ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 6, Issue 12 , December 2019

Modeling Forecast of Power Consumption of Rural Enterprises

RakhmonovIkromzhonUsmonovich, NajimovaAysuluMakhmudovna

Head of Department of Electra supply, Tashkent stateTechnical University, PhD, associate professor, Uzbekistan
Senior lecturer of the Department of "electric power" of Karakalpak state University, Uzbekistan

ABSTRACT: The article deals with the issues of modeling and forecasting of electricity consumption of agricultural enterprises. The relevance of determining forecast values with low errors is described. The scheme of formation of the predicted value of the electric power consumption which provides increase in accuracy of forecasting is offered.

KEY WORDS: forecasting, power consumption, power consumption, accuracy, factors, technological process

I.INTRODUCTION

Agriculture has a number of specific production characteristics that distinguish it from other industries. Existing methods of forecasting and rationing of electricity do not include these features which characterize the process of production, modes of power consumption of the equipment, as well as the impact of technological and operational factors on the energy performance. As also noted above, energy services have to rate, evaluate and distribute energy on the basis of experience and intuition with regards to the data on actual and planned performance of individual enterprises, which leads to certain inaccuracies and errors.

II.RELATED WORK

Many works are devoted to a solution of the problem of forecasting of the electric power. Works on short-term forecasting of volumes of a power consumption of such scientists as Voronov, I.V., Demura, A. V. which offered forecasting on the basis of neural network, Hnatiuk, V.I., Lagutkin, O. E. who offered a method on the basis of a tekhnotsenoz, Manusov V. Z., Nikiforov, who offered forecasting on the basis of the regression analysis, Kleopatrov D.I. who offered forecasting on the basis of exponential smoothing are of special interest. However the offered methods cannot be applied to the solution of a problem of forecasting of volumes of electricity consumption at the power marketing enterprise, due to some restrictions, which include: impossibility of use of a large number of factors, use of the subjective assessments, a need of the use of statistic selections for a major period of time, the requirements to technical and program tools.

III. SIGNIFICANCE OF THE SYSTEM

In this regard, we set the task of science-based calculation, analysis and forecasting of energy consumption for each production site in view of its specific features [1].

Forecasts of energy consumption should take into account a variety of factors related to the technological features of production, organization of the equipment operation, etc.. Although at this time there is a sufficiently large number of energy consumption forecasting methods, the results of their application are not always reflect the real situation.

IV. METHODOLOGY

To improve the reliability of forecasting it is necessary to identify patterns of change in electric capacity of the products, determine the conditions under which the dynamics of electricity may change significantly. In each industry the scale and pace of technological improvement and growth in the volume of output are different, in addition, the amount of electric capacity of production and the level of power consumption can be significantly affected by changes in energy consumption patterns due to changes in demand for such components of the process, as compressed air, oxygen, water, et al., as well as energy-intensive consumption such as ventilation, air conditioning, etc [2].

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 6, Issue 12 , December 2019

Thus, to improve the accuracy of forecasting we must differentially solve complex problems related to the above mentioned factors [3].

In the first stage we divide all the projected energy consumption industries into components:

a) energy consumption of enterprises, which do not change the equipment and technology for the entire forecast period - basis enterprises (W_b);

b) energy consumption of enterprises, which plan to upgrade of technological equipment, the transition to a new technology (W_m);

c) energy consumption of new enterprises, with new equipment and technology (W_n).

So, forecasted energy consumption will be:

$$W = W_b + W_m W_n \tag{1}$$

or

$$W = P(\beta_b d_b + \beta_m d_m + \beta_n d_n) \tag{2}$$

where n - planned output;

β_b, β_m, β_n - share of planned production of each enterprise respectively;

d_b, d_m, d_n - specific power consumption respectively.

The planned value of output over the forecasted period (P) and, accordingly, the share of existing, upgraded and new enterprises (β_b, β_m, β_n) determined in accordance with the plan of development of the industry.

It is more difficult to identify future specific electricity consumption per unit of output (d), since it is necessary to take into account a large number of factors that determine the level of this indicator, the type and condition of the main equipment, processing of raw materials and semi-finished products, the quality of raw materials, the amount of consumable components and secondary resources (oxygen, compressed air, etc.). Shortcomings in the evaluation of these factors can lead to deviations of the actual values of the projected energy consumption [4].

