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Country Update: Nicaragua

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ABSTRACT

Geothermal exploration began in Nicaragua at the end of the 1960s. Medium and high-temperature resources are associated with the Maribios range, an active Quaternary volcanic chain of the Nicaraguan depression. The commercial exploitation of Momotombo started in 1983. when the first 35MW unit was installed to operate. The installed capacity increased with further units but the plant is now running below peak capacity. In October 2003, the government of Nicaragua granted an exploitation geothermal concession to San Jacinto power to develop the San Jacinto geothermal field, initially with two 5 MWe back pressure turbines, later replaced by two condensing turbines and later a binary plant. There has been further exploration but as yet no further power development.

1 INTRODUCTION

This paper is an update of that by Ariel Zúñiga Mayorga (2005) and the historical information is taken directly from that source.

Nicaragua is the Central American country with the greatest geothermal potential, possibly on the order of several thousand megawatts (MWe). Reserves that can be estimated with a higher degree of confidence total about 1500MW (Ministerio de Energia y Minas 2023). Medium and high-temperature resources are associated with volcanoes of the Nicaraguan depression, which parallels the Pacific coast.

Geothermal exploration began in Nicaragua at the end of the 1960's, showing the large geothermal potential of the country and giving priority to the Momotombo and San Jacinto-Tizate fields. Studies increased after 1973, at a time when the oil crisis had a large impact on Nicaragua's economy.

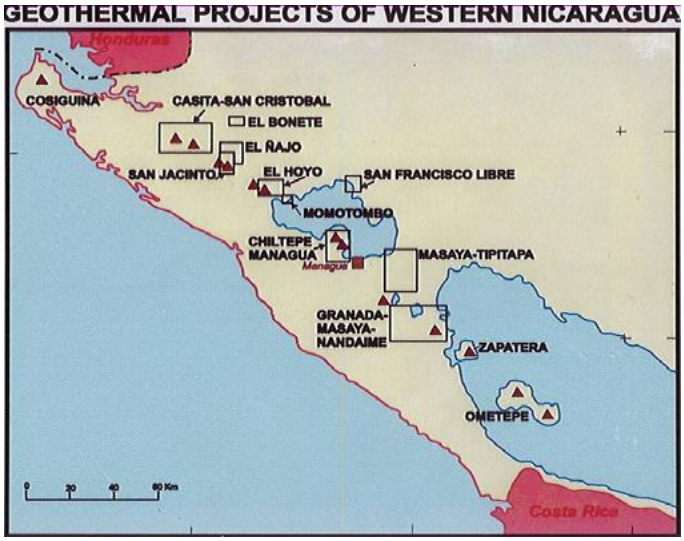

Figure 1. Location of the main geothermal areas in Nicaragua (from Zuniga 2005)

2 POWER DEVELOPMENT

2.1 Momotombo Area

The Momotombo geothermal field lies on the northwestern shore of Managua's Lake and on the southwestern slope of the active Momotombo volcano, which is located in the central sector of the Nicaraguan depression at the SE extremity of the Marrabios mountain range. The cone of the Momotombo volcano grew over oldest lavas formations, and partially over the volcanic structure of the Monte Galán caldera that is located in the north west base of the volcano. Around the volcano either at the north zone or in the South West are shown a wide formations of tuffs and pumices.

The first wells at the field were completed in early 1970s. In 1983 a 35 MWe geothermal flash power plant was placed on line. A second identical unit was installed in1989, bringing installed capacity to 70 MWe. Initially brine was disposed of to Lake Managua rather than being injected.

Since then, numerous wells have been drilled for the purposes of exploration, injection and development. The depths of these wells vary from 313m to 2983 m intersecting three different geothermal reservoirs: one is shallow (300m-800m), another is intermediate (from 800m to 1700m); and one is a deep reservoir (1700m-3000m). In addition some permeability appears to be fault-controlled (Porras and Bjornsson 2010). Locations of wells and the geothermal reservoirs are shown in Figure 2. Wells produce at a wide range of enthalpies.

