El Salvador

Geothermal Energy Market Overview

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THINK GEOENERGY

Key Facts

- Current installed geothermal power generation capacity of 204 MW (as of April 2021)
- Development and operation of geothermal assets by state-owned La Geo
- Geothermal resource potential estimated at around 650 MW
- The largest plant complex are the geothermal plants at the Berlin geothermal field
- Additional capacity planned 108 MW with 7.4 MW under construction
- No private development of geothermal projects at the moment

Abstract:

El Salvador, the nation commonly called the Land of Volcanoes, is characterised by major hydrothermal areas, hot springs and fumaroles. The main renewable resources used in El Salvador for electricity generation are geothermal and hydropower. The exploration of geothermal resources in El Salvador began in the 1960s with the aid of the United Nations. Geothermal reconnaissance in the country provided 18 areas classified as low- and high-enthalpy areas. Currently, there are two geothermal fields in full operation: Ahuachapán (the first geothermal field in El Salvador) and Berlin with an installed capacity of 95 MW and 109 MW, respectively. Whereas the other two fields are under development (i.e San Vicente field and Chinameca field). The government's energy policy proposes increasing public investment in projects to develop and use new renewable energy sources, as well as reviewing and reconfiguring the country's energy mix. The National Energy Council continues to work on updating institutional and regulatory frameworks to promote optimal resource use and the efficient implementation of appropriate technologies. The General Electricity Law of 1996, which liberalised the power sector, also allowed for more private sector participation in renewable energy development, alongside the government's more active promotion of renewable energy sources. The new National Energy Policy 2020-2050 aims to diversify El Salvador's energy mix and take advantage of the country's significant renewable energy resource potential

Country Overview

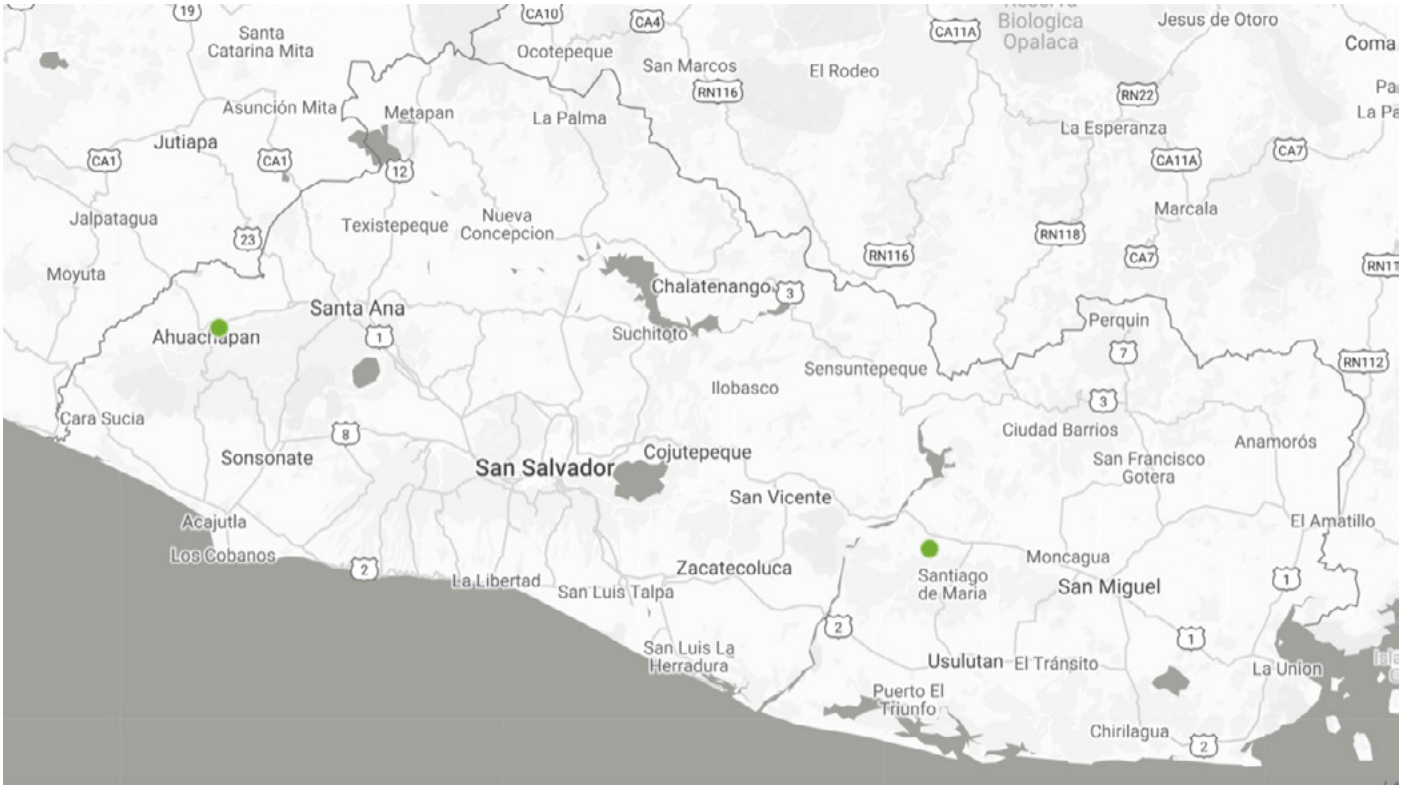
El Salvador is Central America's smallest country, with a land area covering 21,040 square kilometres (km2). Bordering Guatemala to the west, Honduras to the east, and the Pacific Ocean to the south, in 2018, El Salvador had an estimated population of just over 6.4 million. In the fiscal year (FY) 2019, El Salvador's gross domestic product (GDP) per capita at purchasing power parity (PPP) was around USD 9,140. In FY 2018 and FY 2019, the Salvadoran economy saw annual GDP growth of 2.5% and 2.3%, respectively. El Salvador has made impressive progress in ensuring access to affordable, reliable, sustainable and modern energy for all (SDG7). The country's access to electricity rates reaches around 97% in 2018, compared to 95.4% in 2015. By 2016, 88% of the population had access to clean cooking, while the same year, energy efficiency had improved to 4 megajoules (MJ) per USD of GDP. Geothermal power in El Salvador represents 25% of the country's total electricity production.

