

GEOTHERMAL DEVELOPMENT IN EL SALVADOR – A COUNTRY UPDATE

José Antonio Rodríguez

Geotérmica Salvadoreña S.A. de C.V.

Km. 11 ½ Carretera de La Libertad

Desvío a Nueva San Salvador, El Salvador

Abstract

El Salvador has an area of 21,000 km², and a population of six million inhabitants, making it one of the most densely populated countries in the American continent. Since the mid-1970's geothermal has been one of the main sources of electricity in the country, supplying up to 41% of the national electricity demand in 1981.

Since 1996, Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL), the National Electric Utility Company, has embarked on projects to recover and expand geothermal electricity generation, all in the midst of wholesale reform of the electricity legislation and regulation. Geothermal generation now competes-favourably-with other energy sources in an open market.

I. Introduction.-

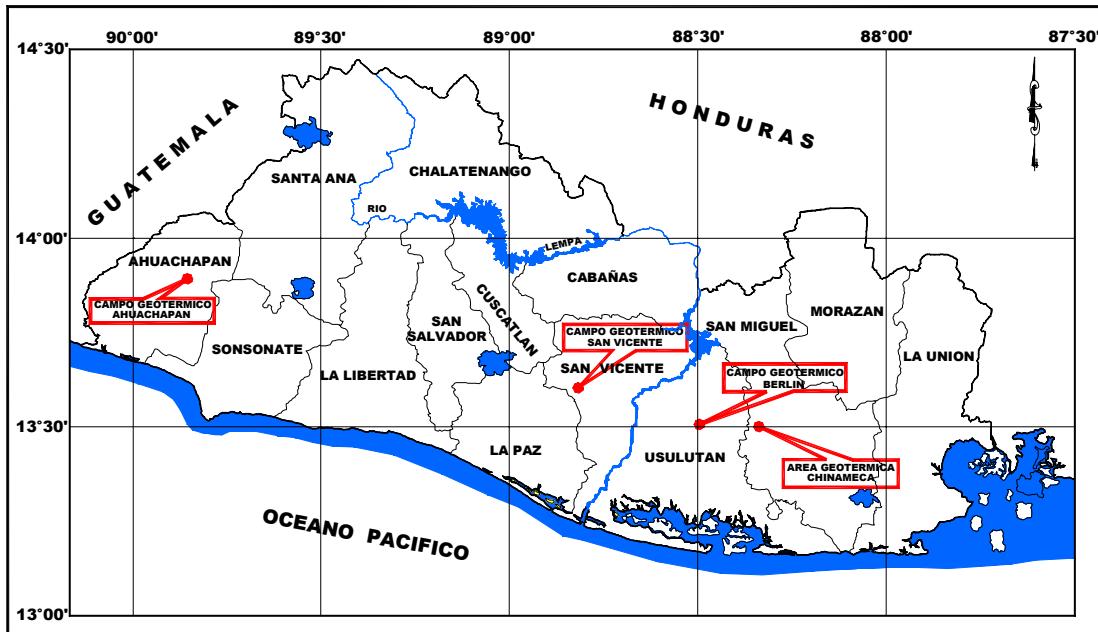
There have been major changes in El Salvador's geothermal scene in the past few years that will permanently modify the business of geothermal developments and power generation in general in this Central American country. Since 1996, Ahuachapán geothermal field – long a main provider of electricity in El Salvador, but whose output had declined over the years – has been increasing its output steadily. There is a new 56 MW condensing plant in Berlín, which brings national installed capacity to 161 MW.

Also since 1996, El Salvador has new electricity legislation aimed to open the market and introduce competition, so now

prices for kWh are set by forces of supply and demand, rather than by executive decree. Several new organizations have been created to control and regulate the power market, which is becoming a very strong and dynamic player in the national economy.

Some of the regional energy projects will also have an impact on geothermal, some expected as early as 2001. There are projects underway to interconnect all of Central America and construct one large market, and plans to build a gas pipeline from Mexico to El Salvador, or from Colombia to Panama. All of these projects would have an impact on the local electricity market.

The entire focus of geothermal has been power generation for many years now, and there is no direct use made of geothermal energy that has any economic or social impact. Although there is some potential to use geothermal to dry coffee or grains, these applications remain unexplored and will not be mentioned in this paper.



II. New Projects.-

Much work has been done in the area of geothermal developments since the Interamerican Development Bank approved financing for the first condensing power plant in Berlin and the stabilization and rehabilitation of Ahuachapán. Work began in both these projects in November 1996, with an aim to increase share of electricity generation for geothermal from 11% in 1996 to close to 20% in 2000. As a result of these projects, geothermal generation for December, 1999 will supply over 20% of national demand for the month, and the share is still increasing as the Ahuachapán project continues to bear fruit.

