPECIFIC INDICATORS OF COST. POWER EQUIPMENT. FEASIBILITY STUDIES. INFLATION.

Рассмотрены проблемы обоснования удельных показателей стоимости энергетического оборудования для линий электропередач и подстанций, возникающие при технико-экономическом обосновании энергетических объектов. Анализируется влияние инфляции на удельные показатели стоимости.

УДЕЛЬНЫЕ ПОКАЗАТЕЛИ СТОИМОСТИ. ЭНЕРГЕТИЧЕСКОЕ ОБОРУДОВАНИЕ. ТЕХНИКО-ЭКОНОМИЧЕСКОЕ ОБОСНОВАНИЕ. ИНФЛЯЦИЯ.

The calculations of technical solutions for the power facilities involve the choice of an optimum variant of the development of the power industry facilities. The main criterion for the choice of optimal variant is the maximum synergetic effect or net present value (Э or NPV):

$$Э = -\sum^{T} \frac{K_t}{(1+E_н)t} + \sum^{T} \frac{ЧДt}{(1+E_н)t} \to \max,$$

where $ЧДt$ – net present value of the year t; K_t – capital investments for the year t; $E_н$ – interest rate of the Bank.

$$ЧДt = РПt - Н - И_{ба}t,$$

where $РПt$ – sales volume in the year t; $И_{ба}t$ – annual costs, excluding depreciation $И_а$.

It should be noted that the study of energy facilities indicates that the value of sales and annual costs of comparable options for the completion of the facility does not change from year to year if the calculation is performed at constant prices. In this case, if we assume that the capital investments are made in one year, the criterion NPV should be replaced by the criterion adjusted costs, which is a special case of the criterion NPV:

$$З = E_н K + И \to \min.$$

Given the fact that the value of the annual costs for power grid enterprises (substations and transmission lines) is a percentage of the value of capital investments, the criterion for determining the optimal decision is a minimum capital investment which is a particular case of the criterion of adjusted costs

$$K \to \min.$$

In order to justify the technical solutions of electric power facilities the estimation of capital investments in the technical-economic calculations is based on aggregated data value (UPS) of power projects. This approach based on the UPS is used for pre-design stage, when there is no detailed information on future energy projects. UPS of power projects are accepted according to the reference design of electrical power systems [1], which has been developed by JSC Institute «Energosetproject». There are other references for UPS power equipment [3, 4], but they basically use the same value indicators as in the book [1].

Cost parameters in reference the book [1] refer mainly to the year 2000. The recalculation of the current price are made by using indexes of translation costs, which are published in the journal KO INVEST [2]. For example, according

to the journal index retranslation of 2000 in 2010. the electricity industry index was 4.815 [2]. Such an increase in costs is due to the rising cost of materials for components, wages, and in the end – with inflation. The inflation factor has a significant impact on the price levels of power equipment and makes a substantial error in the determination of prices.

The calculation of the capital investments in power projects based on this approach and the comparative evaluation of the Russian equipment with the foreign one, demonstrate that Russian equipment cost indices are more expensive than those of the imported equipment, although in 2000 the situation was different, with the value indicators of the Russian equipment being 2-3 times cheaper than those of the imported equipment (see Tab. 1).

This difference in value can be attributed to the fact that inflation rates in Russia and in other countries are very different. At home, the rate of inflation from 2000 to 2010 decreased from 20.2 to 9 %.

In developed countries, the rate of inflation is 2–3 %, similarly in many developing countries.

If the inflation rate for the year is 2 %, the growth rate of prices in 10 years was 1.22, while the annual rate of inflation rate of 10 %, the price increase in 10 years is 2.6. Consequently, for 10 years, the difference in the prices of Russian and foreign equipment doubled. As a result, in 2000 the Russian equipment was 2–3 times cheaper than in 2010. when it became 20–30 % more expensive.

