



**Methods of reduction in value of electrical energy**  
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**Abstract**

At the present stage of industrial sector development industrial efficiency together with technological improvements is becoming more relevant. This refers to achieving of required quality and reduction in value of supplied products and its transportation. As a consequence, the issue concerning cost cutting while producing goods at enterprises of different types has become critical nowadays. Cost optimization is the main point that every corporate management team focuses on. This article suggests several ways of reduction in value of electrical energy produced at a thermal power station. These methods can't be used at any power plants, because the features of every station should be taken into account.

*Keywords:* power engineering, energy cost, reduction in value.

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**1. Introduction**

Prime cost is a definition that reflects all costs occurring during production process; as a result it characterizes enterprise's resource efficiency. Reduction of this indicator leads to increase in earnings and production profitability. There are a lot of theoretical works offering efficient solutions of the problem. For instance, the article [1] which deals with methods of costs decrease common to all factories. It should be noted that despite the variety of theoretical works this issue should be dealt with individually for each particular form of manufacture.

For analysis, the thermal power station was chosen. It is located in the northern part of the Siberian Federal District and distant enough from coal mining companies. This power station is used for settlement's needs and isn't one of the constituents of the Unified Energy System of Russia.

**2. Prime cost calculation of electrical energy**

Calculation basic data are made as report documents per 1 quarter of year 2015 where all kinds of costs occurred during the process of production are shown.

Table 1. Prime cost calculation of electrical energy

Expenditure items	Actual costs (million rubles)
Fuel for technological purposes	25,5
Spare parts	0,1
Auxiliary materials	3,6
Fuel	0,1
Transport-procured works	85,0
Electrical energy for own needs	3,7

Continuation of the table 1

Water	1,9
Remuneration of labour	23,0
Allocations for remuneration of labour	6,8
Reserve of the Federal Compulsory Medical Insurance Fund	4,6
Reserve for leaves	7,5
Amortization	17,5
Outsourced services for equipment repair	19,0
Other outsourced services	0,4
Other costs	0,5
Combined costs	199,2
Electric-power generation	39,521 (mil. kWh)
Prime cost	5,04 (rub./ kWh)

### 3. Methods of prime cost reduction

According to the data of table 1 the main cash costs account for transport-procured works (about 45 %). They include fuel costs, combustive and lubricating materials costs and other materials, required for correct operation of equipment.

Coal is the main fuel used for boiler furnace at the thermal power station. Before coal firing it is necessary to buy coal from coal mining company, deliver it at the station, crash and process into dust. In order to reduce fuel costs the price of coal purchase should be reduced or transportation's costs should be kept down. There are two methods of coal transportation at modern stations: via automobile transportation and via rail transport. The thermal power station uses the first method. It involves high fuel costs, repair costs and costs for ownership of large number of cars as one car can transport only small amount of coal, consequently, it is necessary to employ large number of drivers.

The second method of transportation can significantly reduce costs for coal transportation. At first, however, high investments for construction of railway lines and purchase of train set will be required. Nevertheless, the amount of coal transported by one van during one run is 30% more than transported by car. Besides transportation by train demands much less work force; as a result, costs for salary are rapidly decreased. Thus, this method is more economical in the long-term perspective.

Operation of the most unprofitable (in terms of fuel) equipment should be restricted in order to reduce costs. It can be done via installation of automated systems which will distribute electrical load to aggregates taking into account fuel consumption.

Next most unprofitable point is fuel for technological purposes (13%). This kind of fuel is designed for cars, used for coal transportation from the place of gathering to conveyer belt, load-transfer devices, cranes etc. Cost cutting according to this point is not possible as purchase of lower fuel involves frequent equipment failures which will lead to increasing of repair costs. Purchase of modern equipment which is more economical in regard to fuel consumption and which also has the lowest loss level demands high investments. Profit resulting from lower fuel consumption can't be compared with these investments. Therefore, cost cutting by the purchase of new equipment is not expedient.

Costs of the remuneration of labour can only be reduced when automated equipment which operation doesn't require human participation is installed. For example, installation of a new monitoring system (SCADA – system) will allow to reduce work hours of trackwalkers who are responsible for reading devices and control over fulfillment of conditions for correct operation of equipment.

Costs for outsourced services for equipment repair can be reduced if workers from own station but not from the other enterprises are engaged to perform repair works; as a consequence costs for remuneration of labour will be increased while total costs will be decreased. Sometimes, however, it is necessary to engage a highly skilled specialist for repair works. Outsourced services are expedient as hiring a specialist requires a set wage while repair works have periodic nature.

### 4. Conclusion

The structure of prime cost for power engineering differs from the structure of prime cost for industrial sector and different types of power generating system. Thus, the greatest costs in electric power industry

account for fuel resources whereas in machine-building and metal industry they account for raw and other materials and at factories of heating system they account for capital allowances [2]. The structure for different types of manufacture varies according to equipment capacity and industrial scale.

Prime cost of electrical energy was calculated by the example of a thermal power station. The analysis of received data shows that more than 45 per cent of costs account for coal purchase and transportation. Considerable cost cutting will not be reached without high investments.

The same situation is with fuel for own needs. As the station works under conditions of extreme north, a lot of resources used for making right temperature conditions indoor are wasted.

During the process of building's engineering of electrical generating system a lot of terms must be taken into consideration. Some of them influence prime cost of export electrical energy, for instance, remoteness from coal deposits. It's also important to consider a question about expedience of separate electrical station's building as perhaps the most economical method of electrical power supply of remote areas will be bulling of electric power transmission lines from stations which already exist than maintaining a new one.

Thus, it may be concluded that costs reduction to those points that don't demand high investments (for example, substitution workforce for modern automated systems) will be initial phase to reduction of production cost. These measures will give the particular effect; in course of time with the help of these measures and received facilities it will be possible to perform manufacture's technical re-equipment.

## References

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