To solve this problem we recommend block-differential method of calculation and analysis of the energy performance of individual enterprises and the industry as a whole.

Production is divided into blocks according to the following principles: a group of units of the basic production facilities - I type, a group of auxiliary facilities – II type, other needs - III type (Figure 3.1.).

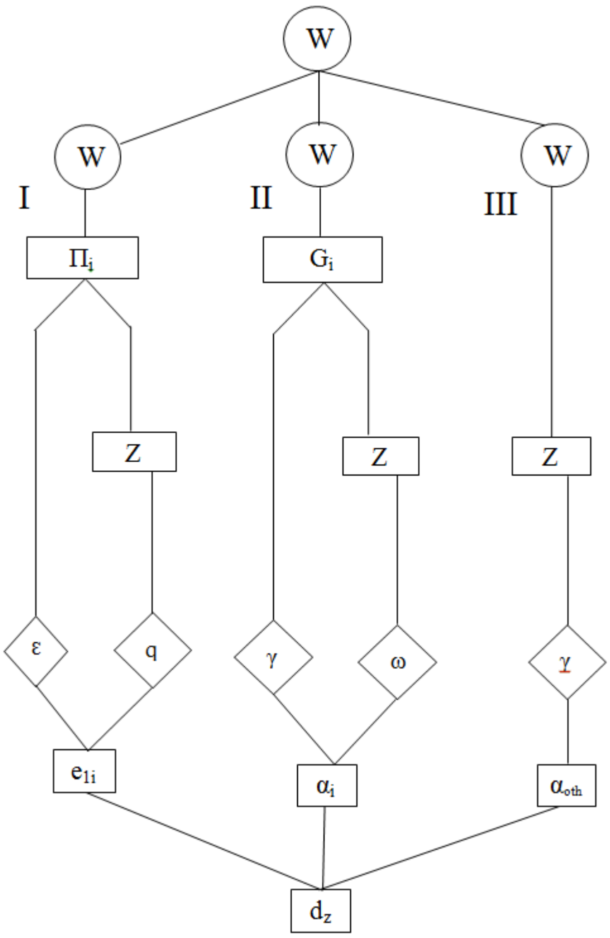

Fig. 1 Flowchart of formation of power consumption projected value

I – Power consumption block W_1 – the units (shop, process) which release intermediate product P. It includes specific consumption ε_l of power W_l to release product P_l and specific consumption q_l of product P_l per unit of end-product Z;

II – Power consumption block W_{III} of industrial units which release components of technology process and secondary resources B_l. This, as block I, includes specific consumption γ_l of power W_{III} for product B_1 per unit of the end-product Z ;

III – Block – other electricity consumption W_{oth}.

Thus, each of the above blocks, along with energy consumption indicators includes indicators of raw materials consumption, semi-finished products and technology components:

a) Specific energy consumption for one shop or process production:

for block I

$$\varepsilon_l = \frac{W_l}{P} \tag{3}$$

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 6, Issue 12 , December 2019

for block II

$$\gamma_{II} = \frac{W_{II}}{B} \quad (4)$$

b) Specific consumption of intermediate products, technology components per unit of end-product:
for block I

$$q = \frac{P}{Z} \quad (5)$$

For block II

$$\varpi = \frac{B}{Z} \quad (6)$$

Share of each block in the overall specific power consumption of the enterprise is given by:

$$e_l = \varepsilon \cdot q \quad (7)$$

$$a_{ll} = \lambda \cdot \varpi \quad (8)$$

Consequently, the total figure of the specific energy consumption will be:

$$d_z = \sum_{l}^{n} e_l + \sum_{l}^{n'} a_l + a_{oth} \quad (9)$$

Where n, n' - The number of blocks of type I and II respectively.

The proposed block structure, by type of energy consumption and production processes, can significantly simplify them, increase the accuracy of calculations, aided by the ability to include component of specific energy consumption directly into the calculation, performance of individual power-objects that are usually defined, accounted and monitored separately, as in-plant performance, without a direct link to the factory-wide specific power consumption factors (for example, electric arc furnace, compressors, etc.) [5,6].