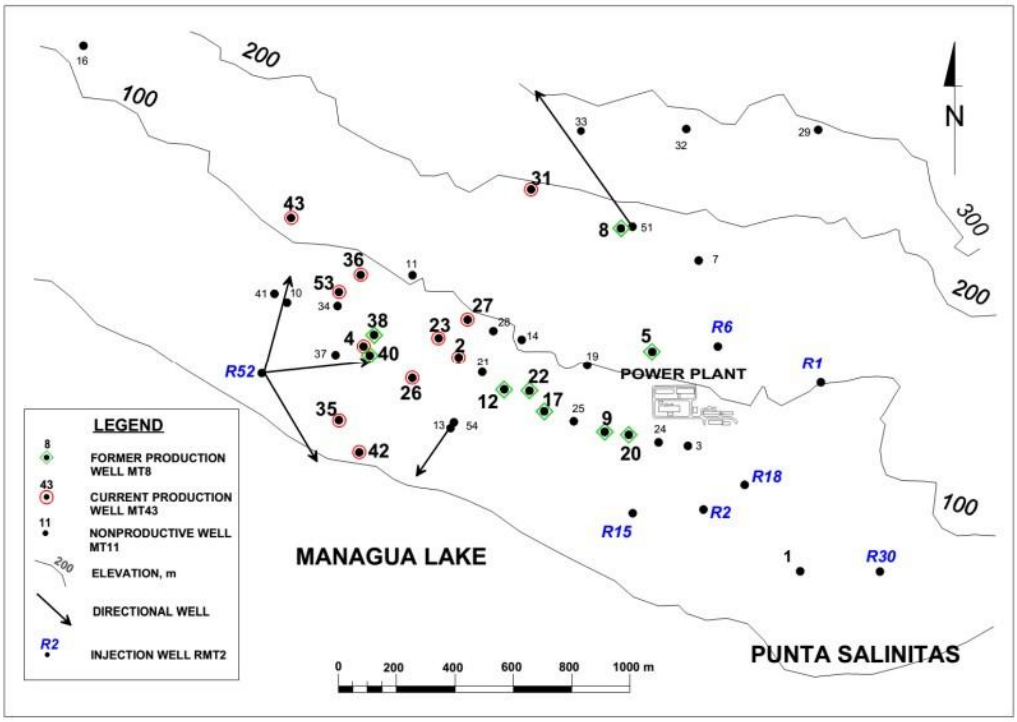

Figure 2. Momotombo Field Location of wells and power plants as of 2010 (from Porras and Bjornsson 2010)

In 1999, Ormat International, Inc won a 15 year Build-Operate-Transfer (BOT) contract to exploit the geothermal resources and improve electricity output at the Momotombo geothermal field; where the enthalpy and pressure of the producing wells had declined rapidly, due to enthalpy decline and calciting, affecting the steam output of the wells and the plant's electricity production. By early 1999, only 9 MWe were being generated. Since then, the company did further drilling of four deep wells. Mineral scales were cleaned out of eight production and four injection wells, using mechanical methods, in addition, chemical-scale inhibition systems have been installed in five wells. About 83 percent of waste geothermal fluids are being injected back to the reservoir. These efforts have increased and stabilized the electrical output of the flash plant at around 29MWe. In November 2002, a 7.5MWe Ormat binary energy converter entered online but further declines occurred. Current installed capacity is 67 MWe and the current power generation is 25 MWe, being about 6-7MWe binary and steam is 18-19MWe. Further drilling of production and reinjection wells took place, with a current program of two production wells and one reinjection well to try to restore capacity.

There have been recent changes of ownership, with the concession being cancelled, and the Momotombo plant is currently owned and operated by the State of Nicaragua, though in the past it has been subject to a variety of private ownership.

2.2 San Jacinto Area

During the 1993-1995 period, seven exploration-production wells were drilled in the San Jacinto-Tizate geothermal area with total depths between 724 and 2235 m, encountering temperatures from 264 to 289ºC and proving the resource. The production test demonstrated the commercial viability of the field. Further drilling took place though the period 2007 -2018 with a total of 21 wells now completed, four of which are multi-legged. Thirteen or 14 wells are used for production (depending on cycling behaviour) and three for reinjection. Maximum reservoir temperatures encountered are just over 300 ºC.

Initially (2005) two 5 MWe back pressure turbines were installed, to provide an initial estimate of resource sustainability and early revenue. The production test demonstrated the commercial viability of the field. These were then replaced in 2012 by two MWe Fuji single flash condensing turbines, which continue to operate successfully today. They were supplemented by a 10 MWe Ormat binary plant in 2023.

The San Jacinto plant now has a total installed capacity of 82MWe (net) but is currently operating below peak capacity due to limited steam capacity. Latest quarterly average output was about 50 MWe, but it varies from quarter to quarter because of two strongly cycling wells and has exceeded 50 MWe in some recent quarters. The reservoir has benign characteristics with no acidity or calcite scaling, and localised excess enthalpy though largely liquid dominated. Silica scaling in the reinjection system is potentially a problem but is under control using acid inhibitors (see Matus et al., these proceedings 2026).

The San Jacinto plant is owned and operated by PENSA.



Figure 2. San Jacinto-Tizate 82 Mwe Geothermal Power Plant

3 EXPLORATION

3.1 Casita Area

The Casita area was held under concession by Cero Colorado Power S.A., an affiliate of Polaris Renewable Energy Inc., but is no longer. A slimhole was drilled there in 2011 at a total depth of 842.85 m and with a maximum downhole temperature of 230 °C, achieving a capacity of 1.5 MWe of dry steam despite a large fish. There are intriguing indication of apparently a large dry steam resource.

