DATA USED IN PAPER: DAY-AHEAD OPTIMAL OPERATION PLANNING OF WIND AND HYDROTHERMAL GENERATION WITH OPTIMAL SPINNING RESERVE ALLOCATION

For the hydroelectric system, were used parameters shown in Tables 1-5.

TABLE 1 – COEFFICIENTS OF THE POLYNOMIAL QUOTA AMOUNT.

a_0(x10^3) [m]	a_1(x10^{-1}) [m/hm^3]	a_2(x10^{-5}) [m/hm^6]	a_3(x10^{-9}) [m/hm^9]	a_4(x10^{-13}) [m/hm^{12}]
0,4477	0,1823	-0,2871	0,3003	-0,1273

TABLE 2 – COEFFICIENTS OF THE POLYNOMIAL QUOTA DOWNSTREAM.

b_0(x10^3) [m]	b_1(x10^{-4}) [s/m^2]	b_2(x10^{-7}) [s^2/m^5]	b_3(x10^{-12}) [s^2/m^8]	b_4(x10^{-18}) [s^4/m^{11}]
0,3944	21,110	-0,7923	2,3516	-27,1386

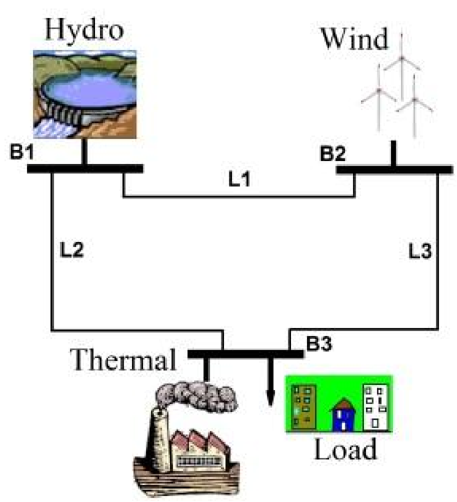

Fig.1: Hydrothermal-Wind System (3 Buses).

TABLE 3 – YIELD COEFFICIENTS OF THE HYDROPOWER AND THE COEFFICIENT OF HYDRAULIC LOSSES.

ρ_0(x10^{-1})	ρ_1(x10^{-3}) [s/m^3]	ρ_2 (x10^{-3}) [m^{-1}]	ρ_3 (x10^{-6}) [s/m^4]	ρ_4 (x10^{-6}) [s^2/m^6]	ρ_5 (x10^{-5}) [m^{-2}]	k(x10^{-6}) [s^2/m^5]
3,9235	2,9719	1,9804	4,0996	-5,7325	-1,3964	10,776

TABLE 4 – LIMITS VOLUMES AND FLOWS OF RESERVOIRS.

Minimum Volume [hm^3]	Maximum Volume [hm^3]	Maximum Swallowing [m^3/s]	Maximum Spillage [m^3/s]
2662	6775	1576	3152

TABLE 5 – CHARACTERISTICS OF THE GENERATING UNITS.

Number of Units	Operative Zones [MW]	Maximum Swallowing [m^3/s]	Nominal Decline (m)
4	[210-355]	394	102

The inflow will considered 902 [m^3/s] and the initial volume will 5.718,5 [hm^3]. In this paper is used the coefficients of future costs and adapted so that the hydroelectric do not waste water and hydropower problem converge showed in Table 6.

TABLE 6 – VALUES OF THE COEFFICIENTS OF COST FUNCTIONS $\pi^{(P)}$[\$/hm³] E *Ctotal(p)* [\$].

π^1	π^2	π^3	π^4	π^5
2053,351	2311,881	41,037	407,217	274,554
C_{total}^1	C_{total}^2	C_{total}^3	C_{total}^4	C_{total}^5
2,9014 E+5	7,9698E+4	1,2972E+5	7,1092E+5	5,1569E+5

TABLE 7 – PARAMETERS OF THERMAL UNIT

ct_1 [$/MW]	ct_2 [$/MW^2$]	Pt_{min} [MW]	Pt_{max} [MW]	Δp [MW/h]	t^{down} [h]	t^{up} [h]	t^{online} [h]	start-up cost [$]
40	0,005	0	300	100	4	2	4	150

Figure 2 show daily typical curve of wind power generation. The maximum wind power capacity is 150 MW, however, in this paper the wind power forecasted capacity varies along the 24-hour of day thus the spinning reserve requirements varies in each hour.

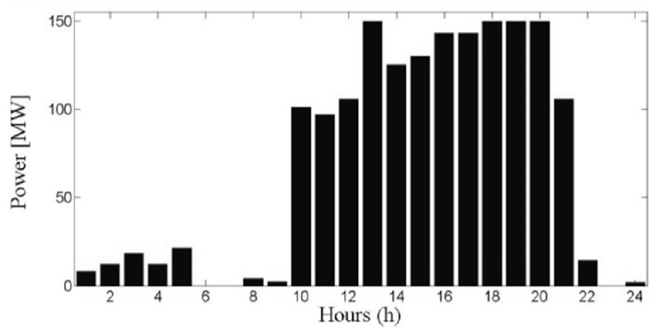

Fig. 1: Daily Typical Curve of Wind Power Generation.

Figure 3 shows the hourly distribution of day demand considered in this paper.

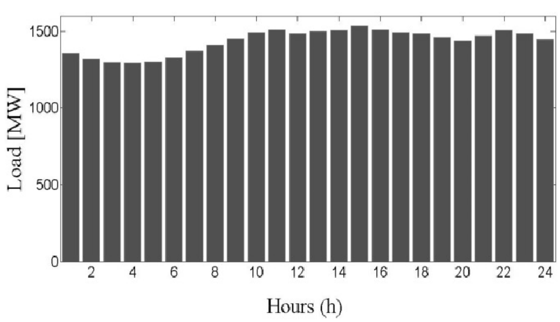

Fig. 2: Daily Typical Curve of the Energy Demand in the Summer Period.