

Costa Rica

Geothermal Update

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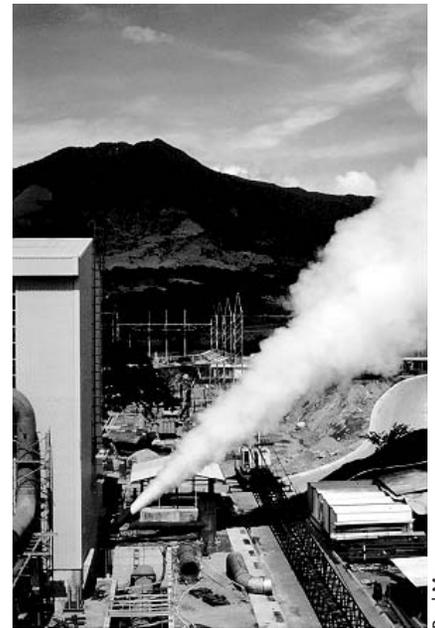
For the last five years, geothermal energy development activities in Costa Rica have taken place in the province of Guanacaste, in the northwestern part of the country (Fig.1). At the Miravalles Geothermal Field, electricity is being produced and well repairs continue. Exploration work on the slopes of the Rincón de la Vieja Volcano at the Las Pailas and Borinquen geothermal fields is ongoing.

Miravalles

The first geothermal studies on the southwestern slopes of the Miravalles Volcano began in the mid-1970s. The area showed promise with significant surface

manifestations and its location near the site of eruptive activity about 7,000 years ago. The results of initial exploration work were very encouraging, prompting drilling of a discovery well in 1979. The Miravalles liquid-dominated reservoir temperature is approximately 240° C.

In March 1994, the first 55-megawatt (MW) single-flash turbogenerator (Unit I) came on line at Miravalles, and has been in continuous commercial operation for more than nine years. Since its inception, the geothermal power operation's installed power generation capacity has more than doubled. At the end of 1994, a 5-MW backpressure power plant was installed at Unit I. In 1998, a second 55-MW unit and subsequent 29.5 MW backpressure unit began operation, increasing installed generation capacity of the Miravalles Geothermal Field to 144.5 MW



Paul Moya

Figure 1. Location of the Borinquen, Las Pailas and Miravalles geothermal fields in Costa Rica.



by 2000. All incremental additions of power output were accomplished with single-flash technology.

At the end of 2003, an 18-MW binary power plant (Unit V) is scheduled to start generating electricity in the southern part of the Miravalles field (Fig. 1). It will exploit heat in separated geothermal brines before the fluids are injected back to the reservoir. The new unit will raise total installed generation capacity at Miravalles to 162.5 MW.

To satisfy steam requirements of existing and future Miravalles geothermal power plants, wells are being repaired and recompleted, while replacement and exploratory wells are being drilled. Studies to identify the most promising drilling sites are ongoing, especially east of the present geothermal field. In April 2003, Well PGM 55 was successfully completed in an area more than 1.5 km east of the nearest existing well in the field. It produces sufficient steam to generate 4 MW of electricity.

Well PGM 55 confirmed the presence of a new high-permeability area that produces fluids similar to those being exploited in the main part of the Miravalles Geothermal Field. However, its steam has

a higher than usual content of non-condensable gases (mainly carbon dioxide), posing a higher calcium carbonate scaling potential than found in other wells. Preliminary data suggest that Well PGM 55 taps the same geothermal reservoir as wells in the present production area. In the near future, a long-term production test and a number of scientific studies will be performed to determine if there is hydraulic communication between Well PGM 55 and the rest of the geothermal field. Since Well PGM 55 is located near a virgin rain forest, future wells at Miravalles will be drilled directionally to protect the environment while optimizing use of available area. This is the first time such drilling technology will be used at Miravalles.

Las Pailas

The Las Pailas Geothermal Field is located on the southern slope of the Rincón de la Vieja Volcano. It is the largest active volcano in northwestern Costa Rica, and has erupted numerous times in the recent past—the latest in 1998. Five exploration wells were drilled in the area in 2001-2002. Three of the wells produce enough steam

to generate 18 MW. Fluids from the 250° C reservoir have a TDS of 12,800 ppm and pH of 7.5.

Well PGP 02 was marginally successful. A fifth well (PGP 5), planned as an injector, did not encounter significant permeability. During January-March 2003, following interference production tests, field work to prepare a technical feasibility report for the first unit at Las Pailas was completed. Future activities will include deepening Well PGP 02 in search of a permeable zone, and drilling additional wells to identify an area for injection of waste geothermal brines.

Borinquen

The Borinquen Geothermal Field is located seven km northwest of Las Pailas, also on the slopes of the Rincón de la Vieja Volcano. Four exploration wells are planned for this area, and the first (PGB 01) has been drilled. Initial data suggest the presence of an important geothermal resource. Currently (June 2003), the drill bit has reached a depth of 1,627 m. Below 922 m, the well has experienced total loss of circulation. The current plan is to drill the well to a depth of 2,200 m. ■

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