Thus, if you use the approach of defining cost parameters of power equipment with aggregate value of 2000. restated to the price of the current year index-based conversion [2], we see that the Russian power equipment is more expensive than its imported substitute. However, this approach does not always provide an objective assessment, as evidenced by the actual data on the cost of equipment from manufacturers. As a result, the cost of equipment does not grow to the extent predicted initially. In particular, comparison of the cost of transformers high voltage levels according to the manufacturer gets a 10–20 % lower, and for gas-insulated switches – 2 times lower than that from [1], with their conversion rates in 2010–2012.

Therefore, the approach currently used to the valuation of energy equipment requires adjustment. The probable reason for price differences is due to inflation. Inflation in Russia is characterized not only by the growth of prices, but also by a significant change in price ratios. Growth rates of prices for certain goods, products differ considerably. This phenomenon can be explained by the relative lack of development of the market infrastructure, monopoly market segments, the presence of barriers to competition, for example, due to established licensing for certain activities, etc. Therefore, the majority of Russian companies use individual price indices of industrial products [5].

It should also highlight some of the factors related to the inflation in Russia. These are, above all, the importance of imports for the Russian economy and the high cost of domestic production. These are purely Russian factors inherent in the domestic economy, like in most developing countries, even the level of production of consumer goods allows them to do without expensive imports.

Table 1

Comparison of specific cost-of-energy equipment for the Russian and foreign producers Equipment Prices 2000 Prices 2010

Equipment	Prices 2000		Prices 2010	
	russian	foreign	russian	foreign
Substation DC	16 % cheaper than their foreign substantes	More expensive	In 2.1–2.5 times higher	Cheaper
Overhead line DC	2–3 times cheaper	More expensive	20–40 % more expensive	Cheaper
Substation AC (switch)	No data	No data	Vacuum switch comparable, circuit breaker is 2–3 times more expensive	Equal, cheaper

The constant growth of imports of both industrial and food products in Russia is also one of the most serious and permanent inflationary factors. Any increase in imports from developed countries will have a tangible impact on the price increase stimulating inflation. [5]. It should be noted that the volume of imports of the power equipment has increased significantly, which is largely due to the higher quality of the power equipment, as well as due to the lack of a technological base for the production of certain types of equipment.

Besides the main causes of inflation in Russia related to the lack of domestic consumer goods, on other factor of accelerating inflation is a disbalance of the formation of incomes and wages, as wage growth has accelerated compared with the indexes of economic growth. Let us compare the prices of production of company codes of power equipment and wage growth. Producer price indices in the energy sector by sector at the beginning of 2010 compared to 2002 areas follows [2]:

1. Manufacture of electrical machinery and apparatus – 2.39.

2. Manufacture of electrical generators and transformers – 2.70.

3. Manufacture of insulated wire and cable – 3.97.

4. Generation, transmission and distribution of electricity – 3.11.

From 2000 to 2010. the growth of average monthly gross wages and salaries of employees of organizations in the economy was 4.70. which is higher than the producer price index in energy.

Thus, among the reasons for the rise in inflation in the energy sector are an increase in the imports of power equipment, as well as the wage growth rate compared with the indices of the growth of production of energy equipment.

It should also be noted that in addition to the factors of inflation, we can identify the factors that promote the reduction of inflationary processes. These factors include the innovative technology used in the energy sector and the emergence of power equipment with improved technical and economic indicators. The use of such equipment may help reduce the growth of prices in comparison with the general increase in prices for the given segment of the market for power equipment.

Conclusions:

1. The current approach of valuation of power equipment in the justification of the technical solutions of electric power facilities by UPS in 2000 prices adjusted for changes in prices using the inflation index does not always give an objective assessment.

2. The costs of power equipment are influenced by various factors that have different effect and require detailed analysis and account for the various types of power equipment.

3. In estimating the cost of power equipment in current prices requires a more detailed differentiation of inflation rates for certain types of equipment. The index for the whole electricity industry provides only aggregate measures, which do not reflect the real value of a rise in prices for certain types of power equipment.

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