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Country Update: El Salvador

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ABSTRACT

Geothermal energy in El Salvador has become the fundamental pillar to the country's energy transition. It represents almost 19% of the country's total electricity production. LAGEO S.A. de C.V., a state-owned geothermal company manages two main geothermal fields in Ahuachapán and Berlín, and two geothermal projects in San Vicente and Chinameca. The Ahuachapán geothermal field started its commercial operation in 1975, while Berlin geothermal field in 1992 with initial two back pressure units of 5 MW each and with ongoing expansion. In 2025, the total installed capacity of geothermal energy production reached 217 MW, approximately 9% increase from the previous years and expanding further with two geothermal projects, supported by favorable laws and international partnerships to boost energy security and reduce reliance on fossil fuels.

1 INTRODUCTION

El Salvador is the smallest country in Central America and has an area of 21,041 km^2 (Figure 1). Its capital is San Salvador, and the currency is US dollar. It has a democratic and representative government, whose three bodies are the executive, legislative and judicial branches. Its main population is around 6.5 M.



Figure 1. Location of El Salvador

Known as the Land of Volcanoes, it has more than 20 active volcanoes, characterized by major hydrothermal areas, hot springs and fumaroles, making it feasible for geothermal energy.

In September 2025, the Geothermal Energy Law was approved by the Legislative Assembly, providing a framework for granting geothermal concessions to attract investment by offering tax incentives and encouraging strategic development.

As the country is focused on renewables and reduction on dependence in fossil fuels, geothermal energy development has become a priority with ongoing projects in Berlín, San Vicente and Chinameca, the latter to be funded by the World Bank.

2 GEOLOGY BACKGROUND

El Salvador is located within the Central American Volcanic Front (CAVF), a volcanic chain extending for more than 1000 km from Guatemala to Costa Rica and related to the subduction of the relatively young lithosphere (age <25 Ma) of the Cocos Plate beneath the Caribbean Plate (Figure 1). The CAVF is divided into several distinct structural segments with different geological and geophysical features (Agostini et al., 2006).

The El Salvador segment is characterized by strong tectonic and volcanic activities. The latter has been continuous since at least the early Neogene; during the Holocene 21 volcanoes were active, 6 of which erupted in historical times. The widespread magmatic activity has resulted in a relatively high heat flow that has created areas of shallow thermal anomaly whose exploitation is economically feasible. Thus, almost 19% of electricity generation is provided by geothermal energy, where most of the geothermal areas of interest lie along the Central American Volcanic Front.

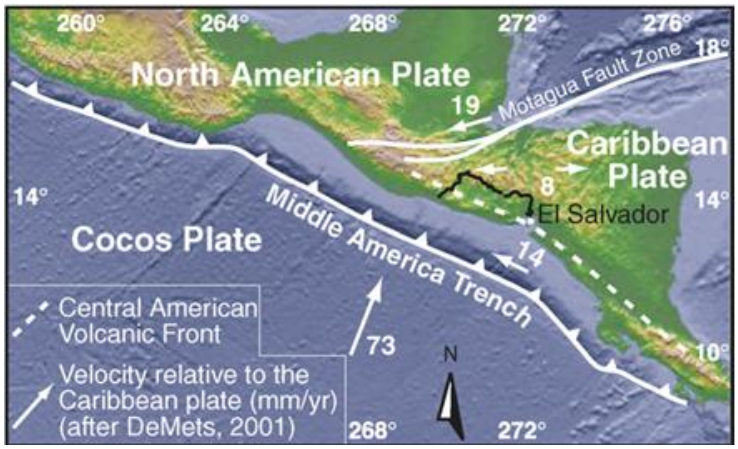
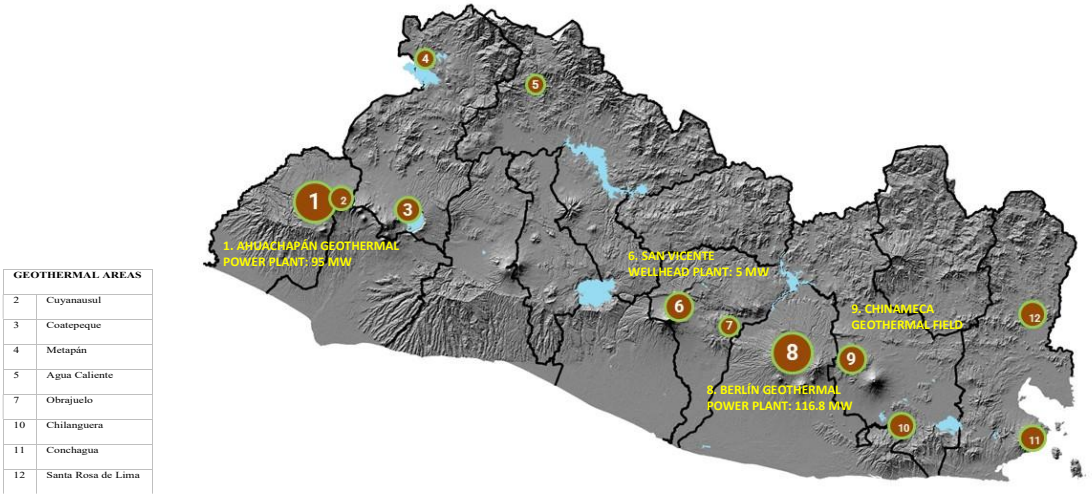


