EL SALVADOR, GEOTHERMAL DEVELOPMENT TO THE YEAR 2000

VEGA, D.; Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL), El Salvador, C.A.
CAMPOS, T.; Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL), El Salvador, C.A.
ESCOBAR, D.; Bishimetal Exploration Co. Ltd.; Chiyoda Ku, Tokyo 101, Japan.

National Plan of Energy for the Next Decade

This year, CEL has proposed a National Plan of Energy for the period 1988-2000, emphasizing an intensive utilization of the geothermal and hydro resources available for electric power generation. The total expected increase of installed capacity is in the order of 500 MWe, with a typical composition as shown in fig.1. The corresponding total investment would reach a figure of US$ 700 millions.(CEL, 1988).

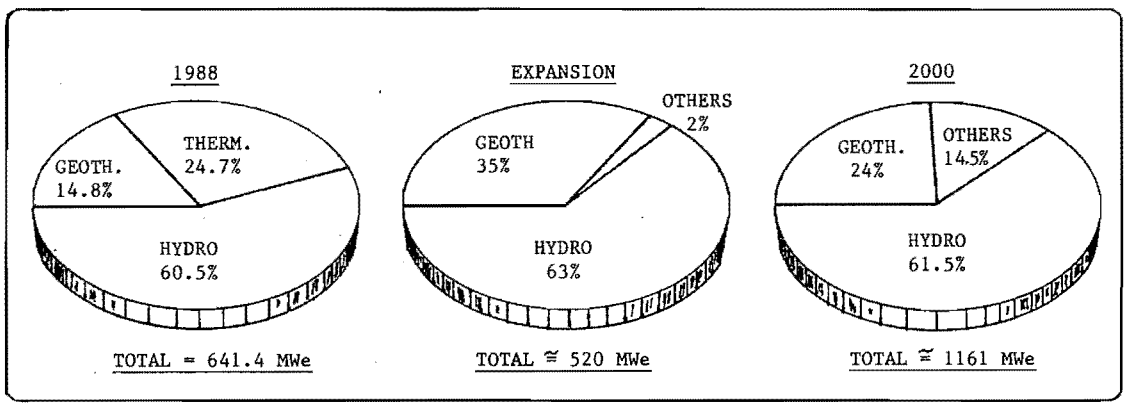


Fig. 1 - Composition of Installed Capacity

Geothermoelectric Program

In relation to geothermoelectric expansion, the goal would be to install a capacity of 180 ± 20 MW, essentially through the accelerated development of 4 geothermal areas: Berlín, Chipilapa, San Vicente and Coatepeque; the latter being the only one where no drilling has been made as to actually have a direct identification or appraisal of the subsurface conditions. The paralell development of other identified areas, including the south-east zone of the Ahuachapan field, as well as experimental applications of Binary Cycles, are also considered but.basically as a support to accomplish the general task of the program.

Fig. 2 illustrates the composition of the planned geothermal development, for the range of expected power. Table 1 gives for the areas involved the basic strategy of conversion types and power capacities of the equipment to be installed.

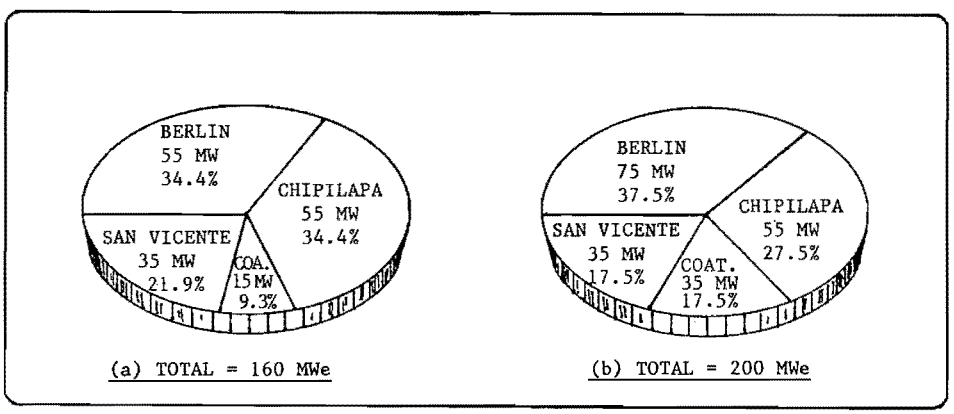


Fig. 2 - Composition of Planned Geothermal Development

| Name of Area | Location | Actual Status | Year of Operation Start-up | Total Projected Development (No.of Units x Capacity)(2) |
|---|---|---|---|---|
| Berlín | 13° 31' Lat N<br>88° 32' Long W | E.C.W.(1) for exploitation project: 2 x 5 MWe | 1990 | 3 x 5 MWe + 3 x 20 MWe |
| Chipilapa | 13° 56' Lat N<br>89° 47' Long W | E.C.W. for exploitation project: 2 x 5 MWe | 1990 | 3 x 5 MWe + 2 x 20 MWe |
| San Vicente | 13° 38' Lat N<br>88° 50' Long W | Planning for accelerated development.(3) | 1995 | 3 x 5 MWe + 1 x 20 MWe |
| Coatepeque | 13° 51' Lat N<br>89° 35' Long W | Preparing for surface studies and shallow drilling to be initiated Jan 1989 | 1997 | 3 x 5 MWe + 1 x 20 MWe |

Notes:
(1) E.C.W. = Erection civil works
(2) 5 MWe and 20 MWe capacities indicate single flash back-pressure and condensing type units respectively.
(3) Local identification for an exploitation with back-pressure units initiated whenever steam production is obtained during the feasibility stage for large-scale development.

Table 1. Basic Strategy for Conversion Type and Power Capacity.

Main Features of the Approach for Geothermoelectric Projects.

The policy for 1988-2000 Geothermal Energy Development would be guided by the following criteria:

1. Increasingly widespread adoption of small portable back pressure units to be installed at the head of wells for inmediate utilization of newly-discovered steam. This will mainly allow a faster recovery of the investments. A number of 3 wellhead units is considered a reasonable upper limit to early test an specific area and to obtain some warranties for the investments and long-term reservoir capacity needed for condensing systems. Given the portability of small units and the differences on the scheduled year of operation start-up, all or some of the back pressure units used in Berlín and Chipilapa could be transferred to San Vicente and Coatepeque.

2. The adoption of condensing power plants, which will be of importance to reduce the steam specific consumption and to increase the load factor, is designed to be gradual with single-flash condensing 20 MWe units as, among other factors, these would require practically the same magnitude of medium pressure steam already supplied and proved through 3 back-pressure units.

   Were the reservoir response and steam availability of an specific area better than present estimates, then larger capacities would be adopted for the condensing units either from single or dual-flash process. A capacity increment by dual-flash is actually considered a non possible approach only for the Berlín Field due to the high mixture enthalpy that has been measured in all production wells (1674 $\frac{Kj}{Kg}$).

3. The disciplines or techniques to be applied for surface studies are essentially those that the best practical results have given according to local conditions and experience. Both depth and scope of drillings would advance accordingly. These features are expected to result in shortening the time of investigations.

4. Both the natural production decline of wells and the waste disposal by reinjection, are to be considered as drilling needs that should be initially included in each project whatever its nature.

ACKNOWLEDGEMENTS

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REFERENCES

CEL (1988). Primer Plan Nacional de Desarrollo Energético Integrado 1988-2000, Vol III; pp. 453-455, 519-565.