The Country's Energy Market

El Salvador is one of the top geothermal energy producers in the world. The main renewable resources used in El Salvador for electricity generation are geothermal and hydropower. While variable renewable power is growing considerably, there is much more potential for these resources, either for electricity or direct uses. With demand expected to grow at a rate of 5% in the coming years, the Government's 2007 National Energy Strategy identified several hydroelectric and geothermal projects as the best option to meet demand in the future and to diversify the country's energy mix. In 2017, fossil fuels (incl. Coal, natural gas, and oil) represented 2,170 GWh, solar 60 GWh, hydropower 1,540 GWh, and 1,450 GWh from geothermal sources. By 2019, installed power generation capacity by renewable energy technologies (hydropower, solar, and geothermal) rached 64.3% of the total power generation capacity of the country of 2, 200 MW (2.2 GW). The installed geothermal power generation capacity of El Salvador at year-end 2020 was 204 MW.

Geothermal resources and potential

The exploration of geothermal resources in El Salvador began in the mid 1960s with the aid of the United Nations. The geothermal reconnaissance of the country provided 18 areas classified as lowland high-enthalpy areas. Five of these areas were investigated: Ahuachapán, Chipilapa, Parras Lempa, Berlín, and Santa Rosa de Lima in the eastern part of El Salvador. Ahuachapán was the first geothermal field in El Salvador to be developed for commercial electricity generation. The motivation for this exploration was the abundance of hot springs, hot wells, fumaroles and other manifestations of hydrothermal activity in the southwestern volcanic belt of El Salvador, where Ahuachapán lies. The second geothermal field, Berlín, started production in 1992 with two back-pressure units of 5 MW each. Currently, the estimated potential of geothermal generation in El Salvador is estimated at 644 MW, of which one third is already being used for generation.