Figure 2. Tectonic setting of El Salvador (Agostini et al., 2006)

3 GEOTHERMAL RESOURCES AND POTENTIAL

The geothermal potential in El Salvador was first identified in the 1960s by the United Nations and was evaluated by the Comisión Ejecutiva Hidroeléctrica del Río Lempa (CEL) in 1987. Based on the studies, it was estimated to have a potential geothermal energy reserve of 644 MW with reservoir temperatures greater than 150°C.

Figure 3 shows the location of geothermal fields and other geothermal areas.



GEOTHERMAL AREAS	
2	Cuyanausul
3	Coatepeque
4	Metapán
5	Agua Caliente
7	Obrajuelo
10	Chilanguera
11	Conchagua
12	Santa Rosa de Lima

Figure 3. Location of geothermal fields and areas with thermal anomaly

There are two geothermal fields in operation: a) Ahuachapán Geothermal Field, commissioned in 1975, almost half-century of exploitation and b) Berlin Geothermal Field, which has been in operation since 1992.

Two geothermal projects are underway with proven existence of high-temperature resources: a) San Vicente Geothermal Field and b) Chinameca Geothermal Field.

Likewise, based on the inventory of the existing geothermal resources, El Salvador has approximately 123 hydrothermal manifestations identified throughout the country (Figure 4). 29% of geothermal manifestations have temperatures between 50° and 80 °C, whose heat flow provides exploitable potential for direct uses, 25% of hydrothermal manifestations have temperatures above 80 °C and could provide opportunities for exploitation through the use of binary plants or for (agro) industrial thermal heating and/or cooling processes.

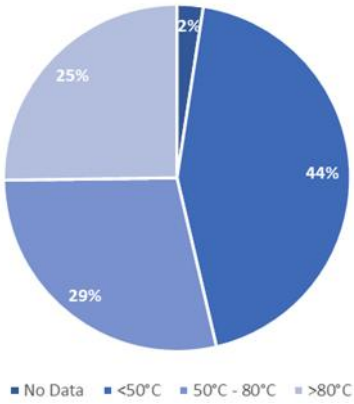


Figure 4. Percentage of areas with thermal anomaly, LAGEO 2021

4 GEOTHERMAL UTILIZATION

The main geothermal utilization in El Salvador is power generation. At present, the total installed capacity is 217 MW, addressing the electricity demand by contributing 19% to the energy mix of the country (Figure 5).

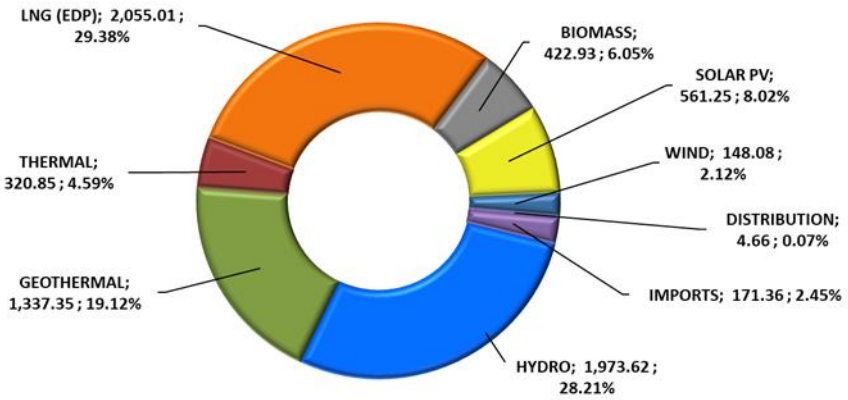


Figure 5. Energy mix in El Salvador

LAGEO is a state-owned geothermal company which started in 1999. It is focused on a platform of corporate values and principles, among which social responsibility is fundamental. It operates the geothermal power plants in El Salvador (Table 1) and conducts exploration studies in other geothermal areas with highly qualified technical staff.