Ahuachapán.- The Ahuachapán geothermal field was overworked in the early 1980's, when the transmission lines from hydro projects from the North of the country were systematically knocked out by guerrilla groups and geothermal

energy from the peaceful Western end of the country had to supply the deficit. Furthermore, waste brine was not injected, but instead was dumped to the ocean via an 80-km-long canal. As reservoir pressure dropped rapidly, power output was cut back from 95 MW (installed) in 1981 to just 48 MW in 1994. The US\$50 Million "Ahuachapán Stabilization and Rehabilitation Project" was devised to simultaneously stop further pressure drop and increase power output by carrying out several key project components: (a) drilling 10 new production wells to the South of the production area, closer to the heat source and the recharge area; (b) building a pipeline to inject brine into existing wells in the Chipilapa area, 7 km away, which is connected to the Ahuachapán reservoir; (c) constructing the gathering system from the new wells to the power plant and to injection wells; and (d) refurbishing some of the electrical and mechanical equipment in the power plant. As new wells have been added and injection has started to work, power output is now at

53 MW and climbing slowly, and reservoir pressure has essentially stabilized at 1994 levels.

Berlín.- A new 56 MW (2 X 28 MW) condensing facility was dedicated on July 10, 1999 in the Berlín geothermal field, before a distinguished audience. The ceremony concluded a two-and-a-half year effort to complete the US\$120 Million project. Reservoir depth is between 1950 m and 2300m, and highest measured temperatures are 305°C. Project components were: (a) erection of a 56 MW condensing power plant (2 X 28 MW modular units), (b) drilling of 18 new production and injection wells, complete with access roads, (c) erection of a 7 km long 115 kV transmission line, (d) Erection of 16 km of pipelines for the gathering system, and (e) construction of a 24-person camp for workers who will reside on-site. The new power plant is currently operating at capacity, but not all the wells are being used. Since the two wellhead units that were installed in 1992 have not been decommissioned, studies are underway to maintain wellhead generation using the same gathering system. Also, because field capacity estimates range from 100 MW to 150 MW, feasibility studies are being carried out to determine the possibility of installing a third condensing unit at the same site.

San Vicente and Chinameca.- Requests for concessions have been filed with the electricity regulator to exploit San Vicente and Chinameca geothermal fields, each initially estimated at 50 MW capacity. After undergoing a public review and selection process, the final bidding process is scheduled to begin in December 1999.

III. Electricity Reform.-

The electricity industry has undergone a thorough reform in El Salvador since legislation was passed in November 1996. The market passed from a vertically integrated, state-owned monopoly (CEL), to an open, competitive market, with mostly private players. The distribution and thermal generation assets were spun off from CEL and sold, all to foreign investors. The high voltage grid was spun off from CEL and will operate as an independent company. Geothermal generation was separated into Geotérmica Salvadoreña S.A. de C.V., an independent company owned by CEL, currently competes in the open market, and debate is under way about how to privatize it. Hydro generation still forms an integral part of CEL. The system operator is an independent company owned by all the wholesale market participants, but controlled by none. The system operator also operates the high-voltage spot market. A regulatory agency was created, called the Superintendencia General de Electricidad y Telecomunicaciones (SIGET), to fix distribution and transmission wire use costs (open access is mandatory), resolve disputes between market operators, and give concessions for geothermal and hydroelectric developments. The electricity system has been operating in its present form since early 1998.

Some results of the reform are already visible. The sale of the distribution and thermal generation companies brought US\$650 Million to the Salvadorean government, which was used mostly to pay debt. The new owners have started making investments to prevent blackouts and increase thermal generation capacity. Wholesale energy prices have remained fairly stable at around 6 US cents/kWh

(including generation, transmission, regulation, and system operation charges), except for a slow rise mostly due to hikes in international oil prices in 1999.

IV. Regional Energy Projects.-

Some Central American energy projects are expected to have significant impact on the local Salvadorean electricity market. There are three that are currently being considered: (a) interconnection with Honduras, (b) the Central American interconnection line (SIEPAC), and (c) a Central American gas pipeline.

Interconnection with Honduras.- Central America is interconnected in two blocks: the Northern block, consisting of Guatemala and El Salvador, and the Southern block, consisting of Honduras, Nicaragua, Costa Rica, and Panama. The only remaining link that is missing to interconnect Central America in its entirety is El Salvador-Honduras. The IDB has given a binational loan to complete the interconnection with a 230 kV line, and the process has passed the design stage and is currently in bidding for the construction stage. Completion of the interconnection is scheduled for 2001.

SIEPAC line.- The six Central American governments have signed an

interconnection treaty to erect a 230 kV transmission line extending 1800 km from Guatemala to Panama, to allow for larger energy transactions than those possible through binational interconnections of local grids. The project is financed by the IDB, the Spanish government, and the six local governments, and is expected to conclude by 2004.

Central American gas pipeline.- The United Nations Economic Commission for Latin America (CEPAL, for its Spanish acronym) has studied and proposed the construction of a natural gas pipeline from Mexico through Central America, and private investors are studying the possibility to build a pipeline to transport natural gas from Colombia to Panama. Either of these projects, together with the interconnection projects mentioned above, would have an impact on electricity prices throughout Central America.

References.-

CEL – Estadísticas eléctricas 1998

Unidad de Transacciones – Web site www.ut.com.sv

SIGET – Web site www.siget.gob.sv