

## CERRO PRIETO IV, THE NEWEST POWER PLANT IN CERRO PRIETO GEOTHERMAL FIELD

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### *Capacity installed*

### **ABSTRACT**

The Cerro Prieto IV power plant is the newest power plant in Cerro Prieto geothermal field, it started the production commercial generating in 2000, at present the entire installed capacity of generation in the geothermal field of Cerro Prieto is 720 MWE, the plant CP IV has a capacity of 100MW distributed in four units of 25 MW each one, all these units are feeding by the steam produced by twenty wells approximately. The total accumulate gross electricity generated through four years by this power plant is about 2'796,580 MWH.

The Cerro Prieto IV power plant is the newest plant in Cerro Prieto field and was constructed between April 1998 and July 2000, under a BLT (Build, Lease and Transfer) contract won by Mitsubishi Corporation responding to international bid issued by the Comision Federal de Electricidad, Quijano, et al. (2001).

### **INTRODUCTION**

Cerro Prieto, Located in the State of Baja California, northwestern Mexico, close to border with USA, is the largest known water-dominated geothermal field in the world and one of the more thoroughly studied, Heard et al. (1986). The generation of electrical power from geothermal fluids on a commercial scale was begun by Comision Federal de Electricidad on April 4, 1973 with the Cerro Prieto Plant I, originally equipped with two turbogenerators of 37.5 MW each one, Dominguez (1981). Since that date, annual power generation has gradually increased. Its installed capacity is 720 MW, which at present, there are 13 units in operation include the Cerro Prieto IV (100 MW). Cerro Prieto IV is the first new geothermal plant built in Mexico, since 1994. At present, there are 13 units in operation housed in four power plants, see Ta. 1.

### **STEAM PRODUCTION OF CERRO PRIETO FIELD**

In Cerro Prieto geothermal field, the steam flow rate is supplied from large diameter wells (0.24 m) drilled to depths which vary between 2000 m and 3500 m depth. About 150 wells distributed over an area of 15 km<sup>2</sup> (Fig. 1) are required to satisfy the needs of the four power plants.

Cerro Prieto	# Units	Capacity MW
I	4	37.5
II	1	30
III	2	110
IV	2	110
IV	4	25

Table 1. Cerro Prieto Power Plant

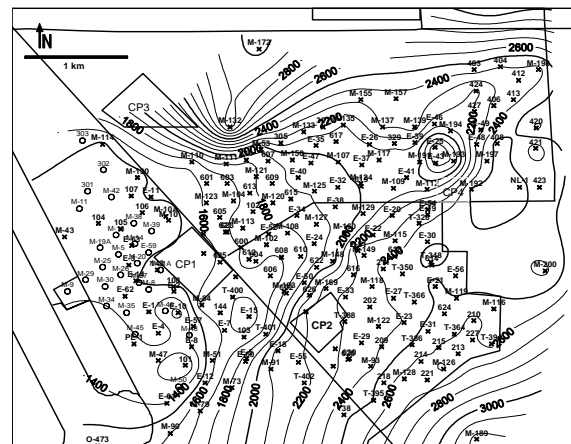


Figure 2. Cerro Prieto wells locations associated to reservoir top depth

The maximum temperature at the bottom of some of these wells reaches 350 °C and the maximum measure wellhead discharge pressure in one of this was about 120 bars. The initial mixture flow rate of

some wells exceeded 500 tonnes/h, Mercado, et al. (1987). Present day the steam produce by wells allocated in each Cerro Prieto production area is shown in Tab. 2.

Production area	High pressure steam flow rate (tonns/h)	Low pressure steam flow rate (tonns/h)	Producer wells number
CP I	347.86	-----	20
CP II	1974.52	284.11	57
CP III	1653.08	113.17	52
CP IV	969.79	79.83	18
Total			

Table 2. Cerro Prieto Steam flow rate by production area

### CERRO PRIETO IV POWER PLANT

The power plant houses four 25-MW condensing units. Each of them requires 183 t/h of steam at 182 °C and 10.5 bar absolute, under standard operating conditions, the specific consumption for these units is about 7.3 tons of steam per MWh. Fig. 2 and Tab. 3 show the gross generation data for Cerro Prieto IV power plant from July 2000 to March 2004