Thus, the proposed electric power consumption forecast method is based, firstly, on the separation of the total amount of the consumption into three categories [7]:

1.power consumption of existing and new enterprises, which, over the forecasted period retain the existing equipment;
2. power consumption of enterprises that undergo modernization;
3.power consumption of enterprises coming into operation in the forecasted period with the new equipment and new technology.

Secondly, differentiation is performed within each category:

1.power consumption of each of the major operating divisions;
2.power consumption by type of support needs;
3.other expenses.

As a result, whole power consumption of the industry and its branches is differentiated and each calculation can be performed in blocks, i.e., extremely simplified. The calculation takes into account the specifics of technical progress in each of the units of production.

According to the method it is assumed that the input data are indicators of power consumption of characteristic enterprises with existing equipment, which are taken as a basis. The calculated factors obtained $(a_o, \varepsilon_o, \gamma_o q_o, \varpi_o, l)$ with adjustments may be used in the calculations for the industry [8].

Consequently, to determine the energy requirements on a given period in industry (W_b) as basic raw data $\Pi_i B_i Z_i$ values are sufficient, where:

$$Z = \beta_o \cdot \Pi. \quad (10)$$

The predicted value of specific and absolute consumption of electric power by companies, which plan to upgrade, $(d_м W_м)$ can be obtained by calculating the d_b. For this purpose, according to the flowchart (. Figure 1) for each block we determine:

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 6, Issue 12 , December 2019

$$\varepsilon = \frac{\varepsilon_b \cdot Z_b \pm \sum_{l}^{m} \Delta W_m}{Z_b + \Delta Z_m}. \quad (11)$$

and correspondingly:

$$\varepsilon = \frac{\gamma_b \cdot B_b \pm \sum_{l}^{m} \Delta W_m}{B_b + \Delta B_m}. \quad (12)$$

Where m - the number of units and processes to be upgraded;
ΔW_m - energy savings due to the modernization of technological equipment.

V.CONCLUSION

According to the forecast figures of consumed raw materials, consumption of the components of the process $\varpi_{м}$ and formula (9) we define d_m and correspondingly, W_m.

Calculation of energy needs for new enterprises with new more advanced technology and equipment (d_m and W_m) for given *P*, *B*, *Z*are produced by the same method on the basis of design data.
In the absence of sufficiently reliable data on individual indicators - forecast output, components consumption and so on, their value can be determined by expert assessments.

Sought value of electricity consumption for the projected year (W) we find from formula (12).
Thus, the proposed method can obtain the required set of mathematical models for each industry, which allow improving the accuracy of power consumption forecast, as well as flexibly and quickly adjusting their spending in all technical and technological changes in individual units for each production.

REFERENCES

[1] Hoshimov F . A. Energy savings at Industry // Problems of energy - and resource savings, Tashkent State Technical University , 2009. № 3-4.
[2] Gofman G.B. Rationing of energy consumption and energy balance at industrial enterprises . -M .- L ., Energiya, 1966, 320 p .
[3] Belenky A.M. Berdyshev V.F. Some aspects of energy saving in the steel industry. - M.: MISiS . - 1999. - 78 p .
[7]Hoshimov F . A ., Allaev K. P .,Energysaving at industrial enterprises , Tashkent , " Fan " publishing house , 2011 g ., 209 p .
[5] Hoshimov F.A., Rasulov A.N., Taslimov A.D., Rakhmonov I.U. The current state of electrometallurgy in Uzbekistan: Monograph, "East West" Association Studies and Higher Education GmbH.– Vienna, Austria, 2017. – 84 p.
[6] Hoshimov F.A., Rakhmonov I.U. Rationing of electricity production in the rolling of ferrous metallurgy // Scientific journal «European Science review». Austria, Vienna, 2014. - №11-12 November-December. PP. 56-59.
[7] Hoshimov F.A., Rakhmonov I.U. Analysis of the optimal energy indicators of electric arc furnace // «Austrian Journal of Technical and Natural Sciences». Austria, Vienna, 2015. - №3-4 Mart-Aprel. – P. 52-55
[8] Rakhmonov I.U. Analysis of problems of management of a power consumption and ways of their decisions / International Scientific-Practical Conference «Science and Innovation in the XXI century: problems and solutions». – The United Kingdom, London, 2015. – P. 22-25.