3.2 Cosigüina Area

The Ministry of Energy and Mines (MEM) with the financing of the Inter-American Development Bank (BID) has been carrying out complementary prefeasibility studies and deep exploratory well drilling.

3.3 Other High Temperature Areas

Several other areas with high temperature potential have been subject to surface exploration, and limited shallow or slimhole drilling, but the results are not generally publicly available. The potential remains good.

Lawless

Field	Stage of development (2025)				Installed Capacity	Gener-ation	Concession by	Potential MWe
	Recog-nition	Pre-Feasibility	Feasibility	Operation				
Momotombo	XX	XX	XX	XX	67	25	MEM	154
San Jacinto-Tizate	XX	XX	XX	XX	82	50	PENSA	167
El Hoyo-Monte Galan	XX	XX	XX				None	159
Managua -Chiltepe	XX	XX					None	111
Casita	XX	XX	XX				None	225
Telica-El Najo	XX	XX					None	78
Caldera de Apoyo	XX	XX					None	153
Mombacho	XX	XX					None	111.5
Caldera de Masaya	XX	XX					None	99.5
Tipitapa	XX						None	9
Cosiqüina	XX						MEM	106
Ometepe	XX						None	146
						Total Potential		1519

Table 1. Status of High Temperatures Geothermal Areas of Nicaragua (CNE, 2001 but updated)

3.4 Geothermal Areas of Low Enthalpy

The Ministry of Energy and Mines (MEM) and the Nicaraguan Electricity Company (ENEL) with the Bid and Deutsch Cooperation have been conducting studies at the recognition level of medium to low temperature geothermal areas and have identified 14 areas. This important potential is mostly limited to the West of the Country, in correlation with the Volcanic Range.

Nº	Áreas de Estudio	Municipio/Departamento	Temperatura ºC	Conductividad µS/cm	pH
1	San Franciso Libre	San Francisco Libre- Managua	40-87	1234 - 2570	7.3-8.5
2	Teustepe	Teustepe- Boaco	37-45	1215-2351	7.9-8.4
3	Macuelizo	Macuelizo- Nueva Segovia	51-73	1497	7.9
4	Santa Bárbara	Jalapa, San Fernando y El Jícaro-Nueva Segovia	55-97	547-979	8.3-8.9
5	Cerro Juan Sapo	El Sauce y Achuapa-León	40-56	1532-1822	7.4-7.9
6	Zinica-Waswalita	Waslala y Siuna-RAAN	54-88	1161-2530	7.2-7.8
7	Boca de Sábalos	El Castillo-Río San Juan	67-84	1388-1679	8.3
8	Aguas Calientes-Juigalpa	Juigalpa-Chontales	35-69	615-2051	6.3-6.9
9	Aguas Calientes-Ñambar	San Pedro de Lóvago-Chontales	41	992	6.5
10	San Antonio-El Playón	San Francisco Libre y Tipitapa-Managua	44-63	2310	5.6
11	Loma Playa Grande	Puerto Morazán-Chinandega	49-93	11620	6.88
12	Telica **	Telica-León	48-98	210-1080	3.5-5.9
13	Mateare **	Mateare-Managua	33-46	310-1100	5.1-6.2
14	Tipitapa**	Tipitapa-Managua	35-88	480-2180	6.94-10.46

Table 2. Low Enthalpy Geothermal Areas of Nicaragua (Martínez, 2023).



Figure 3. Geothermal Areas of Nicaragua (Martinez, 2023).

3.5 Conclusions

Geothermal exploration and development in Nicaragua has been successful. Two power plants are operating. There is undoubtedly considerably more capacity available and so far the resources appear to have benign characteristics. The longer term prospects for further geothermal power development in Nicaragua are good. As well as the potential to supply grid power within the country, there is the potential for export to other Lalin American countries through the inter-connected high voltage grid.

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REFERENCES

CNE, 2001: Geothermal Master Plan of Nicaragua. National Energy Commission, Volume I, V, VII.

Matus Pravia, I. .A, Lawless, J., Cortez Ramirez, M., Gámez Altamirano, G. E.: 2026: Silica Scaling Control After Binary Plant Commissioning, San Jacinto Tizate Geothermal Field, Nicaragua. World Geothermal Congress 2026.

Martinez, J., 2023: Estado del Desarrollo de la Geotermia de Nicaragua, IV Regional Workshop about Geothermal, Costa Rica.

Porras E.A and Bjornsson, G.: 2010: The Momotombo Reservoir Performance upon 27 Years of Exploitation Proceedings World Geothermal Congress 2010

Zúñiga Mayorga, A.:2005: Nicaragua Country Update World Geothermal Congress 2005