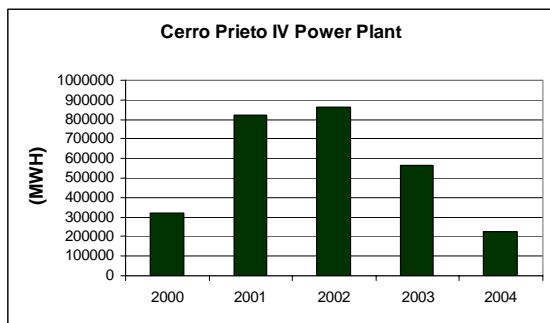


Figure 2. Cerro Prieto IV Power Plant Gross Generation

Year	Total Gross Generation (MWH)
2000	321,295
2001	823,477
2002	862,615
2003	563,269
2004	225,924
Total	2'796,580

Table 3. Cerro Prieto IV Power Plant Annual Gross Generation

Figure 3 shows a basic diagram of Cerro Prieto IV central power station.

### CONCLUSION

The commercial exploitation of liquid dominate geothermal reservoir has been clearly demonstrate wit the installations and operation of the four power plants CP I CP II, CP III and CP IV. After 32 years of commercial operation the thermodynamics efficiency of the plants is good within the limitations of the cycle used and the variations in the supply wells.

Present the total power capacity installed in Cerro Prieto geothermal field is 720 MWe. Cerro Prieto IV is the newest power plant builds in Mexico since 1994, with a capacity of 100 MW, The power plant houses four 25-MW condensing units. Each of them requires 183 t/h of steam at 182 °C and 10.5 bar absolute, under standard operating conditions, the specific consumption for these units is about 7.3 tons of steam per MWh. The accumulated gross generation for Cerro Prieto IV power plant from July 2000 to March 2004 was about 2'796,580 MWH.

### REFERENCES

Dominguez, B., (1981), Brief Commentaries of The Generation in the Main Plant in Cerro Prieto, *Geothermal Resources Council TRANSACTION*, Vol. 5, pp. 9-14.

Heard, C.L., Siqueros, J., Jiménez, J., Ortega L., (1986), Developments in Geothermal Energy in Mexico – part seven: thermodynamic analysis of the operation of geothermal electrical power generation facilities, *J. Heat Recovery Systems* 6, pp. 345-354.

Mercado, S., Bermejo, F., (1987), Mecanismo de Producción del Pozo M-147 de Cerro Prieto II y posible zona de vapor en la profundidad, *Boletín IIE*. Vol. 1, #4, pp. 162-167.

Mercado, S., Bermejo, F., Heard, C., Fernandez, H., Angulo, R., (1990), Cerro Prieto II (220 MW) and III (220 MW) Geothermoelectric Plants, *Geothermal Resources Council TRANSACTIONS*, Vol. 14, Part II, pp. 1043-1048.

Quijano, J.L., Gutierrez, N., L., (2001), Geothermal Production in Mexico in the Year 2000, *Geothermal Resources Council TRANSACTIONS*, Vol. 25, pp. 593-596.

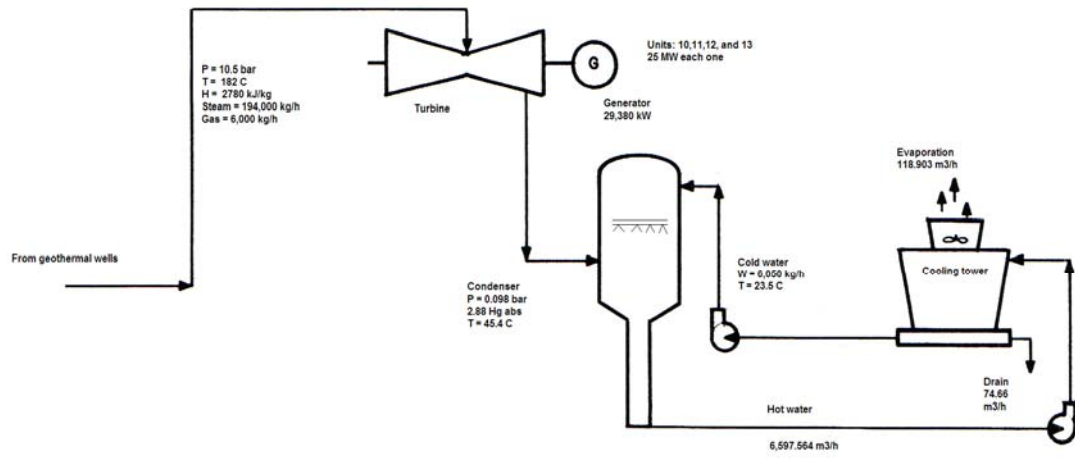


Figure 3. Cerro Prieto IV Central Power Plant Station