Regulatory framework

energy market, geothermal market & development

The electricity Law in El Salvador affords a high degree of liberty to market agents. Since 1996, El Salvador has adopted new electricity legislation aimed to open the market and introduce competition, so now prices for kWh are set by the process of supply and demand, rather than by executive decree. Further regulation is established on the electricity from renewable energy. The Law of Fiscal Incentives for the Promotion of Renewable Energies in Electricity Generation (Decreto Legislativo No. 462, 2007) states that for those projects up to 20 MW, there is an exemption for a period of 10 years on tariffs on imports of machinery, equipment, materials and supplies for the stages of pre-investment and investment in the construction of power plants, including sub-transmission lines. There is an exemption on income tax for a period of 10 years for projects up to 10 MW of capacity. For projects of 10 to 20 MW, this exemption shall be for a period of 5 years. All income derived from the disposal of primary Certified Emissions Reductions (CERs) are tax exempt. Moreover, the new National Energy Policy 2020-2050 aims to continue developing the country's renewable energy potential, which can stimulate local commerce and industry, help reduce electricity tariffs and improve people's welfare.

Geothermal Energy Utilisation today

The main use of geothermal energy in El Salvador is for power generation. Geothermal energy production in El Salvador dates back to 1975, when the operation of the first 30 MW unit in Ahuachapán field started. At present, there are two geothermal fields in operation, the Ahuachapán field with a total installed capacity of 95 MW, and Berlín with an installed capacity of 109 MW. Both are owned and operated by LaGeo. The Ahuachapan plant complex consists of three units, two single flash and one double flash turbine. The Berlin power plant complex consists of four units, three single flash and one binary cycle unit. El Salvador also has great potential for direct use for swimming and bathing, fish farming, drying grains and fruit, as well as greenhouse heating.

Geothermal Market & Industry

The electricity sector players in El Salvador are: Electrical Energy Directorate (DEE - Dirección de Energía Eléctrica), General Superintendence of Electricity and Telecommunications (SIGET), National Energy Council (CNE), and the private entity Transactions Unit (UT). The Electrical Energy Directorate (DEE - Dirección de Energía Eléctrica), created in 2001, is the administrative Unit within the Ministry of Economy that is in charge of elaborating, proposing, coordinating and executing policies, programs, projects and other actions in the electricity sector. The General Superintendence of Electricity and Telecommunications (SIGET) is the regulatory body for both the electricity and telecommunications sector. SIGET is in charge of regulating the power market, the distribution companies and consumer prices. The National Energy Council (CNE), created in 2006, has the role of analysing El Salvador's energy situation as well as the Government proposals, recommending the inclusion of new actions and strategies. The CNE seeks to contribute to a shift in generation towards renewable energy and to modify consumption patterns toward the efficient use of energy. The Transactions Unit (UT) is the private company in charge of administering the wholesale electricity market - in charge of system dispatch and performing clearing-house functions. UT is also responsible for the operation of the transmission system. In El Salvador, the company dedicated to geothermal power production is LaGeo SA de CV, a subsidiary of the Executive Hydroelectric Commission of the Lempa River (CEL) though it seems that both companies are operating in parallel following the recent restructuring. Due to the fact that the local Salvadoran electricity market was liberalised in 1998, distribution was sold to foreign investors, as was thermal generation. The system operation was separated from CEL (Comisión Ejecutiva Hidroeléctrica del Río Lempa) and given to a private entity, the UT (Unidad de Transacciones S.A. de C.V.), which operates the Contracts Market and the System Regulating Market (MRS).

Current Project Development

Currently, La Geo with partner Turboden is working on an expansion plant at Berlin, with a planned 7.4 MW of installed capacity. Production and reinjection wells are ready for power plant construction in the near future at two geothermal fields i.e at San Vicente field, associated with the Chichontepec volcanic system and at Chinameca field, associated with the Limbo and Pacayal volcanic system. German Development Agency, GIZ, is working in El Salvador supporting geothermal direct use development.

Outlook

El Salvador has prioritised renewable energy projects to reduce its dependence on imported fossil fuels and improve energy security. The National Energy Policy 2010-2024 has become a key tool for the country to advance the use of indigenous renewables, including hydropower, biomass, solar photovoltaic (PV) and geothermal power.

Sources

https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Dec/IRENA_RRA_El_Salvador_2020.pdf
UNU-GTP and LAGEO, Short Course on Geothermal Activity and Development In El Salvador 2012.
https://en.wikipedia.org/wiki/Electricity_sector_in_El_Salvador