Table 1. Geothermal plants in El Salvador

Geothermal Field	Geothermal Power plants	Installed capacity (MW)	Commissioning year	Company
Ahuachapán	2 condensing units & 1 dual flash units	95	1975	LAGEO
Berlín	3 condensing units & 2 binary cycle power plants	117	1992	LAGEO
San Vicente	Back pressure unit	5	2023	LAGEO

Upgrades of power plants and expansion are foreseen in Ahuachapán and Berlin geothermal fields in the next five years.

The back pressure unit in San Vicente Geothermal Field came into operation in August 2023 with a modular plant of 5 MW using two production wells, mainly to test the production capacities of the wells and to provide initial generation while project of large-scale is programmed in the future. Volumetric analysis obtained a projected capacity of around 30 MW.

FUNDAGEO (Foundation of LAGEO), the social responsibility branch of LAGEO, promotes the development and well-being of the communities near the geothermal fields. To optimize the use of geothermal energy for direct use, scented candles are manufactured by local people especially by women.

5 PROJECTS UNDER DEVELOPMENT AND EXPLORATION

The Chinameca Geothermal Field has a projected capacity of 50 MW, with 8 wells already drilled. A modular plant of 5 MW Back pressure unit is currently under construction in wellpad CHI-3. It is programmed to be commissioned this year with the same objectives of San Vicente Geothermal Field to test the production capacities of the wells and provide initial generation until the large-scale development of 20 MW with the World Bank funding.

The objective of the World Bank project known as Geothermal Energy for Sustainable and Inclusive Development Project is to increase renewable electricity generation and direct geothermal use for productive use applications. It has four components: a) drilling campaign to confirm geothermal resources to secure steam production for a power generation plant, b) construction of a new geothermal power plant in the Chinameca field with an estimated capacity of 20 – 25 MWe, the steam gathering system, and the connection to the electric substation, c) social and environmental programs and geothermal centers of excellence, and d) technical assistance and project implementation support (excerpts from https://documents.vsemirnyjbank.org/en/publication/documents-reports/documentdetail/099031125135063312).

6 DISCUSSION

With all the energy (geothermal and others) and great effort, El Salvador is moving full steam ahead with its expansion projects of the different geothermal fields, aiming to increase up to 30% of the power generation to the energy mix of the country, which will help consolidate energy security and transition to renewables within the next five years.

With the help of the present government, the Geothermal Energy Law was approved in September 2025 to provide a framework to grant geothermal concessions to attract investment by offering tax incentives and encouraging strategic development. Geothermal development goes hand in hand with the economic growth and security of the country.

The Ahuachapán Geothermal Field, one of the pioneers in Latin America, has reached more than its lifespan of 30 years. In 2025, the field commemorated its 50th year of commercial operation proving production sustainability on a large scale. As a recognition, the First Latin American Geothermal Congress was held successfully in El Salvador with talented professionals (and almost 40% women participation) in the region able to present their significant work to the public.

The Berlín Geothermal Field has now reached a capacity of around 117 MW with 3 condensing units and 2 binary cycle power plants, having an initial production of two back pressure units of 10 MW way back in 1992.

The San Vicente and Chinameca Geothermal Fields now have 5 MW back pressure units to test the capacity of the geothermal resource of the fields, until the large-scale development starts.

Technical personnel are highly specialized under the different post-graduate programmes in Iceland, New Zealand, Italy and Japan, which makes El Salvador a reference of experts in geothermal. With the collaboration of UNESCO GRÓGTP of Iceland and LAGEO, these technical staff are the lecturers in the geothermal diploma course given to Latin American candidates and local participants.

New technologies have been emerging through time: from back pressure units to condensing units to binary cycle power plants implemented in El Salvador. The country is also open to new innovations such as closed loop, drones, etc.

One of the corporate values of LAGEO is social responsibility handled by FUNDAGEO looking after the development and well-being of the communities nearby geothermal fields, in terms of education, health, infrastructure, animal care, etc. This has been a significant synergy between the operational activities of the power plants and the communities.

International funding such as the World Bank can help boost energy security, increase renewable electricity generation and direct use applications and reduce reliance on fossil fuels in the country.

And lastly, El Salvador is the smallest country in Central America, but it is the heart of geothermal energy in the region.

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