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Calculation of the nominal power and electrical energy of the hydro power plant on an electronic calculator

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Abstract. Today, approximately 70.4% of the electricity produced in the world is provided by thermal power plants, 15.2% by hydropower plants, and 14.4% by solar, wind and other types of power plants. This indicator produces approximately 87 % of electricity in the Republic of Uzbekistan by thermal power plants, 10.2% by hydropower plants, and 2,8% by solar and wind power plants. It can be seen that meeting the needs of electricity on a global scale is mainly done through fossil resources. The sharp decline of underground reserves, now requires the need to find a solution to the problem of creating alternative energy sources. For this reason, the problem of electric energy is also serious in the Republic of Uzbekistan, and the cheapest electricity is obtained through hydroelectric power stations. The reason is that 1 kW of electricity received through hydroelectric power stations is 295 soums.

1 Introduction

In the article, first of all, in order to determine and calculate the nominal power of the hydroelectric power station and the generated electricity (active power), a program was created in the Delphi 7 programming language, and by entering the parameters of the hydroelectric power station into it, several parameters of the hydroelectric power station can be simultaneously calculated in very short seconds, using a modern calculator. the possibility of finding through is indicated [1-5].

2 General information about the nominal power and electric energy (Active power) of the hydroelectric power station

The daily load graph of the electric power network consists of 3 characteristic parts:

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1. Basis part, minimum from loading (P^{min}) below is located part;
2. Half peak part, minimum loading (P^{min}) and per diem loading (P_{milk})between place part;
3. Peak (P^{max}) part, per diem from loading (P_{milk}) above place part.

The power of the electric power network is the sum of the power of all the power plants operating in the electric power network:

$$N_{Ep} = \sum_{k=1}^{n} N_k.$$

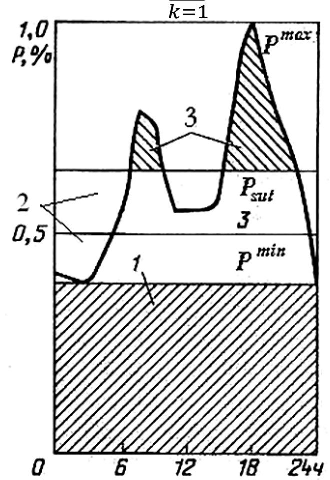

Fig. 1. Daily loading graph.

HPP of guaranteed power that HPP of hydro aggregate stagnation situation custodial marginal power is said to be: [6-8]

$$N_k = 0{,}95 \cdot N_{95\%};$$

$N_{95\%}$- 95% to be provided suitable power:

$$N_{95\%} = 9{,}81 \cdot Q \cdot H \cdot \eta_{ga};$$

this on the ground Q – water spending m ^{3}/s; η – of hydro aggregate useful the work coefficient; H - effort, m: [9-10]

$$H = \nabla HBL - \nabla LBL - h_w;$$

Basis power that electricity energy of the network basis part coveringto power it is said; she is guaranteed power 30% to equal to that taken, that is:

$$N_b = 0{,}3 \cdot N_k;$$

Peak (max) power that electricity energy of the network peak partcovering to power it says:

$$N_p = 0{,}3 \cdot N_k;$$

The maximum supplied power is the power generated by the hydroelectric power plant for daily supply of electricity when there is a peak load in the electric power network: [11-13]

$$N_{m.t} = N_b + N_p;$$

Repair of spare capacity, capital and aggregates at a certain time the power required for repair; and equal to 10% of EET capacity taken, that is:

$$N_z = 0{,}1 \cdot N_{ES};$$

Accident (disruption) reserve power this is downloads emergency without decline or electricity transmission lines and aggregates emergency without from work output power N_{mt} 10% of the power, ie:

$$N_d = 0{,}1 \cdot N_{m.t};$$

Load backup power is in the process of adjusting the frequency of the electric current necessary to prevent accidental and unplanned increases in loads is the power N_{ES} of 2% around is taken:

$$N_L = 0{,}02 \cdot N_{ES};$$

Per diem peak energy that HPP electricity energy in the network a day duringpeak upload when it was electricity energy to provide with it says:

$$E_P = (N_k - N_b) \cdot 24;$$

Scale coefficient in EET as follows defined as:

$$K_C = \frac{N_{ES}}{100};$$

HPP of nominal power:

$$N_{HPP} = N_d + N_L + N_{m.t}.$$

3 Results and discussion

This article is based on the Delphi 7 program and electricity network power, GES is guaranteed power, base power, peak (peak) power, maximum provided power, repair reserve power, accident (disruption) reserve power, loading reserve power, per diem peak energy, mashtabcoefficient and of GES nominal power given For example, in the table 1 given data optional respectively choose received and Delphi 7 programming in the language Created in the program calculated:

Table 1. Parameters of water content.

Order number	Water spending (Q), m^3/s	High buffet level (∇HBL), m	Lower buffet level (∇LBL), m	Loss of pressure (hw), m	Hydro of aggregate UWC (η_{Ha}), %
1	75	100	42	2.3	91

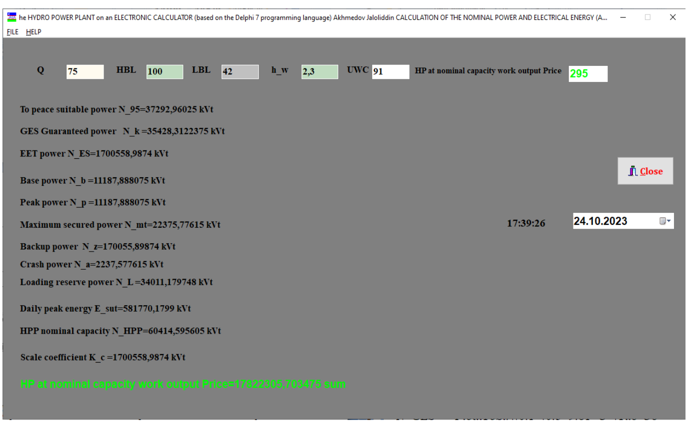

Fig. 2. Calculation of the nominal power and electrical energy (active power) of the hydro power plant on an electronic calculator.

4 Conclusion

The program written in Delphi 7 programming language provides an opportunity to accurately obtain a number of data of the hydro power plant in a short period of time. In particular, it is possible to calculate the guaranteed capacity, the guaranteed capacity of the hydro power plant, the power in the power grid, the base power, the peak power, the maximum power provided, the reserve power, the emergency power, the load reserve power, the daily peak power, and the nominal power of the hydro power plant.

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